



For
2021

CBSE
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PAPERS
with
SOLUTIONS

Science

CLASS X

2009- 2020

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CBSE Science 2020

Question Paper (as it is) -

General Instructions:

- 1) All questions are compulsory.

- 2) The question paper consists of 42 questions divided into 4 sections A, B, C and D. Section A comprises questions of 01 mark each, Section B comprises questions of 02 marks each, Section C comprises questions of 03 marks each and Section D comprises questions of 05 marks each.

- 3) All questions in Section A are to be answered in one word, one sentence or as per the exact requirement of the question.

- 4) There is no overall choice. However, internal choice has been provided wherever necessary. You have to attempt only one of the alternatives in all such questions.

- 5) In question on construction, drawing should be neat and exactly as per the given measurements.

- 6) Use of calculators is not permitted.

Section- A (1 mark each)

1. Write the number of valence electrons present in nitrogen atom (${}^{14}_7\text{N}$)

2. Define the term induced electric current.

3. Answer question numbers 3(a) – 3(d) on the basis of your understanding of the following paragraph and the related concepts.

Around the year 1800, only 30 elements were known, Dobereiner in 1817 and Newlands in 1866 tried to arrange the then known elements and framed laws which were rejected by the scientists. Even after the rejection of the proposed laws, many scientists continued to search for a pattern that correlated the properties of elements with their atomic masses. The main credit for classifying elements goes to Mendeleev for classifying elements goes to Mendeleev for his most important contribution to the early development of a periodic table of elements wherein he arranged the elements on the basis of their fundamental property, the atomic mass and also on the similarity of chemical properties. The format of their hydrides and oxides were treated as basic criteria for the classification of the elements. However, Mendeleev's classification also had some limitations as it could not assign the position to isotopes. He also left some gaps in the periodic table.

3(a). State Mendeleev's Periodic Law

3(b). Why did Mendeleev leave some gap in the periodic table?

3(c). If the letter 'R' was used to represent and of the elements in the group, then hydride and oxide of carbon would respectively be represented as

(i). RH_4 , RO (ii). RH_4 , RO_2 (iii). RH_2 , RO_2 (iv). RH_2 , RO

3(d) Isotopes are

(i) Atoms of elements with similar chemical properties but different atomic masses.

(ii) Atoms of different elements with similar chemical properties but different atomic masses.

(iii) Atoms of elements with different chemical properties but similar atomic masses.

(iv) Atoms of different elements with different chemical properties but similar atomic masses.

4. Answer question numbers 4(a) – 4(d) on the basis of your understanding of the following paragraph and the related studied concepts:

India today is facing the problem of overuse of resources, contamination of water and soil and lack of methods of processing the waste. The time has come for the world to say goodbye to “single-use plastics”. Steps must be undertaken to develop environment -friendly substitutes, effective plastic waste collection and methods of its disposal.

Indore treated 15 lakh metric tonnes of waste in just 3 years, through biomining and bioremediation techniques. Bioremediation involves introducing microbes into a landfill to naturally ‘break’ it down and biomining involves using trommel machines to sift through the waste to separate the ‘soil’ and the waste component. The city managed to chip away 15 lakh metric tonnes of waste at a cost of around Rs 10 crore. A similar experiment was successfully carried out in Ahmedabad also.

4(a) State two methods of effective plastic waste collection in your school.

- 4(b) Name any two uses of “single-use plastic” in daily life.
- 4(c) If we discontinue the use of plastic, how can an environment-friendly substitute be provided?
- 4(d) Do you think microbes will work similarly in landfill sites as they work in the laboratory? Justify your answer.

5. Which one of the following statements is correct about the human circulatory system?

- (a) Blood transports only oxygen and not carbon dioxide.
- (b) Human heart has five chambers
- (c) Valves ensure that the blood does not flow backwards.
- (d) Both oxygen-rich and oxygen-deficient blood gets mixed in the heart.

6. Anaerobic process

- (a) Takes place in yeast during fermentation
- (b) Takes place in the presence of oxygen
- (c) Produces only energy in the muscles of human beings.
- (d) Produces ethanol, oxygen and energy.

OR

Most of the digestion and absorption of the food takes place in the

- (a) Small intestine
- (b) Liver
- (c) Stomach
- (d) Large intestine

7. Fertilization is the process of

- (a) Transfer of male gamete to female gamete
- (b) Fusion of nuclei of male and female gamete.
- (c) Adhesion of male and female reproductive organs
- (d) The formation of gametes by a reproductive organ

8. If a person has five resistors each of value $1/5 \Omega$, then the maximum resistance he can obtain by connecting them is

- (a) 1Ω**
- b) 5Ω**
- c) 10Ω**
- d) 25Ω**

OR

The resistance of a resistor is reduced to half of its initial value. In doing so, if other parameters of the circuit remain unchanged, the heating effects in the resistor will become

- a) Two times**
- b) Half**
- c) One-fourth**
- d) Four times**

9. Fleming's Right-hand rule gives

- a) Magnitude of the induced current**
- b) Magnitude of the magnetic field**
- c) Direction of the induced current**
- d) Both, direction and magnitude of the induced current.**

10. Which one of the following statements is not true about nuclear energy generation in a nuclear reactor?

- (A) Energy is obtained by a process called nuclear fission.**
- (B) The nucleus of Uranium is bombarded with high energy neutrons.**
- (C) A chain reaction is set in the process.**
- (D) In this process a tremendous amount of energy is released at a controlled rate.**

The biggest source of energy on Earth's surface is

- a) Biomass
- b) Solar radiations
- c) Tides
- d) Winds

11. Food web is constituted by:

- a) Relationship between the organisms and the environment
- (b) Relationship between plants and animals
- (c) Various interlinked food chains in an ecosystem
- (d) Relationship between animals and environment.

12. Choose the incorrect statement from the following :

- a) Ozone is a molecule formed by three atoms of oxygen
- b) Ozone shields the surface of the Earth from ultraviolet radiations
- c) Ozone is deadly poisonous
- d) Ozone gets decomposed by UV radiations.

For question numbers 13 and 14, two statements are given – one labelled as Assertion (A) and the other labelled as Reason (R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below : (a) Both (A) and (R) are true and (R) is the correct explanation of the assertion (A). (b) Both (A) and (R) are true, but (R) is not the correct explanation of the assertion (A). (c) (A) is true, but (R) is false. (d) (A) is false, but (R) is true

13. Assertion & Reasoning que: Assertion

(A): Following is a balanced chemical equation for the action of steam iron:



Reason (R): The law of conservation of mass holds good for a chemical equation.

14. Assertion (A) : The sex of a child in human beings will be determined by the type of chromosome he/she inherits from the father.

Reason (R) : A child who inherits X' chromosome from his father would be a girl (XX), while a child who inherits a `Y' chromosome from the father would be a boy (XY).

Section- B (3 marks each)

15. Lead Nitrate solution is added to a test tube containing potassium iodide solution.

- (a)** Write the name and colour of the compound precipitated.
- (b)** Write the balanced chemical equation for the reaction involved.
- (c)** Name the type of this reaction justifying your answer.

OR

What happens when food materials containing fats and oils are left for a long time? List two observable changes and suggest three ways by which this phenomenon can be prevented.

16. List three differentiating features between the process of galvanization and alloying.

OR

Compare in tabular form the reactivity of the following metals with cold and hot water. a) Sodium b) Calcium c) Magnesium

17. Carbon a member of group 14, forms a large number of carbon compounds estimated to be about three million. Why is this property not exhibited by other elements of this group?

18. A cheetah, on seeing a prey, moves towards him at a very high speed. What causes the movement of his muscles? How does the chemistry of cellular components of muscles change during this event?

19. Define geotropism. Draw a labelled diagram of a plant showing geotropic movements of its parts

20. Define the term evolution. "Evolution cannot be equated with progress." Justify this statement.

OR

"During the course of evolution, organs or features may be adapted for new functions." Explain this fact by choosing an appropriate example.

21. A concave mirror is used for image formation for different positions of an object. What inferences can be drawn about the

following when an object is placed at a distance of 10 cm from the pole of a concave mirror of focal length 15 cm ?

(a) Position of the image

(b) Size of the image

(c) Nature of the image Draw a labelled ray diagram to justify your inferences.

22. The refractive index of a medium 'x' with respect to a medium 'y' is $\frac{2}{3}$ and the refractive index of medium 'y' with respect to medium 'z' is $\frac{4}{3}$. Find the refractive index of medium 'z' with respect to medium 'x'. If the speed of light in medium 'x' is $3 \times 10^8 \text{ ms}^{-1}$, calculate the speed of light in medium 'y'.

23. A person may suffer from both myopia and hypermetropia defects. (a) What is this condition called ? (b) When does it happen ? (c) Name the type of lens often required by the persons suffering from this defect. Draw labelled diagrams of such lenses.

24. How will you use two identical glass prisms so that a narrow beam of white light incident on one prism emerges out of the second prism as white light ? Draw and label the ray diagram.

Section- C (5 marks each)

25. A cloth strip dipped in onion juice is used for testing a liquid "x". the liquid "x" changes its colour. Which type of an indicator is onion juice. The juice "x" turns blue litmus red. List observations the liquid "x" will show on reacting with the following.

a) Zinc granules

b) Solid sodium carbonate

Write the chemical equations for the reactions involved.

OR

Define water of crystallisation. Give the chemical formula for two compounds as examples. How can it be proved that the water of crystallisation makes a difference in the state and colour of the compounds?

26. a) i) Write two properties of gold which make it the suitable metal for ornaments.

ii) Name two metals which are the best conductors of heat.

iii) Name two metals which melt when you keep them on your palm.

b) Explain the formation of ionic compound CaO with electron – dot structure. Atomic numbers of calcium & oxygen are 20 & 8 respectively.

27. Why is nutrition necessary for the human body ?

(a) What causes movement of food inside the alimentary canal ?

(b) Why is small intestine in herbivores longer than in carnivores ?

(c) What will happen if mucus is not secreted by the gastric glands ?

28. Draw a neat diagram showing fertilisation in a flower and label

(a) Pollen tube, (b) Male germ cell and (c) Female germ cell, on it.

Explain the process of fertilisation in a flower. What happens to the (i) ovary and (ii) ovule after fertilisation ?

OR

(a) What is puberty ?

(b) Describe in brief the functions of the following parts in the human male reproductive system : (i) Testes (ii) Seminal vesicle (iii) Vas deferens (iv) Urethra

(c) Why are testes located outside the abdominal cavity ?

(d) State how sperms move towards the female germ cell.

29. Draw a schematic diagram of a circuit consisting of a battery of 3 cells of 2 V each, a combination of three resistors of 10 , 20 and 30 connected in parallel, a plug key and an ammeter, all connected in series. Use this circuit to find the value of the following :

(a) Current through each resistor

(b) Total current in the circuit

(c) Total effective resistance of the circuit

OR

Two identical resistors, each of resistance 15 , are connected in (i) series, and (ii) parallel, in turn to a battery of 6 V. Calculate the ratio of the power consumed in the combination of resistors in each case

30. a) State Fleming's Left-hand rule.

(b) List three characteristic features of the electric current used in our homes.

(c) What is a fuse? Why is it called a safety device?

(d) Why is it necessary to earth metallic electric appliances?

Answers

Section- A

Ans 1). 5 valence electrons

Ans 2). Current produced in a conductor due to change in magnetic flux through the coil is called induced electric current and the phenomena is electromagnetic induction.

Ans 3).

3(a) Mendeleev's periodic law states that the properties of element are the periodic function of their atomic masses.

3(b) Mendeleev left some gaps in the periodic table, because he predicted the existence of few more element that had not been discovered at that time.

3(c) (ii) RH_4 , RO_2

3(d) (i) Atoms of element with similar chemical properties but different atomic masses.

Ans 4).

4(a) . Separate dustbins can be set up at school to collect the plastic and the same can be recycled. Certain plastic wastes like bottles can be reused as useful products like pen holder in the school.

4(b).Plastic water bottles, grocery plastic bags

4(c) We can replace the use of plastic bags with cloth or jute bags .Unlike plastic bags ,jute and cloth bag are reusable and environment friendly .

Ans 5). (c) Valves ensure that the blood does not flow backwards.

Ans 6). (a) Takes place in yeast during fermentation

OR

(a) Small intestine

(c) Valves ensure that the blood does not flow backwards.

Ans 7) .(b) Fusion of nuclei of male and female gamete

Ans 8). Maximum resistance is obtained when all resistors are connected in series

(a) 1Ω

OR

(b) Half By Joule's law of heating. (solve it completely)

Ans 9). (c) Fleming's right hand rule shows the direction of induced current when conductor moves in a magnetic field

Ans 10). (B) or (b)

Ans 11). (c) Various interlinked food chains in an ecosystem

Ans 12). (d) Ozone gets decomposed by UV radiations.

Ans 13). (a) Both 'A' and (R) are true and (R) is the correct explanation of the assertion (A).

Ans 14). (a) Both 'A' and (R) are true and (R) is the correct explanation of the assertion (A).

Section- B

Ans 15). a). Name name and colour of the compound precipitated. -
Lead iodide (PbI_2) colour is yellow

b). Equation : $\text{Pb}(\text{NO}_3)_2 + 2\text{KI} \rightarrow \text{PbI}_2 + 2\text{KNO}_3$

c) It is a double displacement reaction.

OR

The food material will get rancid. Two observable changes are:

- 1) Bad smell from the food
- 2) Bad taste of the food

Three ways by which this phenomenon can be prevented are:

- 1) By flushing food with nitrogen.
- 2) By adding antioxidants in the food.
- 3) Keeping the food away from sunlight

Ans 16).

Galvanisation	Alloying
(i). It is a method of protecting steel and iron from rusting by coating them with a thin layer of zinc.	(i). It is a very good method of improving the properties of a metal. We can get the desired properties by this method. Ex: Iron is mixed with 'Ni' & 'Cr', we get stainless steel which is hard and does not rust.
(ii) It doesn't modify the property of the metal	(ii) It modifies the property of the metal.

(iii) If the coating of zinc is removed then rusting takes place.	(iii). Alloy does not rust.
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OR

Sodium	Calcium	Magnesium
The reaction of 'Na' with cold water is very violent. It is highly exothermic. It also reacts with hot water in the same way.	The reaction of calcium with cold water is less violent. Calcium starts floating because the bubbles of hydrogen gas formed stick to the surface of the metal. It also reacts with hot water as well.	Magnesium does not react with cold water. It reacts with hot water to form magnesium hydride. It also starts floating as the bubbles of H ₂ gas stick to its surface.

Ans 17). This property of carbon is known as catenation which is exhibited only carbon atom , not by other elements of this group
 Due to the small size of carbon atoms , stability of carbon atoms and ability to form strong bonds , carbon gives rise to a large number of compounds linked to each other.

Ans 18). On seeing the prey, an impulse is sent from the brain to the muscles in it's limbs so that the cheetah can run towards the prey. Muscles have special proteins that change both their shape and their arrangement in the cells, new arrangement of the proteins give different forms to the muscle cells, i.e. Shorter or Larger form. Therefore, the cheetah is able to run after the prey due to the arrangement of cellular components (proteins) in the muscles.

Ans 19). The movement of plant growth towards or against the gravity is called geotropism. If the movement is towards gravity, its termed as positive geotropism and away from gravity is known as negative geotropism.

DIAGRAM



Ans 20). Evolution is defined as a process of gradual changes which takes in primary organisms over millions of years in which new species are produced.

Evolution cannot be equated with progress. There is no real 'Progress' in the idea of evolution. Evolution is simply the generation of diversity and the shaping of the diversity by environmental selection. The only progressive trend in evolution seems to be that more and more complex body designs have emerged over time. However, again, it is not as if the older designs are inefficient, one of the simplest life forms- bacteria - inhabit the most inhospitable habitats like hot springs, deep - sea thermal vents and the ice in Antarctica

OR

Organisms that have similar structures but adapt for new functions exhibit divergent evolution. These structures are known as homologous organs. Let us consider forelimbs of horse and man. The structure of the forelimbs of horse and man are similar but horse uses forelimbs to walk whereas man does not use the fore limbs to walk. Therefore the function is different but the similar structure is a proof that they share common ancestor.

Ans 21). $u = -10 \text{ cm}$ $f = -15 \text{ cm}$

a). $1/f = 1/v + 1/u$

$$-1/15 = 1/v + (-1/10)$$

$$1/v = -1/15 + 1/10$$

On solving, $v = 30 \text{ cm}$

b). $m = h_{\text{image}}/h_{\text{object}} = -v/u =$

$$-30/-10 = 3$$

It is enlarged

c). Nature of the image is virtual and erect

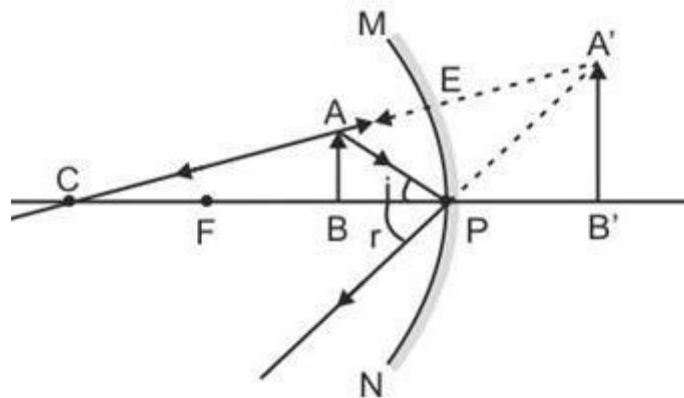


Image distance, $v = 30 \text{ cm}$

Ans 22). $N_{xy} = 2/3$

$$N_{yz} = 4/3$$

Explanation:

$$N_{xy} = N_x/N_y$$

$$N_{yz} = N_y/N_z$$

The refractive index of z with respect to x is given as:

$$N_{zx} = N_z/N_x = N_y N_x \times N_z/N_y$$

$$N_{zx} = 1/N_{xy} \times 1/N_{yz}$$

On substituting the values, we get,

$$N_{zx} = 1/(2/3) \times 1/(4/3)$$

$$N_{zx} = 3/2 \times 3/4$$

$$\therefore N_{zx} = 9/8$$

Refractive index = Velocity of light in vacuum / Velocity of light in that medium

The speed of light in y medium is v

The speed of light in x medium is 3×10^8 m/s

The refractive index of medium y with respect to x is given as:

$$N_{yx} = 3/2$$

Now,

$$3/2 = 3 \times 10^8 / v_y$$

$$\therefore v_y = 2 \times 10^8 \text{ m/s}$$

Hence, $v_y = 2 \times 10^8 \text{ m/s}$

Ans 23).

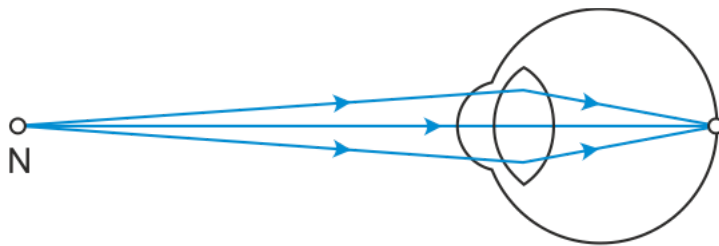
(a) A person may suffer from both myopia and hypermetropia defects. The condition is presbyopia

Presbyopia: With increase in age, the capability of eye to focus on near by object reduces due to decrease in power of accommodation.

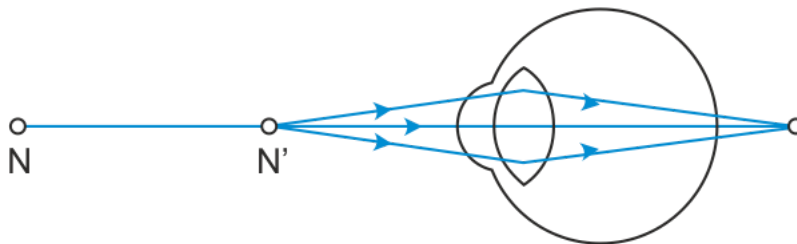
A person suffering from this defect can neither see near by object (nor) distant object clearly.

(b) This condition happens when ciliary muscles become weak.

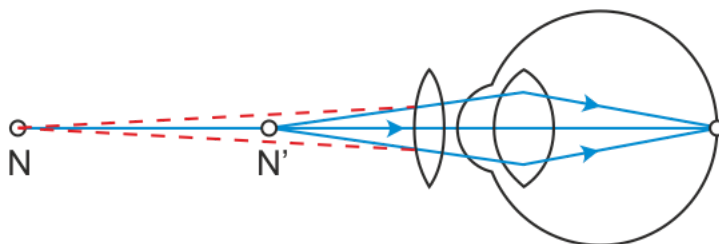
(c) Bi focal lens is used for correction of Presbyopia



(a) Near point of a Hypermetropic eye



(b) Hypermetropic eye

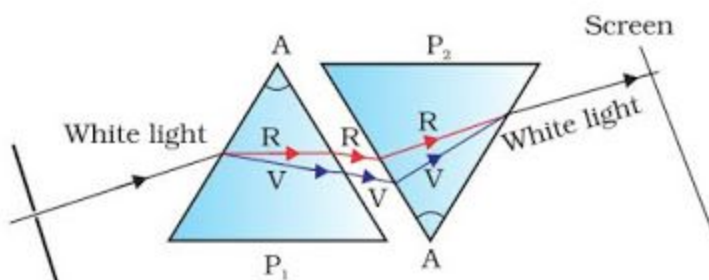


(c) Correction for Hypermetropic eye

Ans 24). (i) When white light is passed through a prism, it splits into its seven constituent colour (VIBGYOR)

(ii) **Dispersion** Splitting of white light into its constituent color is called dispersion.

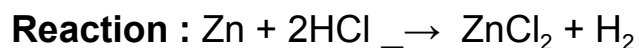
(iii) If another identical prism is placed in an inverted position in front of a prism then dispersed colours obtained from the 1st prism get recombined to produce white light.



Section-C

Ans 25). Onion juice is an olfactory indicator.

(a). Zinc granules



Observation: When a burnt match stick is brought close to the mouth of the test tube, the gas burns with a pop sound.

b) Solid sodium carbonate



Observation: CO_2 that is released turns lime water milky

OR

(a) Water of crystallisation is the number of water molecules that combine chemically in definite molecular proportion, with the concerned salt in the crystalline state.

(b) Two correct examples are

Copper sulphate

Formula - $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$

Washing soda

Formula - $\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$

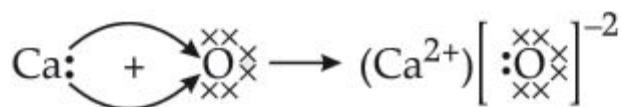
It can be proved that the water of crystallisation makes a difference in the state and colour of the compounds by heating these crystals they lose their water molecules and hence result in change in state and colour takes place.

Ans 26). a)

(i) It is ductile. It is also lustrous and malleable.

ii) Two metals which are the best conductors of heat are Aluminium and copper

iii) Two metals which melt when you keep them on your palm are Gallium and Caesium



Ans 27). a) .The process of taking in nutrients is called nutrition .Nutrients are required for building the various parts of the body ,thus enabling growth and repair of the body .The nutrients also provide us with energy.

b). Peristalsis causes the movement of food inside the alimentary canal.

c). The major nutrient in herbivores is cellulose. It takes a longer time to digest cellulose. This is the reason herbivores have a longer intestine than carnivores.

d). If there is no mucus secreted there would be perforations in the stomach walls due to concentrated HCl

Ans 28). As the pollen grains land on the stigma, the pollen tube formation occurs. The male gametes travel through the pollen tube and enter into the ovule through the micropylar end. The female gamete and male gamete fuse to form the zygote and this process is called fertilization. After fertilization is done:

(i) Ovary becomes fruit (ii) Ovule becomes seed.

OR

(a) Puberty is the period during which an adolescent reaches sexual maturity and becomes capable of reproduction.

(b) **(i) Testes** → They are the oval bodies, around 1.5 to 3 inches in length. Generally the left testis hangs slightly lower than the right one.

The two primary functions of testes are as follows:

1. Producing testosterone which is a male sex hormone.
2. Producing sperms which are carrier of man's genes.

(ii). Seminal vesicle → The function of seminal vesicle is to store sperms and to secrete seminal fluid that makes the sperm active.

(iii) Vas deferens → Carries the sperm from testes to penis.

(iv) Urethra → A common pathway for both urine and sperms.

(c) The process of spermatogenesis requires lower temperature (2 - 2.5 °C) than the body. This is the reason testes are present outside the abdominal cavity. The pouch is known as the scrotum/ scrotal sac.

(d) Sperms are motile as they have a tail for locomotion. The mitochondria in the mid piece of the sperm provides the energy for the tail to locomote.

Ans 29). (a) Fleming's left-hand rule: Stretch the forefinger, middle finger and thumb of left hand in such a way that they are mutually perpendicular to each other. If the forefinger point in the direction of magnetic field, middle finger point in the direction of current then the thumb show the direction of force or motion on the current carrying conductor.

Three characteristic features of the electric current used in our homes are:

1. The current supplied in our homes is alternating current
2. Fuse connected to avoid damage.
3. The neutral wire and the live wire carries the current in our homes

(c) A fuse is an electrical safety device that operates to provide overcurrent protection of an electrical circuit. Its essential component is a metal wire or strip that melts when too much current flows through it thereby stopping or interrupting the current. This is the reason a fuse is called a safety device

(d) Earth wire is used as a safety measure especially for those appliances that have a metallic body, for example - toaster. The metallic body is connected to the earth wire, which provides a low resistance conducting path for the current. Thus it ensures that any leakage of current to the

metallic body of the appliances keeps its potential to that of the earth and the user may not get a severe shock.

CBSE Science 2019

Question Paper (as it is) -

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2) The question paper consists of 42 questions divided into 4 sections A, B, C and D. Section A comprises questions of 01 mark each, Section B comprises questions of 02 marks each, Section C comprises questions of 03 marks each and Section D comprises questions of 05 marks each.

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5) In question on construction, drawing should be neat and exactly as per the given measurements.

6) Use of calculators is not permitted.

Section-A

1. If the potential difference across the two ends of a conductor is 5 V and the current through it is 0.2 A, then what is the resistance of the conductor ?
[1]
2. Write the major hazard of nuclear power generation.
[1]

Section - B

3. Draw a labelled ray diagram to show the path of the reflected ray corresponding to the ray which is incident obliquely to the principal axis, towards the pole of a convex mirror. Mark the angle of incidence and angle of reflection on it.
[2]
4. What is the principle of an electric motor ? State the rule which is applied to determine the direction of force experienced by a current carrying conductor when kept in a magnetic field.
[2]
5. Name the acid present in ant sting and give its chemical formula. Also give the common method to get relief from the discomfort caused by the ant sting.

OR

A student prepared solutions of
(i) an acid and
(ii) a base in two separate beakers but forgot to label the solutions and litmus paper is not available in the laboratory. Since both the solutions are colourless, how will he distinguish between the two using
(a) phenolphthalein and
(b) methyl orange ?

[2]

Section - C

6. What is a food chain ? Why is the flow of energy in an ecosystem unidirectional ? Explain briefly.

OR

(a) Why should National Parks be allowed to remain in their pristine form ?
b) Why is reuse of materials better than recycling ?

[3]

7. What is a dam ? List two main advantages and two ill effects of constructing a big dam.

[3]

8. (a) Write two water conducting tissues present in plants. How does water enter continuously into the root xylem ?
(b) Explain why plants have low energy needs as compared to animals.

[3]

9. "Nervous and hormonal systems together perform the function of control and coordination in human beings." Justify the statement.

[3]

10. Define genetics. Why is decrease in the number of surviving tigers a cause of concern from the point of view of genetics ? Explain briefly.

[3]

11. 2 g of ferrous sulphate crystals are heated in a dry boiling tube.
- (a) List any two observations.
 - (b) Name the type of chemical reaction taking place.
 - (c) Write balanced chemical equation for the reaction and name the products formed.

OR

You might have noted that when copper powder is heated in a china dish, the reddish brown surface of copper powder becomes coated with a black substance.

- (a) Why has this black substance formed ?
- (b) What is this black substance ?
- (c) Write the chemical equation of the reaction that takes place.
- (d) How can the black coating on the surface be turned reddish brown ?

[3]

12. In an industrial process used for the manufacture of sodium hydroxide, a gas 'A' is formed as a by-product. The gas 'A' reacts with lime water to give a compound 'B' which is used as a bleaching agent in the chemical industry. Identify 'A' and 'B'. Also give the chemical equations of the reactions involved.

[3]

13. An ore on treatment with dilute hydrochloric acid produces brisk effervescence. Name the type of ore with one example. What steps will be required to obtain metal from the enriched ore? Also write the chemical equations for the reactions involved in the process.

[3]

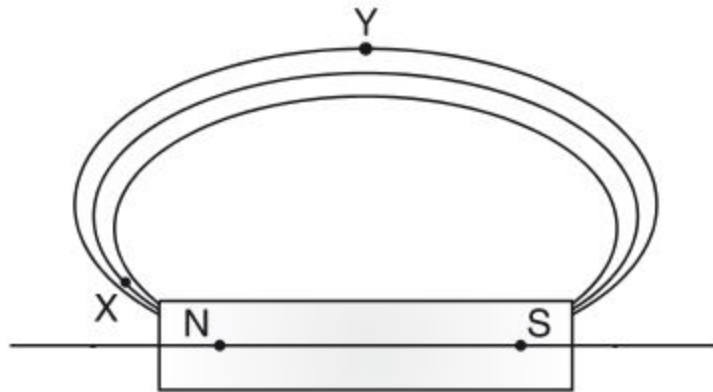
14. A concave mirror has a focal length of 20 cm. At what distance from the mirror should a 4 cm tall object be placed so that it forms an image at a distance of 30 cm from the mirror? Also calculate the size of the image formed.

OR

A real image $\frac{2}{3}$ rd of the size of an object is formed by a convex lens when the object is at a distance of 12 cm from it. Find the focal length of the lens.

[3]

15. Magnetic field lines are shown in the given diagram. A student makes a statement that the magnetic field at 'X' is stronger than at 'Y'. Justify this statement. Also redraw the diagram and mark the direction of magnetic field lines.



[3]

Section - D

16. (a) Distinguish between cross-pollination and self-pollination. Mention the site and product of fertilization in a flower. (b) Draw labelled diagram of a pistil showing the following parts : Stigma, Style, Ovary, Female germ cell

OR

- (a) Draw a diagram of human female reproductive system and label the parts :
- (i) which produce an egg.
 - (ii) where fertilization takes place.
- (b) List two bacterial diseases which are transmitted sexually.
- (c) What are contraceptive devices ? Give two reasons for adopting contraceptive devices in humans.

[5]

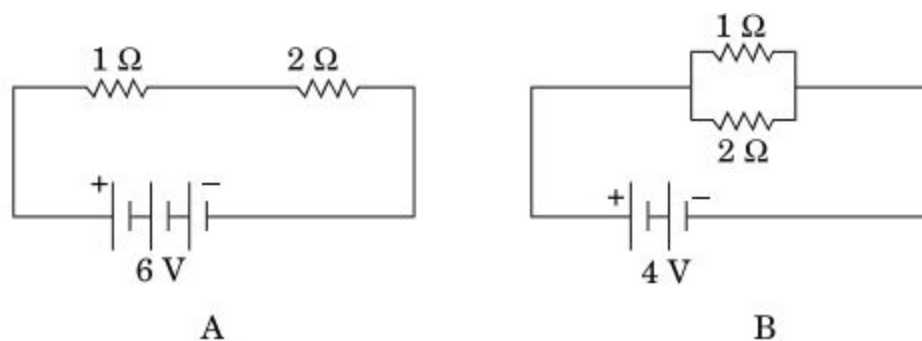
17. (a) How is equal genetic contribution of male and female parents ensured in the progeny ? Explain.
(b) Does the occurrence of diversity of animals on Earth suggest their diverse ancestry also ? Discuss this point in the light of evolution.
- [5]

18. (a) A 5 cm tall object is placed perpendicular to the principal axis of a convex lens of focal length 20 cm. The distance of the object from the lens is 30 cm. Find the position, nature and size of the image formed.

(b) Draw a labelled ray diagram showing object distance, image distance and focal length in the above case.

[5]

19. Compare the power used in 2 resistor in each of the following circuits :



OR

A bulb is rated 40 W; 220 V. Find the current drawn by it, when it is connected to a 220 V supply. Also find its resistance. If the

given bulb is replaced by a bulb of rating 25 W; 220 V, will there be any change in the value of current and resistance ? Justify your answer and determine the change.

[5]

20. Answer the following questions based on the elements with atomic number 3 to 9 :

- (a) Name the element with smallest atomic radius.
- (b) Name the element which shows maximum valency.
- (c) Name the element which is a metalloid.
- (d) Name the element which is most electropositive.
- (e) Write the chemical formula of the compound formed when the elements of atomic number 6 and 8 react together.

[5]

21. (a) State the reason why carbon can neither form C^{4+} cations nor C^{4-} anions, but forms covalent bonds. Also state reasons to explain why covalent compounds

- (i) are bad conductors of electricity.
- (ii) have low melting and boiling points.

(b) Write the structural formula of benzene, C_6H_6 .

OR

(a) Define the term 'isomer'.

(b) Two compounds have the same molecular formula C_3H_6O .

Write the name of these compounds and their structural formula.

(c) How would you bring the following conversions :

- (i) Ethanol to ethene
- (ii) Propanol to propanoic acid

[5]

Section - E

22. A teacher gives a convex lens and a concave mirror of focal length of 20 cm each to his student and asks him to find their focal lengths by obtaining the image of a distant object. The student uses a distant tree as the object and obtains its sharp image, one by one, on a screen. The distances d_1 and d_2 between the lens/mirror and the screen in the two cases and the nature of their respective sharp images are likely to be
- (a) (20 cm, 40 cm) and (erect and erect)
 - (b) (20 cm, 40 cm) and (inverted and inverted)
 - (c) (20 cm, 20 cm) and (inverted and inverted)
 - (d) (20 cm, 40 cm) and (erect and inverted)
- Give reason for your answer.

[2]

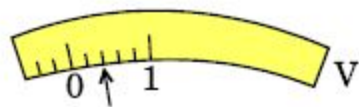
23. The rest position of the needles in a milliammeter and voltmeter, not in use, are as shown in Figure A. When a student uses these instruments in his experiment, the readings of the needles are in the positions shown in Figure B. Determine the correct values of current and voltage the student should use in his calculations



Figure A



Figure B

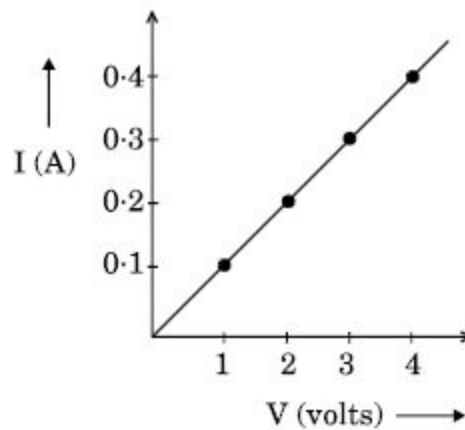


OR

In the experiment to study the dependence of current (I) on the potential difference (V) across a resistor, a student obtained a graph as shown.

(i) What does the graph depict about the dependence of current on the potential difference ?

(ii) Find the current that flows through the resistor when the potential difference across it is 2.5 V.



[2]

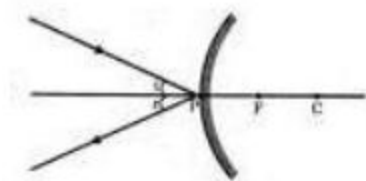
Answers

Section- A

Ans 1). $R = V/I$
 $= 5/0.2 = 2.5 \Omega$

Ans 2). The major hazard of nuclear power generation is storage and disposal of spent or used fuel.

Section- B

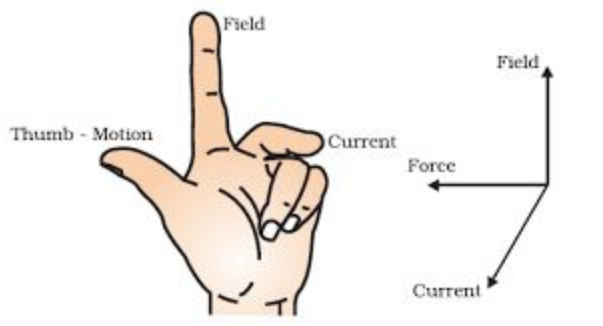


Ans 3).

While attempting this question. Properly label everything.

Ans 4). Principle : When the current carrying coil is placed in a magnetic field ,it experiences force as per Fleming's left hand rule.

Fleming's left hand rule: According to Fleming's left hand rule, stretch the thumb, forefinger and middle finger so that they are mutually perpendicular. If the first finger points in the direction of the magnetic field and the second finger in the direction of current, then the thumb will point the direction of force acting on the conductor.



(While attempting this, even if you don't draw the hand diagram, do draw the diagram with arrows beside it.)

Ans 5). The acid present in ant sting : Formic acid / Methanoic acid
Chemical formula: HCOOH

The common method to get relief from the discomfort caused by the ant sting is putting a solution of weak /mild base like baking soda.

OR

(a) Acid + Phenolphthalein -----> Colourless
Base+ Phenolphthalein -----> Pink colour

(b) Acid + Methyl Orange -----> Red
Base + Methyl Orange -----> Yellow

Section- C

Ans 6). The series of living organisms taking part at various biotic level forms a food chain.

- (i). An average of 10% of the food eaten is turned into its own body and made available for the next level of consumers.
- (ii). The energy which is passed to the herbivores does not come back to the autotrophs.

OR

(a) Since interference will create disturbances in the protected area (National Park) or to maintain the self sustainability in the protected area

(b) Reuse of materials is better than recycling because the process of recycling use some energy, in the reuse strategy things are used of again and again.

Ans 7). Dams are projects on river to use the river water for many purposes like hydroelectricity.

ADVANTAGES:

1. Dams produce large percentage of energy requirements for domestic and industrial purposes.
2. it is supplied to the farmers for crop irrigation.

DISADVANTAGES:

1. It displaces local people.
2. The construction of dams leads to deforestation.

Ans 8). (a) Xylem vessels and Xylem tracheids are two water conducting tissues present in plants.

At the roots, cells in contact with the soil actively take up ions. This creates a difference in concentration of ions. As a result, water moves up.

(b) Since plants do not move and have a large proportion of dead cells in many tissues. Thus plants have low energy needs.

Ans 9). Control and coordination of functioning of various systems is under the direct Control of the nervous system. It is the nervous system which governs the way, a particular organ has to work .This control is achieved by a complex network of neurons which carry signals in the form of electric impulse, to and from the brain. The hormonal system on the other hand coordinates the functioning of the nervous system. The hormonal system has indirect control on various functions. It tells a system to either slow down or pace according to the situation. Nervous and hormonal systems are complementary to each other thus we can say that the nervous and hormonal systems perform their function of control and coordination together.

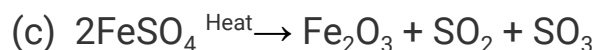
Ans 10). The branch of biology which deals with the study of heredity and variation is genetics.

The decrease in the number of surviving tigers is a cause of concern because fewer number of tigers impose extensive inbreeding among themselves, this limits the appearance of variation and put the species at a disadvantage if there are changes in the environment. Since the tigers fail to cope with the environmental changes, they may become extinct.

Ans 11). a) Two observations are :

- 1). Colour changes from green to white
- 2). Formation of reddish brown Ferric oxide (Fe_2O_3 or evolution of SO_2/SO_3 gas.)

(b) Decomposition reaction is taking place.



$\text{Fe}_2\text{O}_3 \rightarrow$ Ferric oxide

$\text{SO}_2 \rightarrow$ Sulphur dioxide

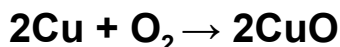
$\text{SO}_3 \rightarrow$ Sulphur trioxide

OR

(a) When copper is heated in air, oxidation takes place

(b) This black substance is CuO (Copper oxide).

(c) The balanced chemical equation for the reaction and name the products formed:

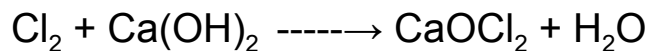
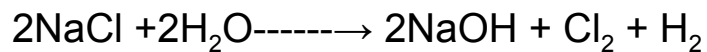


(d) the black coating on the surface be turned reddish brown by passing hydrogen gas over the heated material.

Ans 12). A \rightarrow Cl_2 (Chlorine gas)

B----->-CaOCl₂ (Calcium oxychloride)

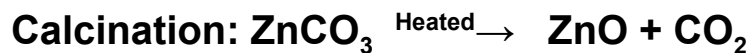
The chemical equations of the reactions involved:



Ans 13). Type of Ore -----> **Carbonate ore**

Example: Zinc Carbonate

Calcination/ Reduction would be required to obtain metal from the enriched ore.



Done in limited supply of air.



Ans 14).

$$1/f = 1/v + 1/u$$

$$1/v = 1/f - 1/u$$

$$1/u = 1/20 + 1/30$$

$$u = -60\text{cm}$$

$$m = -v/u$$

$$m = - (-30/-60)$$

$$m = 1/2$$

$$h_2/h_1 = m$$

$$h_2 = h_1 \times m$$

$$h_2 = 4 \times (-1/2)$$

$$h_2 = -2 \text{ cm}$$

OR

$$m = v/u$$

$$m = -2/3$$

$$-2/3 = v/-12$$

$$v = 8 \text{ cm}$$

$$1/f = 1/v - 1/u$$

$$1/f = 1/8 - (-1/12)$$

$$1/f = 1/8 + 1/12$$

$$1/f = 5/24$$

$$f = 24/5 = 4.8 \text{ cm}$$

Ans 15). Crowding of magnetic field lines is directly related to the strength of the magnetic field

So, strength of magnetic field at point 'X' is more than at point 'Y' since at point 'X', there is more crowding of magnetic field lines •

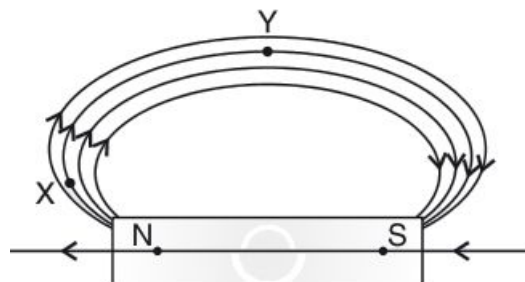


Diagram with marking:

Section- D

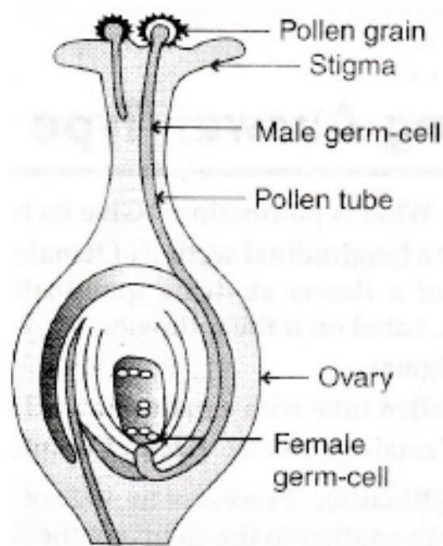
Ans 16).

Cross Pollination	Self Pollination
1. Pollen is transferred from anther/stamen of one flower to another flower.	1. Transfer of pollen from anther/stamen to the stigma of the same flower.

The site of fertilization in a flower is **Ovary**.

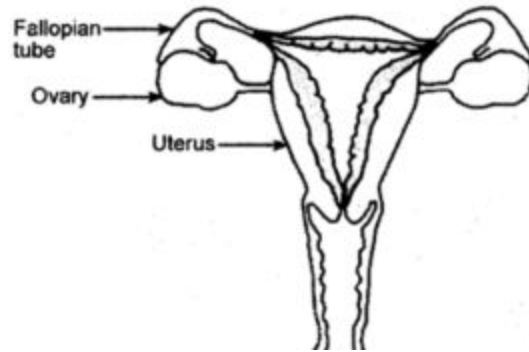
The product of fertilization in a flower is **Zygote**.

(b) Diagram with labelling:



OR

(a)



(b). Two bacterial diseases which are transmitted sexually are syphilis and gonorrhoea.

(c). Contraceptive methods include any approach to prevent conception or or materials required to avoid pregnancy
Example: diaphragm, cervical cap, condoms.

Two reasons for adopting contraceptive devices in humans are:

- (i) Controlling human population
- (ii) Maintain gaps between successive birth

Ans 17). (a) When the gametes from male and female parent combine during sexual reproduction to form zygote, they contribute equal amounts of DNA(half each). The normal body cells of humans contain 46 chromosomes each. Human sperm cells and egg cells both have 23 chromosomes .So the combination of these 23 chromosomes from male and female each during sexual reproduction ensures equal genetic contribution to progeny ($23+23 = 46$).

(b). (i). Animals have a vast diversity in structures, they probably do not have a common ancestry because common ancestry may greatly limit the extent of diversity.

(ii). Many of these diverse animals are inhabiting the same habitat , the evolution by geographical isolation and speciation is not likely to happen.

Ans 18). $f = 20 \text{ cm}$, $u = -30 \text{ cm}$

$$1/v - 1/u = 1/f$$

$$1/v = 1/f + 1/u$$

$$1/v = 1/20 + (-1/30)$$

$$1/v = 1/60$$

$$v = 60 \text{ cm}$$

Nature of the image - Real, inverted

Position - Behind $2F_2$

Size - Magnified

$$m = v/u$$

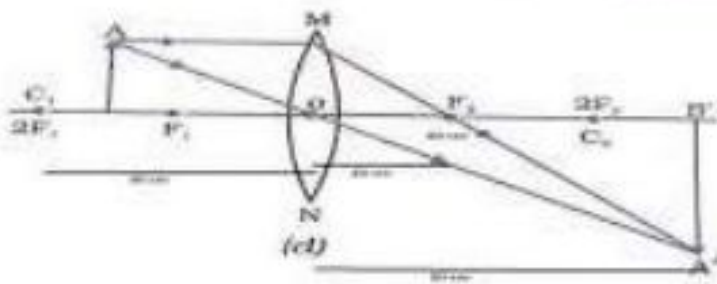
$$m = 60/-30$$

$$m = -2$$

$$h' = m \times h$$

$$h' = -2 \times 5$$

$$h' = -10 \text{ cm}$$



Ans 19).

In 'A'

$$R_{eq} = R_1 + R_2$$

$$R_{eq} = 1\Omega + 2\Omega$$

$$R_{eq} = 3\Omega$$

To find out the Power: $V = IR$

$$I = V/R$$

$$I = 6/3 = 2A$$

We know,

$$P = I^2 R$$

$$= 2 \times 2 \times 2$$

$$= 8 W$$

In 'B',

$$P = V^2 / R$$

$$P = (4 \times 4) / 2$$

$$P = 8 W$$

OR

$$(i) P = 40 W$$

$$V = 220 V$$

$$P = VI$$

$$I = P/V = 40/220$$

$$I = 0.18 A$$

$$(ii) R = V^2 / P$$

$$= 220 \times 220 / 40$$

$$= 1210 \Omega$$

$$(iii) P = 25 W$$

$$V = 220V$$

$$P = VI$$

$$I = P/V = 25/220$$

$$I = 0.113 \text{ A}$$

$$\begin{aligned} \text{(iv) } R &= V^2 / P = 220 \times 220 / 25 \\ &= 1936 \Omega \end{aligned}$$

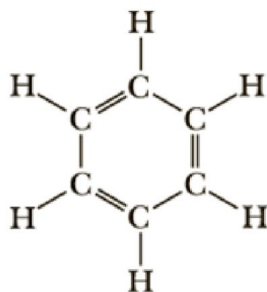
Yes there is a change in current and resistance.

- Ans 20).** (a) Element with smallest atomic radius ----- Fluorine (F)
(b) Element with maximum valency----- Carbon (C)
(c) Element which is metalloid ----- Boron (B)
(d) Element which is most electropositive ----- Lithium (Li)
(e) The chemical formula of the compound formed when the elements of atomic number 6 and 8 react together CO and CO₂

Ans 21). Carbon cannot form C⁴⁺ ions as very high energy is required to remove 4 electrons . Carbon cannot gain 4 electrons to form C⁴⁻ ions as 6 protons cannot hold 10 electrons.

- (i) Covalent compounds are bad conductors of electricity as they do not have free electrons.
(ii) They have have low melting and boiling points. Due to weak forces of attraction between the molecules, thus less energy is required for breaking the bonds

(b) The structural formula of benzene, C₆H₆



OR

(a) Compounds having same molecular formula but different molecular structures are known as structural isomers.

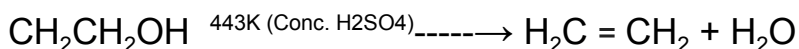
(b) $\text{CH}_3\text{CH}_2\text{CHO}$ ---- -Propanal

CH_3COCH_3 ----- Propanone

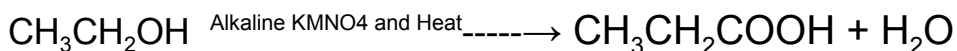
These two compounds have same molecular formula $\text{C}_3\text{H}_6\text{O}$

(c)

i). Ethanol to ethene



ii). Propanol to propanoic acid



Section- E

Ans 22).

(c) (20 cm, 20 cm) and (inverted and inverted)

On the screen only real and inverted image can be obtained and in both cases the image is formed at the principal focus.

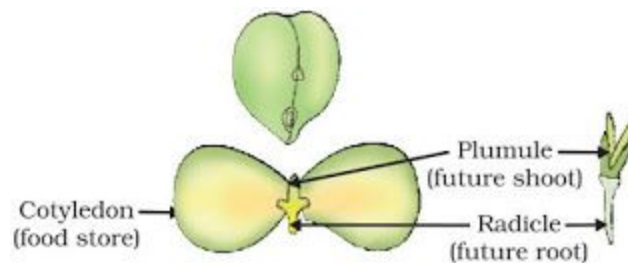
Ans 23). The correct values of current and voltage the student should use in his calculations.: 38 mA, 3.2 V

OR

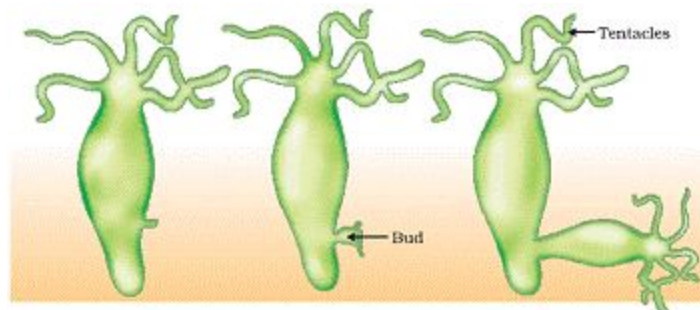
(i) $V \propto I$

(ii) at 2.5 V , Current will be 0.25 A

Ans 24).



OR



Ans 25). Safranin is used to stain/colour the material for better view. Glycerine prevents the leaf peel from getting it dried.

Ans 26). The solution turns:

i). green to colourless

ii). black coating is formed on Zinc.

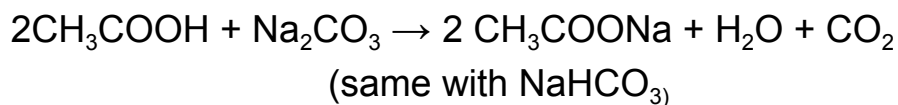
Zinc is more reactive than iron so it displaces the iron from its salt solution.

Ans 27). There will be no change as acid turns blue litmus to red, so there is a need of blue litmus paper. To get the blue litmus dip the red litmus paper into a basic solution and get blue colour.

OR

(i) The substance he must add to acetic acid to produce carbon dioxide is **Sodium hydrogen carbonate (NaHCO₃)** or **Sodium Carbonate (Na₂CO₃)**.

(ii). The relevant chemical equation for the reaction:



(iii). To test CO₂ gas liberated CO₂ is passed through lime water, which is turned to milky.

CBSE Science 2018

Question Paper (as it is) -

General Instructions:

- 1) All questions are compulsory.**

- 2) The question paper consists of 42 questions divided into 4 sections A, B, C and D. Section A comprises questions of 01 mark each, Section B comprises questions of 02 marks each, Section C comprises questions of 03 marks each and Section D comprises questions of 05 marks each.**

- 3) All questions in Section A are to be answered in one word, one sentence or as per the exact requirement of the question.**

- 4) There is no overall choice. However, internal choice has been provided wherever necessary. You have to attempt only one of the alternatives in all such questions.**

- 5) In question on construction, drawing should be neat and exactly as per the given measurements.**

- 6) Use of calculators is not permitted.**

- 1. A Mendelian experiment consisted of breeding pea plants bearing violet flowers with pea plant bearing white flowers. What will be the result in F1 progeny ?**
- 2. Write the energy conversion that takes place in a hydropower plant.**
- 3. A compound 'X' on heating with excess conc. sulphuric acid at 443 K gives an unsaturated compound 'Y'. 'X' also reacts with sodium metal to evolve a colourless gas 'Z'. Identify 'X', 'Y' and 'Z'. Write the equation of the chemical reaction of formation of 'Y' and also write the role of sulphuric acid in the reaction.**
- 4. (a) Name one gustatory receptor and one olfactory receptor present in human beings.
(b) Write a and b in the given flow chart of neuron through which information travels as an electrical impulse.**

Dendrite → a → b → End point of Neuron

- 5. If the image formed by a spherical mirror for all positions of the object placed in front of it is always erect and diminished, what type of mirror is it ? Draw a labelled ray diagram to support your answer.**
- 6. Decomposition reactions require energy either in the form of heat or light or electricity for breaking down the reactants. Write one equation each for decomposition reactions where energy is supplied in the form of heat, light and electricity.**
- 7. 2 ml of sodium hydroxide solution is added to a few pieces of granulated zinc metal taken in a test tube. When the contents are warmed a gas evolves which is bubbled through a soap solution before testing. Write the equation of the chemical reaction involved**

and the test to detect the gas. Name the gas which will be evolved when the same metal reacts with dilute solution of a strong acid ?

OR

The pH of a salt used to make tasty and crispy pakoras is 14. Identify the salt and write a chemical equation for its formation. List its two uses.

8. (a) Why are most carbon compounds poor conductors of electricity?

(b) Write the name and structure of a saturated compound in which the carbon atoms are arranged in a ring. Give the number of single bonds present in this compound.

9. Name the hormones secreted by the following endocrine glands and specify one function of each :

(a) Thyroid (b) Pituitary (c) Pancreas

10. Write one main difference between asexual and sexual mode of reproduction. Which species is likely to have comparatively better chances of survival—the one reproducing asexually or the one reproducing sexually ? Give reasons to justify your answer.

11. State the laws of refraction of light. Explain the term 'absolute refractive index of a medium' and write an expression to relate it with the speed of light in Vacuum.

OR

What is meant by power of a lens ? Write its SI unit. A student uses a lens of focal length 40 cm and another of -20 cm. Write the nature and power of each lens.

12. Show how would you join three resistors, each of resistance $9\ \Omega$ so that the equivalent resistance of the combination is

(a) $13.5\ \Omega$ (b) $6\ \Omega$?

OR

(a) Write Joule's law of heating.

(b) Two lamps, one rated $100\ \text{W}; 220\ \text{V}$, and the other $60\ \text{W}; 220\ \text{V}$, are connected in parallel to electric mains supply. Find the current drawn by two bulbs from the line, if the supply voltage is $220\ \text{V}$.

13. (a) List the factors on which the resistance of a conductor in the shape of wire depends.

(b) Why are metals good conductors of electricity whereas glass is a bad conductor of electricity ? Give reason.

(c) Why are alloys commonly used in electrical heating devices? Give reason.

14. Students in a school listened to news read in the morning assembly that the mountains of garbage in Delhi, suddenly exploded and various vehicles got buried under it. Several people were also injured and there was traffic jam all around. In the brain storming session the teacher also discussed this issue and asked the students to find out a solution to the problem of garbage. Finally they arrived at two main points—one is self management of the garbage we produce and second is to generate less garbage at individual level.

(a) Suggest two measures to manage the garbage we produce.

(b) As an individual what can we do to generate the least garbage ? Give two points.

(c) List two values the teacher instilled in his students in this episode.

15. What is a dam ? Why do we seek to build large dams ? While building large dams, which three main problems should particularly be addressed to maintain peace among local people ? Mention them.

16. (a) Write the steps involved in the extraction of pure metals in middle of the activity series from carbonate ores.

(b) How is copper extracted from its sulphide ore ? Explain the various steps supported by chemical equations. Draw labelled diagram for electrolytic refining of copper.

17. (a) The modern periodic table has been evolved through the early attempts of Dobereiner, Newland and Mendeleev. List one advantage and one limitation of all three attempts.

(b) Name the scientist who first of all showed that atomic number of an element is a more fundamental property than its atomic mass.

(c) State Modern Periodic law.

18. (a) Mention any two components of blood.

(b) Trace the movement of oxygenated blood in the body.

(c) Write the function of valves present in between atria and ventricles.

(d) Write one structural difference between the composition of artery and veins.

OR

(a) Define excretion.

(b) Name the basic filtration unit present in the kidney.

(c) Draw excretory system in human beings and label the following organs of excretory system which perform the following functions :

- (i) forms urine.**
- (ii) is a long tube which collects urine from kidney.**
- (iii) Store urine until it is passed out.**

19. (a) Write the function of following parts in human female reproductive system : (i) Ovary (ii) Oviduct (iii) Uterus

(b) Describe in brief the structure and function of placenta.

20. (a) A student is unable to see clearly the words written on the black board placed at a distance of approximately 3 m from him. Name the defect of vision the boy is suffering from. State the possible causes of this defect and explain the method of correcting it.

(b) Why do stars twinkle ? Explain.

OR

(a) Write the function of each of the following parts of human eye :

- (i) Cornea (ii) Iris (iii) Crystalline lens (iv) Ciliary muscles**
- (b) Why does the sun appear reddish early in the morning ? Will this phenomenon be observed by an astronaut on the Moon ? Give reason to justify your answer.**

21. (a) State Fleming's left hand rule.

(b) Write the principle of working of an electric motor.

(c) Explain the function of following parts of an electric motor: (i) Armature (ii) Brushes (iii) Split ring.

Section - B

22. A student added few pieces of aluminium metal to two test tube A and B containing aqueous solution of iron sulphate and copper sulphate. In the second part of her experiment, she added iron metal to another test tube C and D containing aqueous solution of aluminium sulphate and copper sulphate. In which test tube or test tubes will she observe colour change ? On the basis of this experiment state which one is the most reactive metal and why?

23. What is observed when a solution of sodium sulphate is added to a solution of barium chloride in a test tube ? Write equation for the chemical reaction involved and name the type of reaction in this case.

24. List the steps of preparation of temporary mount of a leaf Peel to observe stomata.

25. Name the process by which an amoeba reproduces. Draw the various stages of its reproduction in a proper sequence.

OR

A student is viewing under a microscope a permanent slide showing various stages of asexual reproduction by budding in yeast. Draw diagram of what he observes in proper sequence.

26. An object of height 4.0 cm is placed at a distance of 30 cm from optical centre 'O' of a convex lens of focal length 20 cm. Draw a ray diagram to find the position and size of the image formed. Mark optical centre 'O' and principal focus 'F' on the diagram. Also find the approximate ratio of size of image to the size of object.

27. The values of current (I) flowing through a given resistor of resistance (R), for the corresponding values of potential difference (V) across the resistor are given below :

V (volts)	0.5	1.0	1.5	2.0	2.5	3.0	4.0	5.0
I (amperes)	0.1	0.2	0.3	0.4	0.5	0.6	0.8	1.0

Plot a graph between current (I) and potential difference (V) and determine the resistance (R) of the resistor.

Answers

Ans 1). All the progeny of F1 generation will have violet flowers because violet colour is dominant over the recessive white colour.

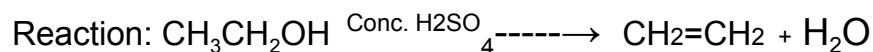
Ans 2). The potential energy of the of water in the reservoir gets converted into the kinetic energy of the flowing water. The flowing water rotates the turbine shaft connected to the generator which produces electricity. and Thus kinetic energy of water transforms into the mechanical energy of turbine which further gets converted into the electric energy.

Ans 3). X is $\text{CH}_3\text{CH}_2\text{OH}$ (Ethanol).

Y is $\text{CH}_2=\text{CH}_2$ (Ethene)

Z is H_2 (Hydrogen gas) .

Conc. H_2SO_4 acts as a dehydrating agent here. It removes the water molecule.



443K Dehydration

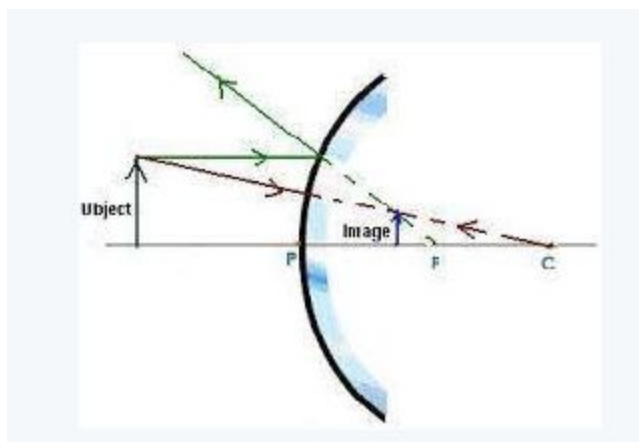
Ans 4). (a). Tongue is the gustatory receptor present in the human body. Nose is an olfactory organ

(b). Dendrite → Cell body → Axon → End point of Neuron

Ans 5). A convex mirror forms an erect diminished virtual image for all the positions of the object placed in front of it.

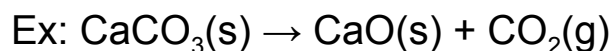
It is used as rear view mirrors in automobiles, as reflectors in street light bulbs and in parking lots.

RAY DIAGRAM:

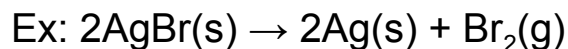


Ans 6). Decomposition reaction : It is a type of reaction in which a larger molecule decomposes into two or more smaller molecules. It always requires energy for breaking bonds and hence is always endothermic.

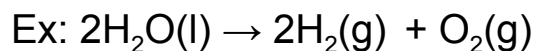
i) Thermal decomposition : Decomposition due to heat



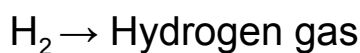
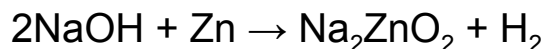
ii) Photolytic decomposition : Decomposition due to light



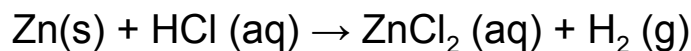
iii) Electrolytic decomposition : Decomposition due to electricity



Ans 7). The equation of the chemical reaction involved:



Test to detect the gas: When a burning candle is brought near the hydrogen gas, it will burn with the pop sound and the candle will blow off.



The gas which will be evolved when the same metal reacts with dilute solution of a strong acid: When Zinc metal reacts with dilute solution of strong acid then zinc chloride and hydrogen gas will be formed.

Ans 8). The salt used to make tasty and crispy pakoras is baking soda or sodium hydrogen carbonate.

Sodium hydrogen carbonate is produced by reacting a cold and concentrated solution of sodium chloride (called brine) with ammonia and carbon dioxide.



Here, NaHCO_3 is Sodium hydrogen carbonate or baking soda
 NH_4Cl is Ammonium Chloride

Uses of baking soda :

- (i) It is used for making baking powder which is used for baking bread, cakes etc.
- (ii) It is used as an ingredient in antacids to reduce the effect of excess acid in the stomach.
- (iii). It is used in fire extinguishers.

Ans 9). a) Electricity is conducted by moving electrons. But carbon forms covalent bonds by sharing electrons. Hence, it does not have free electrons.

(b) Cyclohexane is a saturated compound in which carbon atoms are arranged in a ring. 6 single bonds present in this compound

Ans 10). (a) Thyroid gland secretes thyroxine.

Function : It regulates the metabolism and blood pressure of human beings.

(b) Pituitary gland secretes growth hormone.

Function : It helps the bones and other body organs to grow properly.

(c) Pancreas secrete insulin.

Function : Insulin helps to lower blood sugar level.

Ans 11). Sexual reproduction:

Asexual reproduction	Sexual Reproduction
-----------------------------	----------------------------

1. It involves only one parent.	It involves two parents.
2. Does not require 'production or fusion' of gametes.	2. It requires 'production and fusion' of gametes.
3. The offspring are identical to the parent.	3. Produces a genetically unique parent.

Offsprings produced by sexual reproduction have better chances of survival. Sexual reproduction leads to variation because it leads to the formation of offspring by the combination of DNA from both the parents, so the species will have better adaptability and better survival rate.

Ans 12). Laws of Refraction are:

1. The incident ray, the refracted ray and the normal lie in the same plane at the point of incidence.

2. **Snell's Law of Refraction:** The ratio of the sine of angle of incidence to the sine of angle of refraction for two given optical media is a constant quantity.

The value of the refractive index so obtained is called absolute refractive index.

→ Absolute refractive index = speed of light in vacuum/speed of light in optical medium

OR

The power of a lens is a measure of the degree of convergence or divergence of light rays falling on it. It is also defined as the reciprocal of its focal length in metres. The S.I. unit of power is dioptre (D).

1st lens:

$$P = 1/0.4\text{m}$$

$$=10/4$$

$$=2.5 \text{ D}$$

Since it is positive, it's a convex lens.

2nd lens:

$$P = 1/-0.2\text{m}$$

$$= 10/-2$$

$$= - 5 \text{ D}$$

Since it is negative it's a concave lens.

(a) To get an equivalent resistance of 13.5 Ω , the resistances should be connected as shown in both parallel as well as series as shown below

$$1/R_p = 1/R_1 + 1/R_2$$

$$1/R_p = 1/9 + 1/9 \text{ (2 resistors with } 9 \text{ } \Omega \text{ are connected in parallel)}$$

$$1/R_p = 2/9 , R_p = 9/2 \text{ or } 4.5 \text{ } \Omega$$

Now, after solving the parallel connection, since both would be connected in series

$$R_s = R_3 + 4.5 \text{ } \Omega \text{ (} R_3 = 9 \text{ } \Omega \text{)}$$

$$R_s = 9 + 4.5 = 13.5 \text{ } \Omega$$

(b). To get an equivalent resistance of 6Ω :

$$R_s = R_1 + R_2 = 9 + 9 = 18\Omega$$

As the resistors are now connected in parallel, we will solve it further

$$1/R_p = 1/18 + 1/9 = 3/18$$

$$R_p = 6\Omega$$

OR

(a). When an electric current passes through a conductor for some time, the conductor gets heated up. Thus heating of a conductor due to the flow of electric current through it is known as Joule's law of heating.

$$\text{Heat generated : } H=i^2Rt$$

where

→ i : amount of current flowing through the conductor

→ R : the resistance of conductor and

→ t : is the time for which the current has flown.

(b). Both the bulbs are connected in parallel. Therefore, potential difference across each of them will be same that is 220 V , Current drawn by the bulb of rating 100 W is given by

$$\text{We know, } P= VI, \text{ so}$$

$$I=P/V$$

$$=100/220=0.45 \text{ A}$$

Similarly, current drawn by the bulb of rating 60 W is given by

$$I=P/V$$

$$=60/220=0.27 \text{ A}$$

→ The total current drawn from the line = $0.45 + 0.27 = 0.72\text{A}$

(a) Resistance of a conductor depends directly on its length and is inversely proportional to the area of cross-section.

(b) Metals have free electrons and they can move and conduct electricity, whereas glass does not allow electrons and charges to flow freely as it is an insulator.

(c) The resistivity of an alloy is generally higher than that of its constituent metals. Alloys do not oxidise or burn readily at higher temperatures. Therefore, conductors of electric heating devices, such as toasters and electric irons, are made of an alloy rather than pure metal.

Ans 13). a). The two measures that can be undertaken to manage garbage are:

1). The waste materials should be separated into biodegradable and non biodegradable. Biodegradable waste materials can be used for making compost, manure etc., while non-biodegradable materials can be recycled.

2). Reduce, Reuse and Recycle, the 3R's should be followed. All the non-biodegradable wastes should pass through these 3 stages and only then should go into waste.

b). To generate the least garbage:

1). There should be minimal use of plastic bags, disposable products like plastic cups, cans etc.

2). Recycling and reuse of materials should be adopted in order to minimise the waste.

c). The teacher made the students realise the responsibility towards the environment. Teacher also made the students more aware about environmental issues and developed a problem solving approach in them.

Ans 14). A dam is a barrier constructed to hold back water and raise its level forming a reservoir used to generate electricity or as a water supply. Large dams are built in order to generate electricity from water supply.

While building large dams, which three main problems should particularly be addressed to maintain peace among local people are:

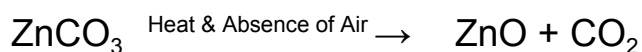
1. Social problems : Proper rehabilitation should be provided to people.

2. Economical problems : Judicious use of people's money should be done to ensure economic prosperity

3. Environmental problems : Excessive cutting of trees, biological diversity loss should be checked.

Ans 15). The carbonate ore of a metal is heated in absence of air. This process is called calcination.

Equation :



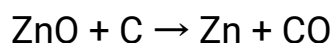
$\text{ZnCO}_3 \rightarrow$ Zinc carbonate

$\text{ZnO} \rightarrow$ Zinc oxide

$\text{CO}_2 \rightarrow$ Carbon dioxide

After that, ZnO is heated with coke.

Equation :



ZnO → Zinc Oxide

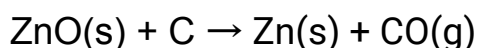
Zn → Zn metal (Pure)

CO → Carbon monoxide

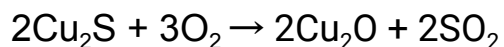
Ans 16). As iron, zinc, lead, copper etc are moderately reactive metal and ore present as sulphides or carbonate metal is obtained from its ore by reduction or by electrolysis to reduce a carbonate ore metal from middle reactivity series zinc. zinc ore is concentrated and roasted in air to produce zinc oxide and carbon dioxide. CO_2 are formed when ZnCO_3 is roasted in air.



Zinc oxide produced from ore is then heated with carbon to reduce it into metallic zinc.



(b) Copper is present low in reactivity series. It mainly occurs in the form of sulphide which can be converted into corresponding oxide by heating in absence of air as ROASTING. The obtained oxide then reduced with C or any other reducing agent to obtain metal.



Then it purified by electrolytic. The impure copper metal is made anode and pure metal of copper is cathode copper sulphate as electrolyte. Pure copper from electrolyte deposited on cathode soluble impurities goes into solution and insoluble impurities remain in the solution and deposited at bottom of anode. The reaction taking place :

At Anode: $\text{Cu} \rightarrow \text{Cu}^{+2} + 2\text{e}^{-}$

At Cathode: $\text{Cu}^{+2} + 2\text{e}^{-} \rightarrow \text{Cu}$

Ans 17). (a). The advantages and limitations are:

→ **Dobereiner Periodic Table**

Advantage: To predict the atomic mass of middle element in each triad

Limitation: Dobereiner could identify only three triads

→ **Newland Periodic table**

Advantage: Every eighth element had properties similar to that of first; correlated the properties of elements with their atomic mass.

Limitation: It was only applicable up to Calcium; only 56 elements and no future element

→ **Mendeleev's Periodic Table**

Advantage: Elements with similar properties could be grouped. He predicted the existence of new elements that had not been discovered at that time.

Limitation: No fixed position for hydrogen/ position of isotopes. Atomic masses do not increase in a regular manner.

b) Name of the scientist who first of all showed that the atomic number of an element is a more fundamental property than its atomic mass was Henry Moseley

(c) Modern periodic law states that Properties of elements are a periodic function of their atomic number.

Ans 18). (a) Red blood cells, white blood cells and platelets are the components of blood.

(b) The oxygenated blood goes into the left atrium from there it goes to the left ventricle and then to all the body organs.

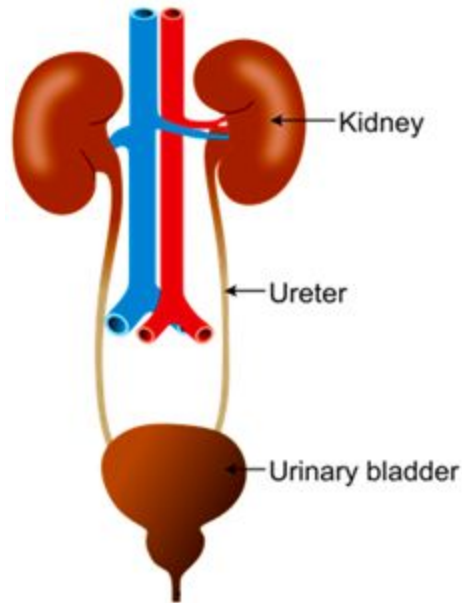
(c) Valves prevent the backflow of blood from the ventricles to the atrium.

(d) Walls of arteries are thick and they carry oxygenated blood whereas walls of vein are thin and they carry deoxygenated blood.

OR

(a) The process of removing toxic waste from the human body is called excretion.

(b) Nephron is the basic filtration unit present in the kidney.



Ans 19). (a) (i) Ovary : It produces egg for fertilisation. It secretes estrogen and progesterone. Estrogen regulates secondary sexual characters and progesterone controls the thickness of the lining of uterus.

(ii) Oviduct : It is the site of fertilization and carries egg or fertilized ovum (zygote) to the uterus.

(iii) Uterus : It helps to nourish the fertilised ovum that will develop into foetus. It holds the baby till it is ready for birth.

(b) Placenta is a special tissue connection between embryo and uterine wall. It acts as an endocrine gland.

Role of placenta:

1. It possesses villi that increase the surface area for absorption of nutrients.
2. Facilitates passage of nutrition and oxygen to embryos from mother through blood.

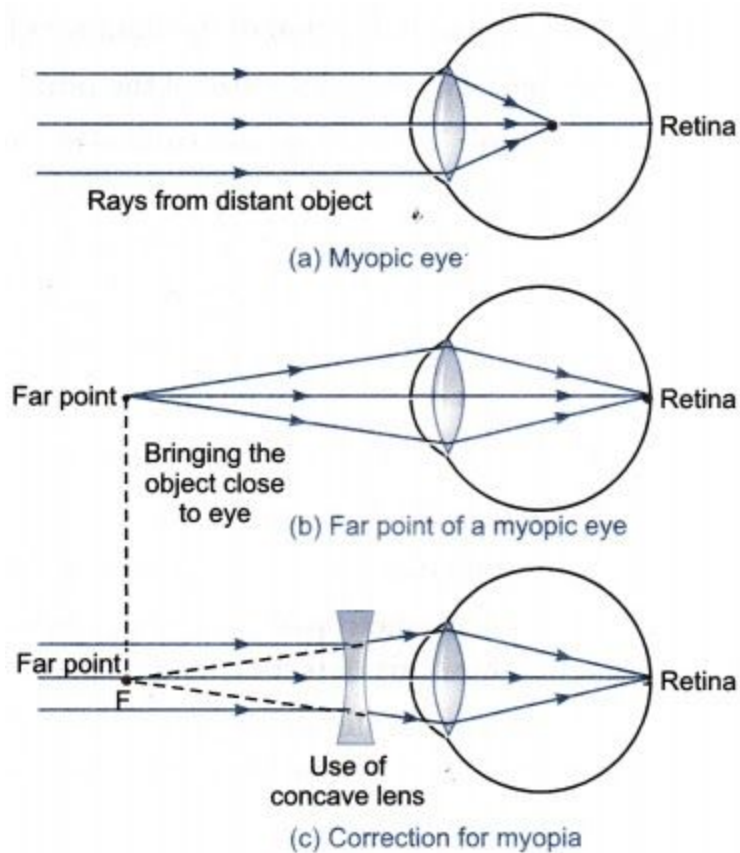
3. Waste substances produced by embryo are removed through placenta into the mother's blood.

Ans 20). (a) The boy is suffering from myopia. This defect is caused :

(i) due to increase in length of eyeball, and

(ii) decrease in focal length of eye lens, when the eye is fully relaxed.

Correction : The image of a distant object (i.e., at infinity) is formed in front of the retina of eye suffering from myopia as shown in figure



(b) The twinkling of stars is due to atmospheric refraction of star-light. The atmosphere is made of several layers and the refractive indices which keep on changing continuously due to this path of light rays from the star keep on changing their path continuously. As a consequence the number of rays entering, the pupil of the eye goes on changing with time and the stars appear twinkling.

OR

i) Cornea: It covers the transparent bulge on the surface of the eyeball. Combination of Cornea and Aqueous humour act as a lens and provide most of the refraction of light.

(ii) Iris: It is dark assembly of muscles which can control the size of the pupil.

(ii) Crystalline lens: It enables fine adjustment of the focal length required to focus objects at different distances.

(iv) Ciliary muscles: By virtue of its property of elasticity, it can modify the thickness of the eye lens while focusing.

(vi) Pupil is the fine aperture through which the light enters into the eye. It regulates and controls the amount of light entering the eye.

(b) In early morning, the sun is at the farthest distance from the earth surface. When the white light passes through the earth's atmosphere, light with smaller

wavelength (blue) gets scattered from the dust particles in the atmosphere and only red light reaches the human eye lens. Thus the sun appears red in early morning.

This phenomenon cannot be seen by an astronaut on the moon because there is no atmosphere on the moon to scatter the light.

Ans 21). **(a) Fleming's left hand rule:** Stretch the thumb, forefinger and middle finger of your left hand such that they are mutually perpendicular. If the first finger points in the direction of the magnetic field and the second finger in the direction of current, then the thumb will point in the direction of motion or the force acting on the conductor.

(b). **Principle :** A motor works on the principle that when a rectangular coil is placed in a magnetic field and current is passed through it, a force acts on the coil which rotates it continuously.

(c) . i) **Armature:** It consists of a single loop of insulated copper wire in the form of a rectangle.

(ii) **Brushes:** Two carbon brushes press against the commutator. These brushes act as the contacts between the commutator and the terminals of the battery.

(iii) **Split-ring:** It consists of two halves of a metallic ring. The two ends of the armature coil are connected to these two halves of the ring. Commutator reverses the direction of current in the armature coil.

Section - B

Ans 22). She will observe colour change only in test tube A and B From green to colourless in A. because aluminium is more reactive than iron it will displace iron. She will observe colour change from blue to colourless in test tube B. Since aluminium displaces all the other three metals, it is the most reactive metal

Ans 23). It is an example of double displacement reaction.



$Na_2SO_4 \rightarrow$ Sodium Sulphate

$BaCl_2 \rightarrow$ Barium Chloride

$BaSO_4 \rightarrow$ Barium Sulphate

$NaCl \rightarrow$ Sodium Chloride

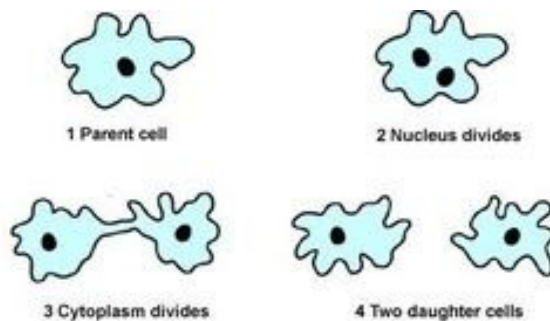
Ans 24). 1). Removal of peel from leaf.

2). Stain with safranin.

3). Put the stained peel on a clean slide.

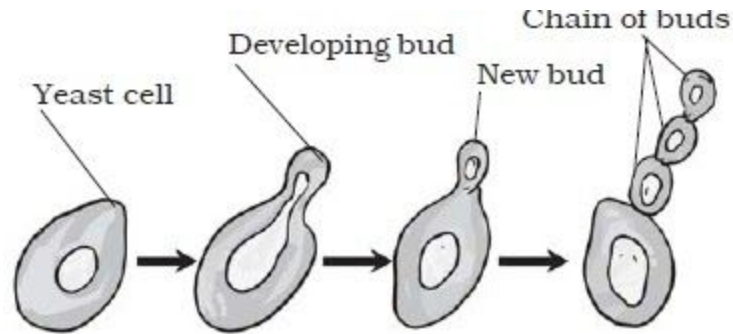
4). Mount it with glycerine and cover slip.

Ans 25). Amoeba reproduces by binary fission. It results in division of nucleus and then happens division of cytoplasm.



OR

Budding in yeast



Ans 26). Given, $f = + 20 \text{ cm}$, $u = - 30 \text{ cm}$, $h_{\text{object}} = 4 \text{ cm}$

Solⁿ -----> $1/f = 1/v - 1/u$

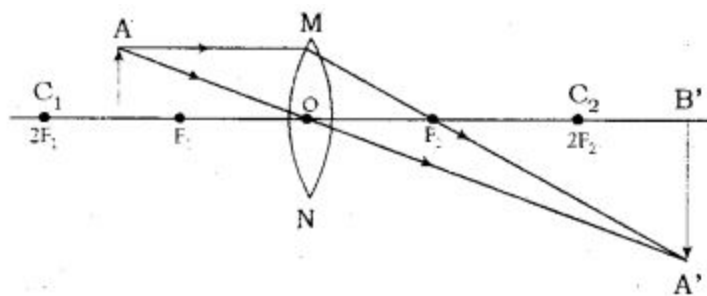
$$1/20 = 1/v - 1/-30$$

On solving, $v = 60\text{cm}$

$$h_i / h_o = v/u$$

$$h_i / 4 = 60 / -30$$

$$h_i = -8\text{cm}$$



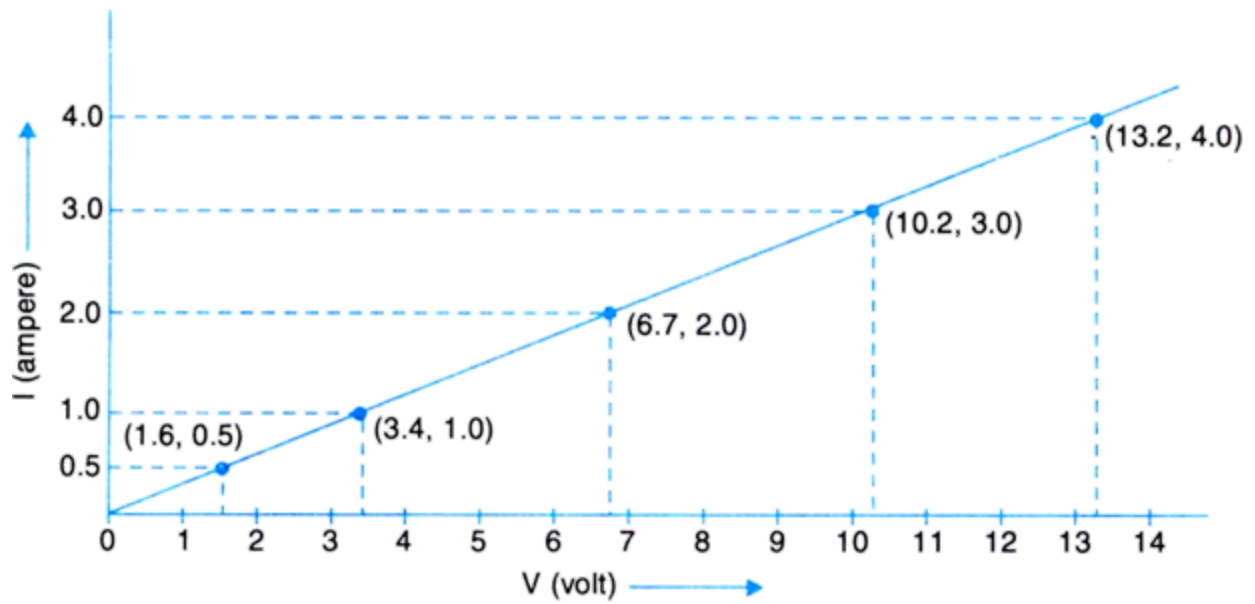
Ratio of size of image to size of object - $h_i/h_o = 8/2 = 4$

Ans 27). From Ohm's Law, $V=IR$, $R=V/I$

$$V = 0.5$$

$$I = 0.1$$

hence $R = 5\Omega$



CBSE SCIENCE 2017

SECTION – A

1. Write the molecular formula of the 2nd and 3rd member of the homologous series where the first member is ethyne.
2. Why is variation important for a species?
3. In the following food chain, 20,000 J of energy was available to the plants. How much energy would be available to man in this chain? Plants → Sheep → Man

SECTION – B

4. An object is placed at a distance of 15 cm from a concave lens of focal length 30 cm. List four characteristic (nature, position, etc) of the image formed by the lens.
5. You being an environmentalist are interested in contributing towards the conservation of nature resources, List four activities that you can do on your own
6. Why are coal and petroleum categorized as natural resources? Given a reason as to why they should be used judiciously.

SECTION – C

7. Distinguish between esterification and saponification reactions with the help of the chemical equations for each. State one use of each (i) esters, and (ii) saponification process
8. Write the structural formula of ethanol. What happens when it is heated with excess of conc. H_2SO_4 at 443 K? Write the chemical equation for the reaction stating the role of conc. H_2SO_4 in this reaction.
9. What is periodicity in properties of elements with reference to the Modern periodic Table? Why do all the elements of the same group have similar properties? How does the tendency of elements to gain electrons change as we move from left to right in a period? State the reason of this change?
10. Write the electronic configuration two elements X and Y whose atomic numbers are 20 and 17 respectively. Write the Molecular formula of the compound formed when element X reacts with element Y. Draw electron-dot structure of the product and also state the nature of the bond formed between both the elements.
11. How did Mendel explain that it is possible that a trait is inherited but not expressed in an organism?

12. What is an organic evolution? It cannot be equated with progress. Explain with the help of a suitable example.
13. List the two types of reproduction. Which one of the two is responsible for bringing in more variations in its progeny and how?
14. What is vegetative propagation? State two advantages and two disadvantages of this method.
15. List three techniques that have been developed to prevent pregnancy. Which one of these techniques is not meant for males? How does the use of these techniques have a direct impact on the health and prosperity of a family?
16. "A lens can form a magnified erect image as well as magnified inverted image of an object placed in front of it". State the nature of this lens and draw ray diagrams to justify the above statement. Mark the positions of O, F and 2F in the diagram.
17. What is "dispersion of white light"? Draw a labelled diagram to illustrate the recombination of the spectrum of white light. Why it is essential that the two prisms used for the purpose should be identical and placed in an inverted position with respect to each other?
18. (a) Water is an elixir of life a very important natural resource. Your science teacher wants you to prepare a plan for a formative assessment activity, "How to save water, the vital natural resource". Write any two ways that you will suggest to bring awareness in your neighborhood, on how to save water'. (b) Name and explain any one way by which the underground water table does not go down further.

SECTION – D

19. With the help of one example for each, distinguish between the acquired traits and the inherited traits. Why are the traits/experiences acquired during the entire lifetime of an individual not inherited in the next generation? Explain the reason of this fact with an example
20. (a) Write the functions of each of the following parts in a human female reproductive system: (i) Ovary (ii) Uterus (iii) Fallopian tube (b) Write the structure and functions of placenta in a human female.
21. Why are certain compounds called hydrocarbons? Write the general formula for homologous series of alkanes, alkenes and alkynes and also draw the structure of the first member of each series. Write the name of the reaction that converts alkenes into alkanes and also write a chemical equation to show the necessary conditions for the reaction to occur.
22. (a) A student suffering from myopia is not able to see distinctly the object placed beyond 5 m. List two possible reasons due to which this defect of vision may have arisen. With the help of ray diagrams explain.

(i) Why the student is unable to see distinctly the objects placed beyond 5 cm from his eyes.

(ii) The type of the corrective lens used to restore proper vision and how this defect is corrected by the use of this lens.

(b) If, in this case, the numerical value of the focal length of the corrective lens is 5 m, find the power of the lens as per the new Cartesian sign convention.

Q.23

S. No	Object Distance U (cm)	Image Distance V (cm)
1	- 100	+25
2	- 60	+30
3	- 40	+40
4	- 30	+60
5	- 25	+100
6	- 15	+120

(a) What is the focal length of the convex lens? Give reason to justify your answer.

(b) Write the serial number of the observation which is not correct. On what basis have you arrived at this conclusion?

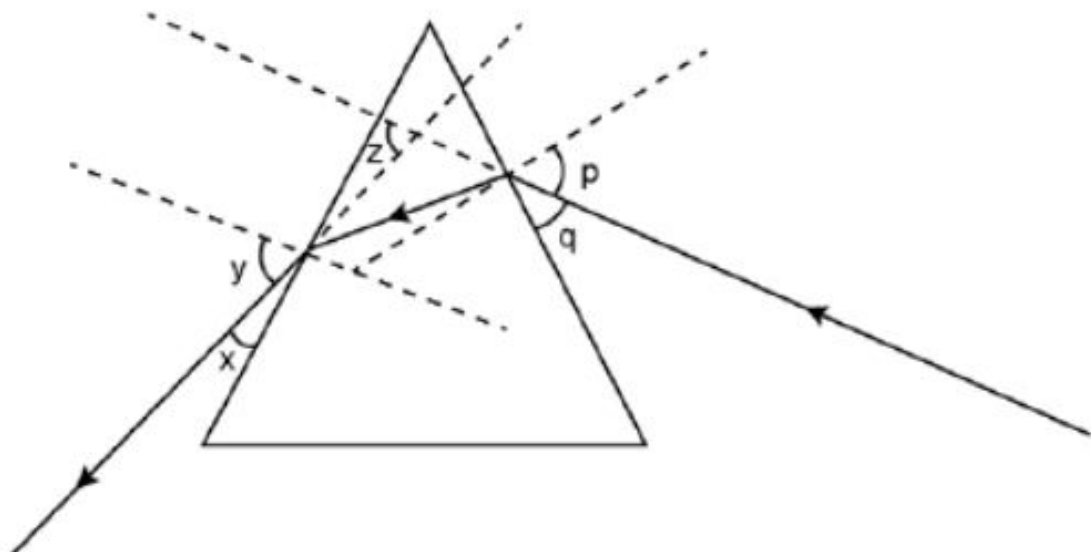
(c) Select an appropriate scale and draw a ray diagram for the observation. Also find the approximate value of magnification.

24. (a) If the image formed by a mirror for all position of the object placed in front of it is always diminished, erect and virtual, state the type of the mirror and also draw a ray diagram to justify your answer. Write one use such mirrors are put to and why.

(b) Define the radius of curvature of spherical mirrors. Find the nature and focal length of a spherical mirror whose radius of curvature is + 24 cm.

SECTION – E

25. Study the following ray diagram:



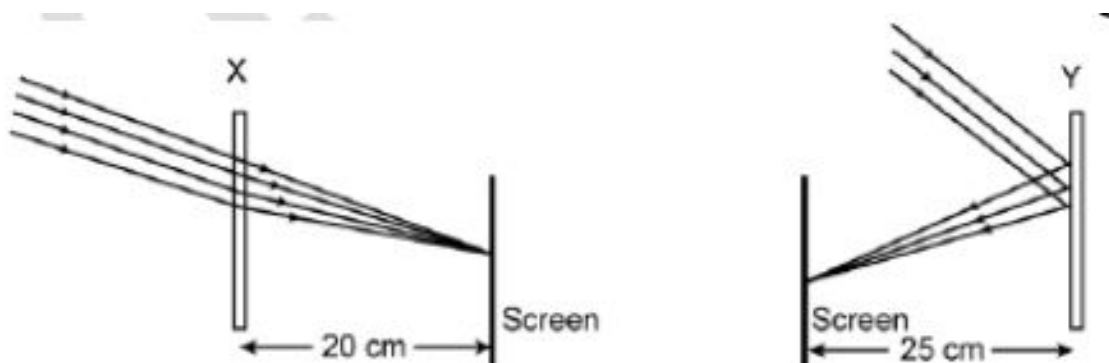
In this diagram, the angle of incidence, the angle of emergence and the angle of deviation respectively have been represented by

- (A) y, p, z (B) x, q, z (C) p, y, z (D) P, z, y

26. A student very cautiously traces the path of a ray through a glass slab for different values of the angle of incidence ($\angle i$). He then measures the corresponding values of the angle of refraction ($\angle r$) and the angle of emergence ($\angle e$) for every value of the angle of incidence. On analyzing these measurements of angles, his conclusion would be

- (A) $\angle i > \angle r > \angle e$
(B) $\angle i = \angle e > \angle r$
(C) $\angle i < \angle r < \angle e$
(D) $\angle i = \angle e < \angle r$

27. Study the given ray diagrams and selects the correct statement from the following:



28. A student obtains a blurred image of a distant object on a screen using a convex lens. To obtain a distinct image on the screen he should move the lens

- (A) Away from the screen
(B) Towards the screen
(C) To a position very far away from the screen
(D) Either towards or away from the screen depending upon the position of the object

29. While studying the saponification reaction, what do you observe when you mix an equal amount of colorless vegetable oil and 20% aqueous solution of NaOH in a beaker?

- (A) The color of the mixture has become dark brown
(B) A brisk effervescence is taking place in the beaker
(C) The outer surface of the beaker has become hot
(D) The outer surface of the beaker has become cold

30. When you add a few drops of acetic acid to a test-tube containing sodium bicarbonate powder, which one of the following is your observation?

- (A) No reaction takes place

- (B) A colorless gas with pungent smell is released with brisk effervescence
- (C) A brown colored gas is released with brisk effervescence
- (D) Formation of bubbles of a colorless and odorless gas

31. A student requires hard water for an experiment in his laboratory which is not available in the neighboring area. In the laboratory there are some salts, which when dissolved in distilled water can convert it into hard water. Select from the following groups of salts, a group, and each salt of which when dissolved in distilled water will make it hard.

- (A) Sodium chloride, Potassium chloride
- (B) Sodium sulphate, Potassium sulphate
- (C) Sodium sulphate, Calcium sulphate
- (D) Calcium sulphate, Calcium chloride

32. To perform an experiment to identify the different parts of an embryo of a dicot seed, first of all you require a dicot seed. Select dicot seeds from the following group: Wheat, Gram, Maize, Pea, Barley, Ground-nut

- (A) Wheat, Gram and Pea
- (B) Gram, Pea and Ground-nut
- (C) Maize, Pea and Barley
- (D) Gram, Maize and Ground-nut

33. The following vegetables are kept in a basket: Potato, Tomato, Radish, Brinjal, Carrot, and Bottle – gourd which two of these vegetables correctly represent the homologous structures?

- (A) Carrot and Tomato
- (B) Potato and Brinjal
- (C) Radish and Carrot
- (D) Radish and Bottle-gourd

SECTION – F

34. Draw in sequence (showing the four stages), the process of binary fission in Amoeba.

35. A student focuses the image of a candle flame, placed at about 2 m from a convex lens of focal length 10 cm, on a screen after that he moves gradually the flame towards the lens and each time focuses its image on the screen.

- (A) In which direction does he move the lens to focus the flame on the screen?
- (B) What happens to the size of the image of the flame formed on the screen?
- (C) What difference is seen in the intensity (brightness) of the image of the flame on the screen?
- (D) What is seen on the screen when the flame is very close (at about 5 cm) to the lens?

36. Mention the essential material (chemicals) to prepare soap in the laboratory. Describe in brief the test of determining the nature (acidic/alkaline) of the reaction mixture of saponification reaction.

- (A) Device X is a concave mirror and device Y is a convex lens, whose focal lengths are 20 cm and 25 cm respectively
- (B) Device X is a convex lens and device Y is a concave mirror, whose focal lengths are 10 cm and 25 cm respectively
- (C) Device X is a concave lens and device Y is a convex mirror, whose focal lengths are 20 cm and 25 cm respectively.
- (D) Device X is a convex lens and device Y is a concave mirror, whose focal lengths are 20 cm and 25 cm respectively

CBSE SCIENCE 2017

Solution 1: The molecular formula of the 2nd and 3rd members of a homologous series where the first member is ethyne (C_2H_2) is formed by adding $-CH_2-$:

2nd member of alkyne series = propyne (C_3H_4) $CH_3 - CH_2 - C \equiv CH$

3rd member of alkyne series = butyne (C_4H_6) $CH_3 - CH_2 - C \equiv CH$

Solution 2: Variation increases the chances of survival of a species in a constantly changing environment.

Solution 3: According to the 10% law, 2 J of energy will be available for the man in this chain.

Solution 4:

$u = -15$ cm (It is to the left of the lens)

$f = -30$ cm (It is a concave lens)

Using the lens formula $\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$

$$\frac{1}{v} = \frac{1}{f} + \frac{1}{u} = \frac{1}{(-30)} + \frac{1}{(-15)}$$

$$\therefore \frac{1}{v} = -\frac{3}{30} = -\frac{1}{10}$$

$$\therefore v = -10 \text{ cm}$$

The negative sign of the image distance shows that the image is formed on the left side of the concave mirror. Thus, the image formed by a mirror is virtual, erect and on the same side as the object.

Solution 5: Four activities which can be done as an environmentalist to conserve natural resources are 1) Using public transport for commuting instead of using a personal vehicle. 2) Avoid using clothes, accessories or articles made of animal skin. 3) Using energy-efficient electrical appliances to save electricity. 4) Ensuring no leakage of water taps and pipes at home.

Solution 6: Coal and petroleum have been formed by natural processes. They have been formed by the degeneration of dead plant and animal biomass buried deep in the earth several million years ago. It has taken millions of years for the formation of these fossil fuels, and the present rate of consumption of these fossil fuels far exceeds the rate at which they are formed. If exhausted, these resources will not be available for use in the near future, and hence, they should be used judiciously.

Solution 7:

Esterification	Saponification
1. Carboxylic acid reacts with alcohols in the presence of a little conc. sulphuric acid to form esters.	1. On treating an ester with a base such as NaOH, it is converted back to alcohol and sodium salt of carboxylic acid.
2. Example: Ethanoic acid reacts with ethanol in the presence of a little conc. sulphuric acid to form esters. $\begin{array}{c} \text{C}_2\text{H}_5\text{OH} + \text{CH}_3\text{COOH} \\ \downarrow \text{Conc. H}_2\text{SO}_4 \\ \text{CH}_3\text{COOC}_2\text{H}_5 + \text{H}_2\text{O} \end{array}$	2. Example: Ethyl ethanoate on reaction with sodium hydroxide gives ethanol and sodium ethanoate. $\begin{array}{c} \text{CH}_3\text{COOC}_2\text{H}_5 + \text{NaOH} \\ \downarrow \\ \text{C}_2\text{H}_5\text{OH} + \text{CH}_3\text{COONa} \end{array}$

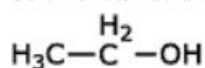
Use of esters:

Esters are used in synthetic flavours, perfumes, cosmetics, lacquers, paints and varnishes.

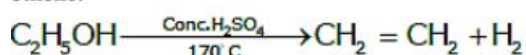
Use of saponification reaction:

It is used in the preparation of soaps on a commercial basis.

Solution 8: structural formula of ethanol:



On adding conc. sulphuric acid to ethanol and heating the mixture up to 443 K (443 K - 273 = 170 °C) gives ethene.

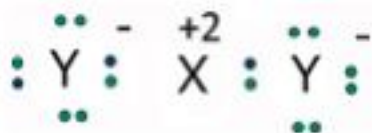


The role of conc. H₂SO₄ in the above reaction is that it is used as a dehydrating agent and causes dehydration of ethanol.

Solution 9: Properties which reappear at regular intervals or in which there is gradual variation at regular intervals are called periodic properties, and the phenomenon is known as the periodicity of elements. Elements in the same group or column have the same number of electrons in their outermost shell. Hence, elements of the same group have similar properties. On moving across a period from left to right, the tendency to gain electrons increases. This is due to an increase in the nuclear pull and a decrease in atomic size.

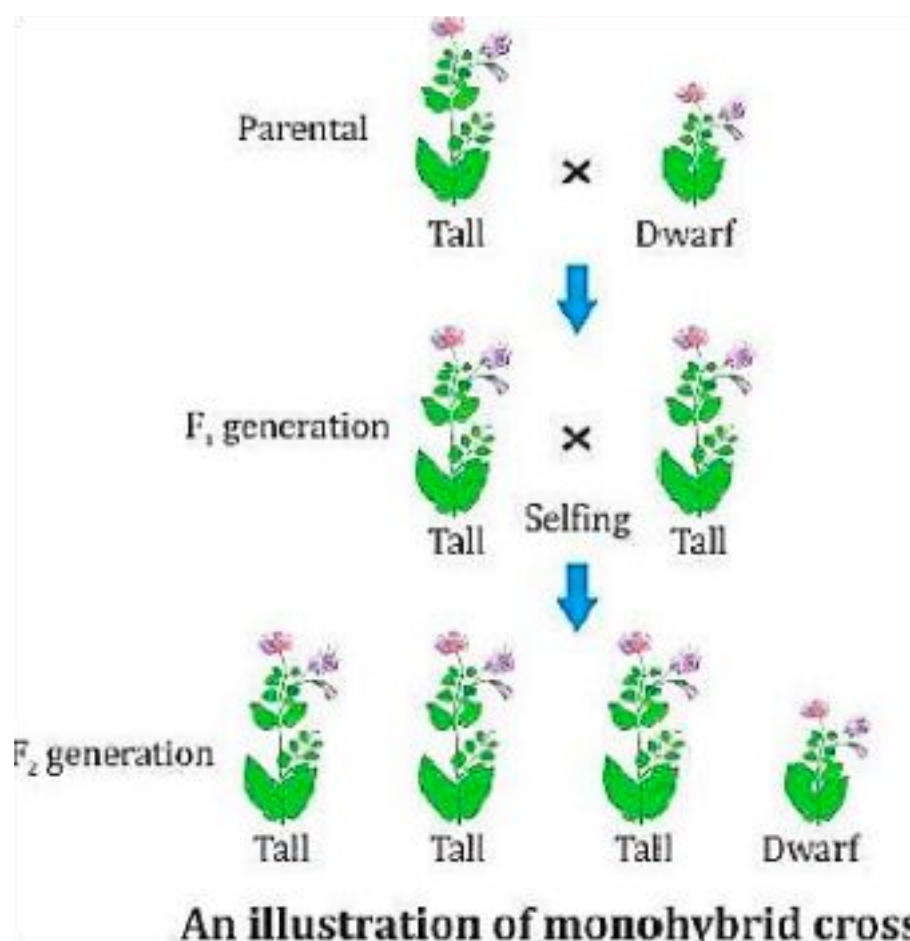
Solution 10:

Atomic number of X = 20, electronic configuration = 2, 8, 8, 2 Atomic number of Y = 17, electronic configuration = 2, 8, 7 Molecular formula of the compound = XY₂
 Electron-dot structure of the compound:



An ionic bond is formed between the two elements.

Solution 11: Mendel explained that it is possible that a trait is inherited but not expressed in an organism with the help of a monohybrid cross.



1. He crossed pure-bred tall plants (TT) with pure-bred dwarf plants (tt).
2. The progeny he received in the first filial generation was tall. The dwarfness did not show up in the F₁ generation.
3. He then crossed the tall pea plants of the F₁ generation and found that the dwarf plants were obtained in the second generation. He obtained three tall plants and one dwarf plant.

Solution 12: : Organic evolution can be defined as the slow, progressive, natural and sequential development in primitive organisms to form more complex organisms or a new species.

Solution 13: Two types of reproduction: 1. Sexual reproduction 2. Asexual reproduction Sexual reproduction is responsible for bringing in more variations in its progeny. It takes place by the combination of male and female gametes. Gametes are formed from one cell which involves copying of DNA and the cellular apparatus. DNA copying is not absolutely accurate, and errors result in new variations. With every DNA copied, a new variation is introduced, and this DNA copy may already have several variations accumulated from the previous generations.

Solution 14 : Vegetative propagation is a type of reproduction in which several plants are capable of producing naturally through their roots, stems and leaves. Advantages of vegetative propagation: Plants not capable of producing sexually are produced by this method. It is a fast and certain method to obtain plants with desired features. Disadvantages of vegetative propagation: There is no possibility for variation. The new plant grows in the same area as the parent plant which leads to competition for resources.

Solution 15: : Techniques to prevent pregnancy:

Use of intra-uterine devices such as Lippes loop and Copper T

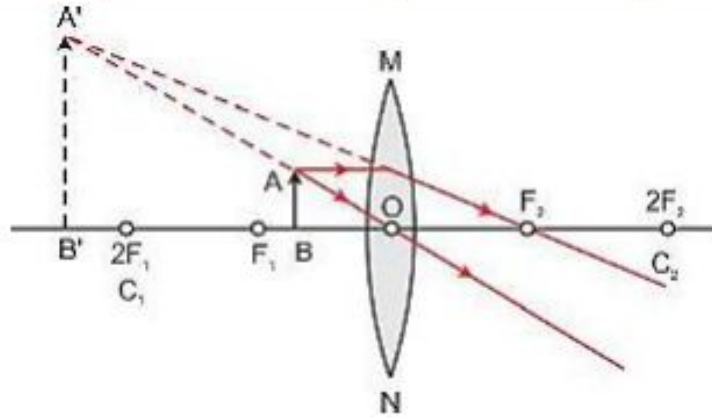
Use of condoms Surgical methods (e.g., tubectomy)

Use of intra-uterine devices is not meant for males.

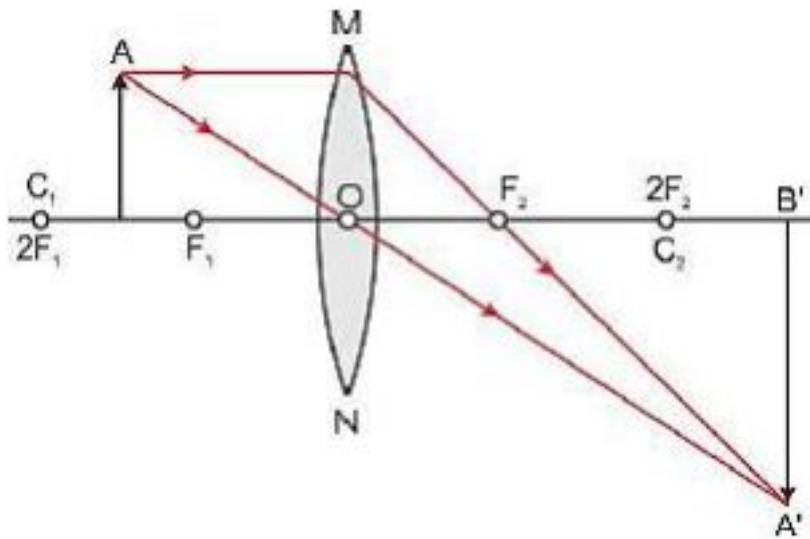
The use of these techniques will keep the mother in good health. With a small family size, parents will be able to provide quality resources to the child such as food, clothes and education. This will improve the overall mental and physical well-being of the family

Solution 16 : Convex lens can form a magnified erect image as well as a magnified inverted image of an object placed in front of it.

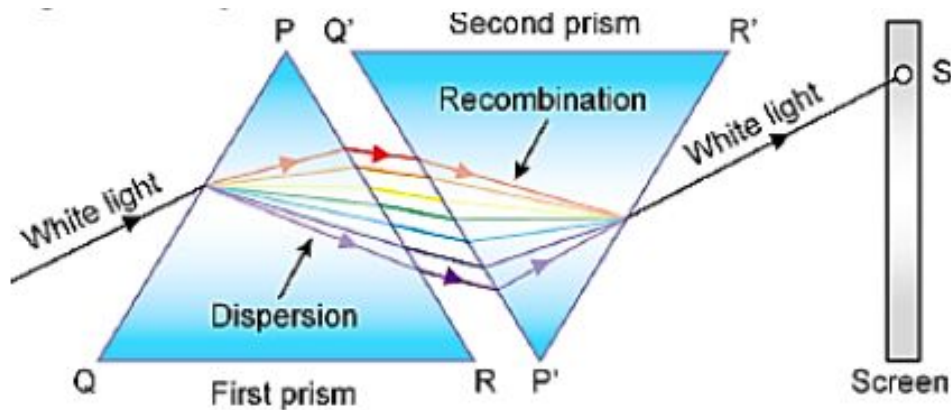
Position of object	Position of image	Size of image	Nature of image
Between focus F_1 and optical centre O	On the same side of the lens as the object	Magnified	Virtual and erect



Position of object	Position of image	Size of image	Nature of image
Between F_1 and $2F_1$	Beyond $2F_2$	Magnified	Real and inverted



Solution 17 :The phenomenon of splitting of white light into its constituent seven colours on passing through a glass prism is called dispersion of light.



It is essential to place the two identical prisms in an inverted position with respect to each other because the refraction produced by the second prism is equal and opposite to that produced by the first prism.

Solution 18 : Two ways by which awareness on how to save water can be created in the neighborhood:

1. By bringing to notice the current situation of drought in rural areas and its dreadful effects on humans and animals
2. Making people realise the importance of water in life and the shortage of water and its consequences in the near future

Khadin is one way of recharging groundwater.

A khadin consists of a 100-300-m long embankment called bund made of earth. The bund is built across the lower edge of the sloping farmland.

Rainwater from the catchment area flows down the slope and collects in front of the bund forming a reservoir.

Pathways through the bund allow excess water to flow through and collect in shallow wells dug behind the bund.

The water which collects in the reservoir and wells seeps into the land and recharges the groundwater.

Solution 19:

Acquired Trait	Inherited Trait
A trait or characteristic which develops in response to the environment and cannot be inherited.	A characteristic feature inherited from the previous generation.
Example: A person learns to swim.	Example: A girl has brown eyes just like her mother.

Only those traits are inherited which are developed because of changes in genes. An acquired trait or experience is developed as a response to the environment; it is not inherited. These are not developed due to the changes in genes.

Example: Human beings experiencing weight loss due to starvation. There will be reduction in weight as a response to starvation. This will result in the reduction in the number of body cells or overall body-mass ratio of the individual. It will not have any

effect on the genetic constitution of the individual. Because there is no change in the gene of the individual, it is not an acquired trait.

Solution 20:

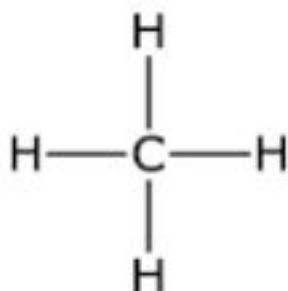
- (i) Ovary: It produces female gametes. One ovum is released by one ovary every month. It also secretes hormones oestrogen and progesterone.
- (ii) Uterus: It protects and nourishes the developing embryo.
- (iii) Fallopian tube: It passes down the ovum towards the uterus released by the ovary. Structure of the placenta in human female:

1. The placenta is a disc which is embedded in the uterine wall.
2. It contains villi on the embryo side. The mother's end of the placenta has blood spaces which surround the villi.

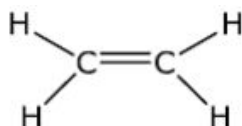
Functions of the placenta in human female:

1. Nutrients and oxygen are received by the foetus from the mother's blood.
2. The foetus gives away waste products and carbon dioxide to the mother's blood for excretion.

Solution 21: Certain compounds contain only carbon and hydrogen. So, these organic compounds are called hydrocarbons. General formula for the homologous series of alkanes = C_nH_{2n+2} First member of the alkane family is methane.



General formula for the homologous series of alkenes = C_nH_{2n} First member of the alkene family is ethene.

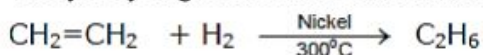


General formula for the homologous series of alkynes = C_nH_{2n-2}

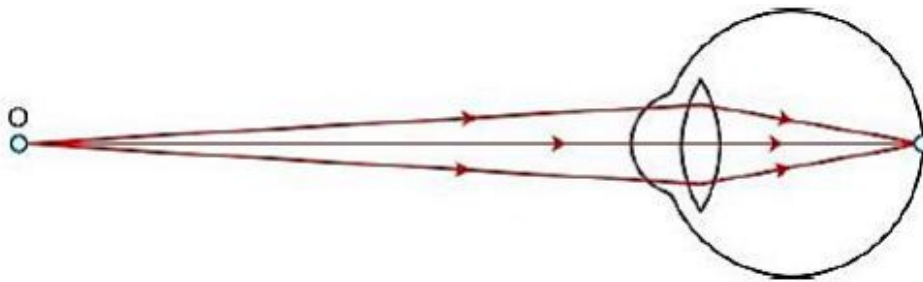
First member of the alkyne family is ethyne.



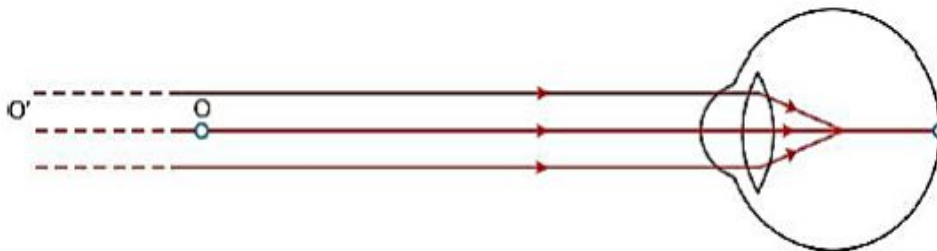
Catalytic hydrogenation is the reaction used to convert alkenes to alkanes.



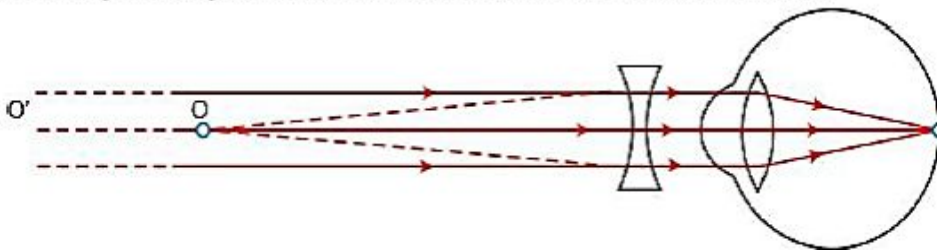
Solution 22 : (a) This defect may arise due to excessive curvature of the eye lens or elongation of the eyeball. (i) A person with this defect has the far point nearer than infinity. Such a person may see clearly up to a distance of a few meters.



In a myopic eye, the image of a distant object is formed in front of the retina and not at the retina itself



(ii) This defect can be corrected by using a concave lens of suitable power. A concave lens of suitable power will bring the image back onto the retina and thus the defect is corrected.



(b) Given: Focal length $f = -5 \text{ m}$ (\because it is a concave lens)

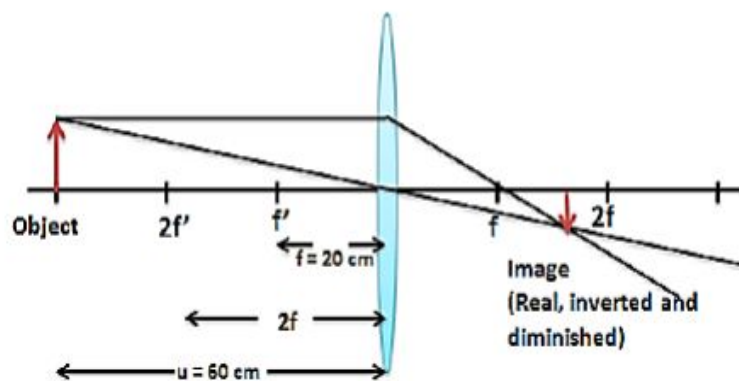
$$\text{Power, } P = \frac{1}{f \text{ (in m)}} = \frac{1}{-5} = -0.2\text{D}$$

The negative sign indicates that it is a diverging lens or concave lens.

Solution 23: (a) When the object distance and the image distance are the same, it means that the object is placed at $2f$ or the image is formed at $2f$. From the table, it is clear that $2f = 40 \text{ cm}$. Therefore, the focal length of the convex lens is 20 cm .

(b) Serial number 6 is incorrect. Given that the object is placed at 15 cm which is between the focal length and the lens. Thus, the image should be formed on the same side as the object. The data given in the observation serial number 6 does not satisfy the condition.

(c)



$$\text{Magnification, } m = \frac{v}{u}$$

Let us consider the third observation where

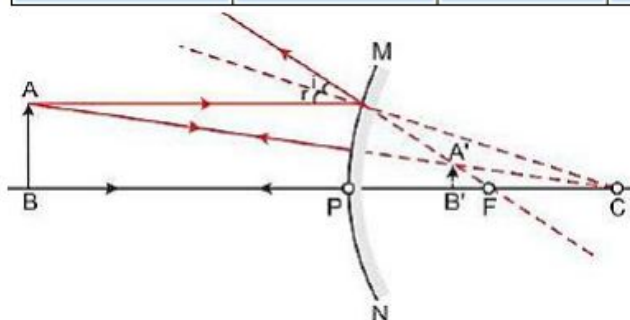
$$u = -40 \text{ cm and } v = 40 \text{ cm}$$

$$\therefore m = \frac{v}{u} = \frac{40}{-40}$$

$$\therefore m = -1$$

Solution 24 (a) A convex mirror always forms a diminished, erect and virtual image of the object placed in front of it.

Position of object	Position of image	Size of image	Nature of image
Between infinity and the pole of the mirror	Between P and F behind the mirror	Diminished	Virtual and erect



Use of a convex mirror:

- i. Convex mirrors are commonly used as rear view mirrors in vehicles.
- ii. They are preferred because they always give an erect image, although diminished. Also, they have a wider field of view as they are curved outwards. Thus, convex mirrors enable the driver to view a much larger area than would be possible with a plane mirror.

(b) The radius of curvature of a spherical mirror is the radius of the sphere of which the reflecting surface of the spherical mirror is a part and represented by R.

Radius of curvature $R = 24$ cm

Radius of curvature $= 2 \times$ focal length

i.e., $R = 2f$

$24 = 2 \times f$

$$f = \frac{24}{2} = 12$$

$f = 12$ cm

Solution 25 : (A) y, p, z The angle between the incident ray and the normal is known as the angle of incidence, and the angle between the emergent ray and the normal is known as the angle of emergence. The emergent ray is bent at an angle with the direction of the incident ray. This angle is called the angle of deviation.

Solution 26 : (B) $\angle i = \angle e > \angle r$ Because the emergent ray is parallel to the incident ray, the angle of incidence is equal to the angle of emergence. The refracted ray travels from a rarer medium to a denser medium (considering the first refraction); it bends towards the normal. Thus, the angle of incidence is greater than the angle of refraction. If we consider the second refraction, then light travels from a denser medium to a rarer medium, due to which it bends away from the normal after refraction. So, in this case, the angle of refraction is again less than the angle of emergence.

Solution 27 : (D) Device X is a convex lens and device Y is a concave mirror, whose focal lengths are 20 cm and 25 cm respectively. Device X is a convex lens and device Y is a concave mirror whose focal lengths are 20 cm and 25 cm, respectively. A parallel ray of light incident on a concave mirror gets reflected, and the image is seen on a screen placed before it. A parallel ray of light incident on a convex lens converges to a point.

Solution 28: (B) Inverted and diminished When the object is at infinity, the distance of the image from the lens will be equal to the focal length of the lens.

Solution 29: (C) The outer surface of the beaker has become hot. When 20% NaOH solution was added to the beaker containing vegetable oil, it was observed that the beaker's surface was warm when touched. A whitish suspension was formed by heating the mixture of vegetable oil and 20% NaOH solution.

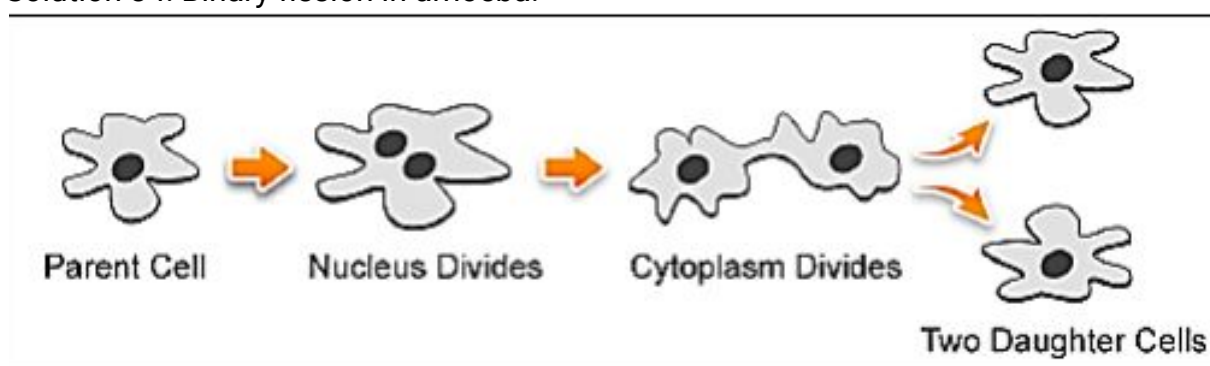
Solution 30 : (D) Formation of bubbles of a colorless and odorless gas. $\text{NaHCO}_3 + \text{HC}_2\text{H}_3\text{O}_2 \rightarrow \text{NaC}_2\text{H}_3\text{O}_2 + \text{H}_2\text{O} + \text{CO}_2$ There is double displacement in which acetic acid reacts with sodium bicarbonate to form sodium acetate and carbonic acid. $\text{NaHCO}_3 + \text{HC}_2\text{H}_3\text{O}_2 \rightarrow \text{NaC}_2\text{H}_3\text{O}_2 + \text{H}_2\text{CO}_3$ Carbonic acid is unstable and undergoes a decomposition reaction to produce carbon dioxide gas. $\text{H}_2\text{CO}_3 \rightarrow \text{H}_2\text{O} + \text{CO}_2$ Carbon dioxide escapes from the solution as bubbles.

Solution 31: (D) Calcium sulphate, calcium chloride Hard water can be prepared by dissolving sulphates, chlorides or bicarbonate salts of Ca^{2+} or Mg^{2+} ions.

Solution 32: (B) Gram, Groundnut, Pea Dicot seeds have two cotyledons.

Solution 33: (C) Radish and Carrot The structures which are same in structure and origin but are modified to perform different functions are called homologous structures. Although radish and carrot store food and are used as food, the nutrients which each provide are different

Solution 34: Binary fission in amoeba:



Solution 35 : (a) As the candle is moved towards the lens, the image distance increases. Thus, the student moves the lens away from the screen to focus the image.

(b) The size of the image increases when the object is moved towards the lens.

(c) Intensity decreases.

(d) When the candle is moved very close to the lens, no image is formed on the screen. A virtual image is formed behind the candle on the same side of the screen.

Solution 36: Chemicals required: Vegetable oil, common salt and 20% sodium hydroxide solution. When a red litmus paper is dipped in the reaction mixture, the paper changes its colour to blue. Hence, the reaction mixture of the saponification reaction is basic in nature.

CBSE Science 2016

Question Paper (as it is) -

General Instructions:

1) All questions are compulsory.

2) The question paper consists of 42 questions divided into 4 sections A, B, C and D. Section A comprises questions of 01 mark each, Section B comprises questions of 02 marks each, Section C comprises questions of 03 marks each and Section D comprises questions of 05 marks each.

3) All questions in Section A are to be answered in one word, one sentence or as per the exact requirement of the question.

4) There is no overall choice. However, internal choice has been provided wherever necessary. You have to attempt only one of the alternatives in all such questions.

5) In question on construction, drawing should be neat and exactly as per the given measurements.

6) Use of calculators is not permitted.

- 1. Write the name and structure of an alcohol with three carbon atoms in its molecule.**
- 2. What happens when a mature spirogyra filament attains considerable length ?**
- 3. The depletion of the ozone layer is a cause of concern. Why ?**
- 4. Name the type of mirrors used in the design of solar furnaces. Explain how high temperature is achieved by this device.**
- 5. "What was Chipko Andolan" ? How did this Andolan ultimately benefit the local people and the environment ?**
- 6. "Burning of fossil fuels results in global warming". Give reasons to justify this statement.**
- 7. Write chemical equation of the reaction of ethanoic acid with the following : (a) Sodium
(b) Sodium hydroxide;
(c) Ethanol.
Write the name of one main product of each reaction.**
- 8. An aldehyde as well as a ketone can be represented by the same molecular formula, say C_3H_6O . Write their structures and name them. State the relation between the two in the language of science.**
- 9. An element 'X' belongs to 3rd period and group 16 of the Modern Periodic Table.**

- (a) Determine the number of valence electrons and the valency of 'X'.
(b) Molecular formula of the compound when 'X' reacts with hydrogen and write its electron dot structure.
(c) Name the element 'X' and state whether it is metallic or non-metallic.

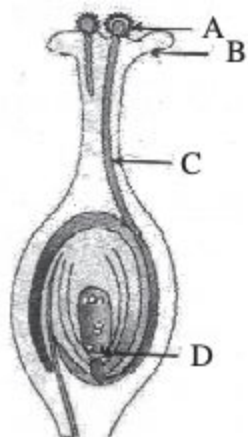
10. An element 'X' has mass number 35 and number of neutrons 18. Write atomic number and electronic configuration of 'X'. Also write group number, period number and valency of 'X'.

11. Define reproduction. How does it help in providing stability to the population of species ?

12. Explain the term "Regeneration" as used in relation to reproduction of organisms. Describe briefly how regeneration is carried out in multicellular organisms like Hydra.

13. (a) List two reasons for the appearance of variations among the progeny formed by sexual reproduction.

(b)



- (i) Name the part marked 'A' in the diagram.**
- (ii) How does 'A' reaches part 'B' ?**
- (iii) State the importance of the part 'C'.**
- (iv) What happens to the part marked 'D' after fertilisation is over ?**

14. How do Mendel's experiment show that traits are inherited independently ?

15. "Two areas of study namely 'evolution' and 'classification' are interlinked". Justify this statement.

16. The image of an object formed by a mirror is real, inverted and is of magnification – 1. If the image is at a distance of 40 cm from the mirror, where is the object placed ? Where would the image be if the object is moved 20 cm towards the mirror ? State reason and also draw ray diagram for the new position of the object to justify your answer.

17. Describe an activity to show that the colours of white light splitted by a glass prism can be recombined to get white light by another identical glass prism. Also draw ray diagram to show the recombination of the spectrum of white light.

18. The activities of man had adverse effects on all forms of living organisms in the biosphere. Unlimited exploitation of nature by man disturbed the delicate ecological balance between the living and non-living components of the biosphere. The unfavourable conditions created by man himself threatened the survival not only of himself but also of the entire living organisms on the mother earth. One of your classmates is an active member of 'Eco club' of your school which is creating environmental awareness amongst the school students, spreading the same in the society and also working hard for preventing environmental degradation of the surroundings.

- (a) Why is it necessary to conserve our environment ?
- (b) State the importance of green and blue dustbins in the safe disposal of the household waste.
- (c) List two values exhibited by your classmate who is an active member of Eco-club of your school.

19. A carbon compound 'P' on heating with excess conc. H_2SO_4 forms another carbon compound 'Q' which on addition of hydrogen in the presence of nickel catalyst forms a saturated carbon compound 'R'. One molecule of 'R' on combustion forms two molecules of carbon dioxide and three molecules of water. Identify P, Q and R and write chemical equations for the reactions involved.

20. What is placenta ? Describe its structure. State its functions in case of a pregnant human female.

21. Define evolution. How does it occur ? Describe how fossils provide us evidences in support of evolution.

22. It is desired to obtain an erect image of an object, using a concave mirror of focal length of 12 cm.

(i) What should be the range of distance of an object placed in front of the mirror ?

(ii) Will the image be smaller or larger than the object. Draw a ray diagram to show the formation of image in this case.

(iii) Where will the image of this object be, if it is placed 24 cm in front of the mirror ? Draw a ray diagram for this situation also to justify your answer.

23. (a) Define optical centre of a spherical lens.

(b) A divergent lens has a focal length of 20 cm. At what distance should an object of height 4 cm from the optical centre of the lens be

placed so that its image is formed 10 cm away from the lens. Find the size of the image also.

(c) Draw a ray diagram to show the formation of image in above situation.

24. What is atmospheric refraction ? Use this phenomenon to explain the following natural events.

(a) Twinkling of stars

(b) Advanced sun-rise and delayed sun-set.

SECTION—B

25. A student puts a drop of reaction mixture of a saponification reaction first on a blue litmus paper and then on a red litmus paper.

He may observe that:

(a) There is no change in the blue litmus paper and the red litmus paper turns white.

(b) There is no change in the red litmus paper and the blue litmus paper turns red.

(c) There is no change in the blue litmus paper and the red litmus paper turns blue.

(d) No change in colour is observed in both the litmus papers.

26. For preparing soap in the laboratory we require an oil and a base. Which of the following combinations of an oil and a base would be best suited for the preparation of soap ?

(a) Castor oil and calcium hydroxide

(b) Turpentine oil and sodium hydroxide

(c) Castor oil and sodium hydroxide

(d) Mustard oil and calcium hydroxide

27. In the neighbourhood of your school, hard water required for an experiment is not available. Select from the following groups of salts available in your school, a group each member of which, if dissolved in distilled water, will make it hard :

- (a) Sodium chloride, calcium chloride**
- (b) Potassium chloride, sodium chloride**
- (c) Sodium chloride, magnesium chloride**
- (d) Calcium chloride, magnesium chloride**

28. A student while observing an embryo of a pea seed in the laboratory listed various parts of the embryo as given below : Testa, Tegmen, Radicle, Plumule, Micropyle, Cotyledon. On examining the list the teacher remarked that only three parts are correct. Select three correct parts from the above list :

- (a) Testa, Radicle, Cotyledon**
- (b) Tegmen, Radicle, Micropyle**
- (c) Cotyledon, Plumule, Testa**
- (d) Radicle, Cotyledon, Plumule**

29. If you are asked to select a group of two vegetables, out of the following, having homologous structures which one would you select ?

- (a) Carrot and radish**
- (b) Potato and sweet potato**
- (c) Potato and tomato**
- (d) Lady finger and potato**

30. To determine the approximate value of the focal length of a given concave mirror, you focus the image of a distant object formed by the mirror on a screen. The image obtained on the screen, as compared to the object is always :

- (a) Laterally inverted and diminished**
- (b) Inverted and diminished**

- (c) Erect and diminished
- (d) Erect and highly diminished

31. Suppose you have focused on a screen the image of candle flame placed at the farthest end of the laboratory table using a convex lens. If your teacher suggests you to focus the parallel rays of the sun, reaching your laboratory table, on the same screen, what you are expected to do is to move the :

- (a) lens slightly towards the screen
- (b) lens slightly away from the screen
- (c) lens slightly towards the sun
- (d) lens and screen both towards the sun

32. In your laboratory you trace the path of light rays through a glass slab for different values of angle of incidence ($\angle i$) and in each case measure the values of the corresponding angle of refraction ($\angle r$) and angle of emergence ($\angle e$). On the basis of your observations your correct conclusion is :

- (a) $\angle i$ is more than $\angle r$, but nearly equal to $\angle e$
- (b) $\angle i$ is less than $\angle r$, but nearly equal to $\angle e$
- (c) $\angle i$ is more than $\angle e$, but nearly equal to $\angle r$
- (d) $\angle i$ is less than $\angle e$, but nearly equal to $\angle r$

33. In the following ray diagram the correctly marked angle are :

- (a) $\angle i$ and $\angle e$
- (b) $\angle A$ and $\angle D$
- (c) $\angle i$, $\angle e$ and $\angle D$
- (d) $\angle r$, $\angle A$ and $\angle D$

34. A student adds a spoon full of powdered sodium hydrogen carbonate to a flask containing ethanoic acid. List two main

observations, he must note in his note book, about the reaction that takes place. Also write chemical equation for the reaction.

35. A student is observing a permanent slide showing sequentially the different stages of a sexual reproduction taking place in yeast. Name this process and draw diagrams, of what he observes, in a proper sequence.

36. An object of height 2.5 cm is placed at a distance of 15 cm from the optical centre 'O' of a convex lens of focal length 10 cm. Draw a ray diagram to find the position and size of the image formed. Mark optical centre 'O', principal focus F and height of the image on the diagram.

Answers

Ans 1). Name of an alcohol: Propanol

Ans 2). Filament of spirogyra breaks into smaller fragments when it matures and each filament grows into a new filament or individual.

Ans 3). The ozone layer present in our atmosphere protects us from the harmful UltraViolet rays of the sun which can cause skin cancer and other diseases. This ozone prevents the UV rays from reaching earth. so the depletion of the ozone layer is a matter of concern for everyone.

Ans 4). Concave mirror is used in the design of solar furnaces. When a solar furnace is placed at the focus of a large concave mirror called

reflectors, it focuses a parallel beam of light coming from the sun on the furnace.

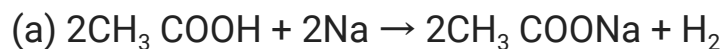
Ans 5). Chipko movement means "hug the tree" it is one of the movements in India to conserve biodiversity. It was started by Sunder Lal Bahuguna. This movement originated in Reni Village of Garhwal. To stop the contractor from falling off trees women of the village clasped to the trunk of the tree. Its benefits were :

(a) Existing forest cover was protected, reducing landslides and soil erosion. It actually protected the environment and maintained ecological balance.

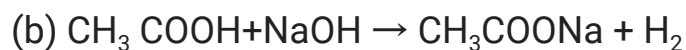
(b) Forest wealth could be utilized for food, fodder, fuel, fertilizers and fibres.

Ans 6). Burning of fossil fuels results in release of CO_2 , CO, water vapours, SO_2 , oxides of nitrogen. High concentration of CO_2 causes global warming. The burning of more and more of fossil fuels is increasing the amount of carbon dioxide in the atmosphere causing increased greenhouse effect leading to global warming.

Ans 7).



Sodium ethanoate



Sodium ethanoate



Ethyl ethanoate

Ans 8). $\text{CH}_3 - \text{CH}_2 - \text{CHO} \rightarrow$ (Ketone)

$\text{CH}_3 - \text{C} - \text{CH}_3 \rightarrow$ (Aldehyde)

||

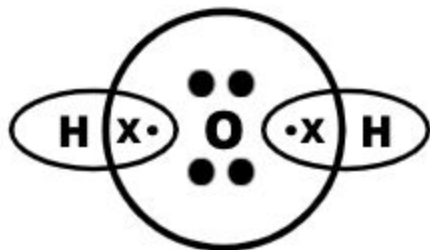
Ans 9).

X=2, 8, 6

(a) Valence electrons are 6 Valency = 2

(b) Formula = H_2X

(c) X is sulphur and it is a non - metal.



Ans 10).

Atomic no. of X = $35 - 18 = 17$

Electronic configuration = 2, 8, 7 Group number = 17

Period number = 3

Valency = 1

Ans 11). Reproduction is the term, which is used for producing the same species by existing organisms. It helps in providing stability to the population of species by increasing the number of species so that birth rate can equate with death rate and a species can maintain its population.

Ans12). Regeneration is the ability of an organism to give rise to a new organism or individual from their body parts. If the body of hydra is cut into pieces, then each body piece of Hydra can grow into a complete Hydra i.e. on cutting into pieces, the cells of the cut parts divide rapidly to make 'ball of cells'. The cells present in the 'ball of cells' move to their proper places within the ball where they have to form various organs and body parts of the organisms.

Ans 13). Variation occurs in the progeny formed through sexual reproduction because in this process both the germ cells are equally involved. Reproduction involves fusion of male and female gametes. So, each time when zygote is formed, it is formed by combining variants.

b) (i) The part marked 'A' is Pollen grains.

(ii) 'A' reaches part 'B' through the process of pollination. B is the stigma of the carpel.

(iii) C' is a pollen tube. It helps in reaching of male gamete to the egg ovule.

(iv) 'D' is egg. After fertilization, the egg divides several times and forms an embryo within the ovule.

Ans 14). Mendel crossed two pea plants differing in contrasting traits of two characters i.e a dihybrid cross. He crossed a pea plant having yellow coloured and rounded seeds with another pea plant having green coloured and wrinkled seed.

The F1 generation has all round and yellow seeds.

The F2 generation, all the characters inherited independently. (round yellow, round green, wrinkled yellow, wrinkled green).

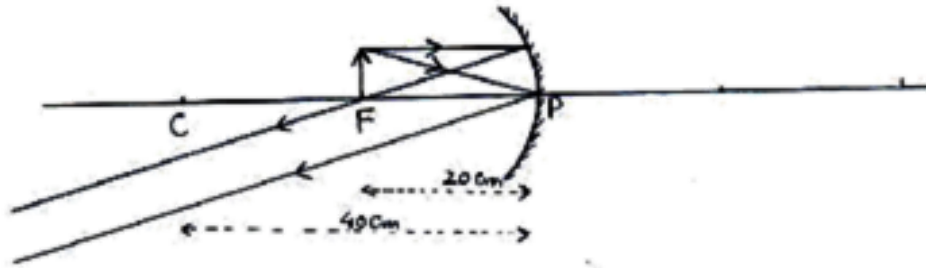
Ans 15). Modern classification system is based on the phylogenetic resemblances and evolutionary relationships between the species. Systematic deals with the classification of living beings on the basis of evolution. Thus, evolution of organisms gives a hint about its position in the classification system and visa versa. Hence, we can say that evolution and classification are two interlinked areas of study.

Ans 16). Magnification is – 1

It means the image is real and inverted and is of the same size as that of the object so if the image is at a distance of 40cm from the mirror then the object is also at a distance of 40cm from the mirror because the object is placed at C ie center of curvature of the mirror.

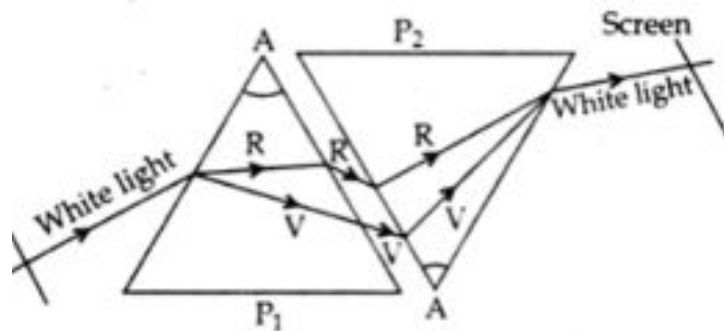
If the object is moved 20cm towards the mirror the object is placed at F ie at the principal focus and the image is formed at infinity.

the nature of the mage so formed is real inverted and highly enlarged.



Ans 17). The colors of white light splitted by a glass prism can be recombined to get white light by another identical glass prism. It can be done by putting an identical glass prism in the inverted position and allowing all the colors of the spectrum to pass through the second prism. This will lead to the emergence of white light from the second prism showing that white light is composed of seven colors.

RAY DIAGRAM:



Ans 18). (a) It is necessary to conserve environment to protect atmosphere and living habitat from degradation.

(b) Green dustbin is used for biodegradable wastes and blue dustbin is used for non-biodegradable waste.

(c) Two values exhibited are working hard and caring for the environment.

Ans 19). Editing needed

Ans 20). Placenta is an organ found only in mammals during development of foetus. It is made up of cells from both mother and foetus.

Placenta is 22cm in length 2-2.5 cm in thickness, weight 500 gm. It has a dark reddish-blue or crimson colour. It is discoidal in shape.

Functions of Placenta :

- 1). Placenta allows the exchange of materials between mother and foetus.
- 2). It also allows the transfer of nutrients and oxygen from mother to foetus.
- 3). Urea, uric acid and even carbon dioxide are some waste products excreted by the foetus and are diffused to maternal blood stream by the placenta.
- 4). Antibodies pass through the placenta that provides immunity to the foetus.

Ans 21). Evolution is the sequence of gradual changes which take place in the primitive organisms over millions of years in which new species are produced.

Ocurring - It is through the constant process of evolution taking place in the organisms since the origin of life that such and enormous variety of plants and animals have come to exist on this earth at present.

There is an inbuilt tendency to variation during reproduction due to errors in DNA copying and as a result of sexual reproduction.

Relationship between fossils and evolution

Fossils are the remains of impressions of dead plants or animals which died millions of year ago. The study of fossils helps us to know about the

evolution of species. Fossils tell us how new species are developed from the old. Fossils provide evidence of evolution by revealing characteristics of past organisms and the changes that have occurred in these organisms to give rise to present organisms. Therefore, fossils have an importance in deciding evolutionary relationships.

For example, a fossil called Archaeopteryx has feathered wings like birds but teeth and tail like reptiles hence suggesting that birds and reptiles had a common ancestor.

Ans 22).

(i) . The range of distance should be 0 cm to less than 12 cm from the mirror.

(ii). Image addition

(iii). Image addition

Ans 23). (a). Optical center of the lens is defined as the point which lies on the principal axis through the rays of light passes without any deflection.

(b). Given : f (focal length) = -20 cm, h_{object} (height of object) = 4 cm
 v (image distance) = -10 cm

Solving it,

$$1/f = 1/v - 1/u$$

$$-1/20 = -1/10 - 1/u$$

$$1/u = -1/10 + 1/20$$

$$1/u = -2/20 + 1/20 = -1/20$$

$$u = -20 \text{ cm} \quad \text{-----> eq}^n 1$$

Magnification: $m = h_i/h_o = v/u$

Given $h_o = 4$ cm

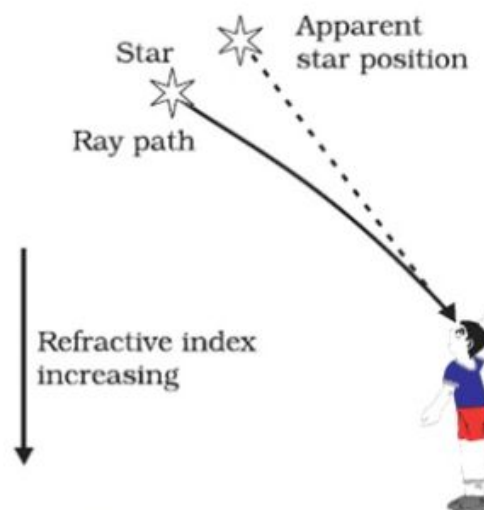
$$h_i / 4 = -10 / -20$$

$$h_i = 2 \text{ cm}$$

(c) image addition

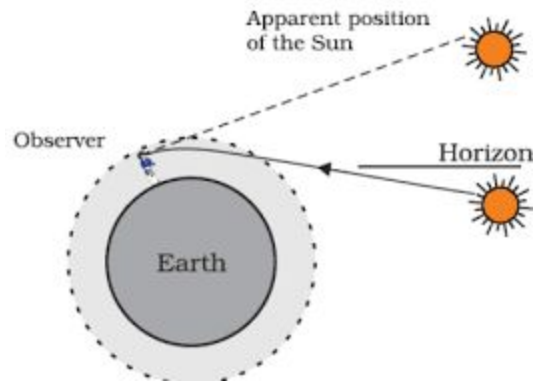
Ans 24). Refraction of light caused by earth's atmosphere is the phenomenon for the changes that occur in the process of light travelling to the atmosphere due to change in the refractive index.

(i). Twinkling of stars is due to atmospheric refraction of star light. The light from the star after entering the earth's atmosphere undergoes refraction in a continuous manner before it reaches the Earth. The atmospheric refraction is due to change in the refractive index at different level in the atmosphere. The star light bends towards the normal, the apparent position is different from the actual position of the star. Since the atmosphere is not stationary and keeps changing. As the path of rays of light coming from the star varies slightly then the apparent position of the star also varies slightly and the amount of light entering the eye flickers.



(ii). The advance sunrise and sunset occurs due to phenomenon of atmospheric refraction. The Sun is visible to us before 2 minutes in sunrise

and 2 minutes after the sunset. The actual sunrise mean the time when the sun crosses the horizon. This occurs due to refraction of light which passes through various layers of atmosphere.



Section - B

Ans 25).

(c) There is no change in the blue litmus paper and the red litmus paper turns blue

Ans 26).

(c) Castor oil and sodium hydroxide

Ans 27).

(d) Calcium chloride, magnesium chloride

Ans 28).

(d) Radicle, Cotyledon, Plumule

Ans 29).

(a) Carrot and radish

Ans 30).

(b) Inverted and diminished

Ans 31).

(a) lens slightly towards the screen

Ans 32).

(a) $\angle i$ is more than $\angle r$, but nearly equal to $\angle e$

Ans 33).

(d) $\angle r$, $\angle A$ and $\angle D$ 34. A student adds a spoon

Ans 34). $\text{CH}_3\text{COOH} + \text{NaHCO}_3 \rightarrow \text{CH}_3\text{COONa} + \text{H}_2\text{O} + \text{CO}_2$

As CO_2 is released:

(i). Brisk effervescence is observed.

(ii). There is evolution of colourless and an odourless gas

(ii). There is formation of salt i.e. sodium ethanoate.

CBSE Science 2015

Question Paper (as it is) -

General Instructions:

- 1) All questions are compulsory.

- 2) The question paper consists of 42 questions divided into 4 sections A, B, C and D. Section A comprises questions of 01 mark each, Section B comprises questions of 02 marks each, Section C comprises questions of 03 marks each and Section D comprises questions of 05 marks each.

- 3) All questions in Section A are to be answered in one word, one sentence or as per the exact requirement of the question.

- 4) There is no overall choice. However, internal choice has been provided wherever necessary. You have to attempt only one of the alternatives in all such questions.

- 5) In question on construction, drawing should be neat and exactly as per the given measurements.

- 6) Use of calculators is not permitted.

- 1. Write the number of covalent bonds in the molecule of ethane.**
- 2. Name the life process of an organism that helps in the growth of its population.**
- 3. What will be the amount of energy available to the organisms of the 2nd trophic level of a food chain if the energy available at the first trophic level is 10,000 joules?**
- 4. The absolute refractive indices of glass and water are $\frac{4}{3}$ and $\frac{3}{2}$, respectively. If the speed of light in glass is 2×10^8 m/s, calculate the speed of light in (a) Vacuum (b) Water**
- 5. List two main causes of the pollution of water of the river Ganga. State how pollution and contamination of river water prove harmful for the health of the people of neighbouring areas.**
- 6. What is biodiversity? What will happen if biodiversity of an area is not preserved? Mention one effect of it.**
- 7. List two tests for experimentally distinguishing between an alcohol and a carboxylic acid and describe how these tests are performed.**

8. Draw the electron-dot structure for ethyne. A mixture of ethyne and oxygen is burnt for welding. In your opinion, why cannot we use a mixture of ethyne and air for this purpose?

9. Two elements 'P' and 'Q' belong to the same period of the modern periodic table and are in Group 1 and Group 2, respectively. Compare their following characteristics in tabular form:

- (a) The number of electrons in their atoms**
- (b) The sizes of their atoms**
- (c) Their metallic character**
- (d) Their tendencies to lose electrons**
- (e) The formula of their oxides (f) The formula of their chlorides**

10. Taking the example of an element of atomic number 16, explain how the electronic configuration of the atom of an element relates to its position in the modern periodic table and how valency of an element is calculated on the basis of its atomic number.

11. List six specific characteristics of sexual reproduction.

12. What are chromosomes ? Explain how in sexually reproducing organisms the number of chromosomes in the progeny is maintained.

13. List four points of significance of reproductive health in a society. Name any two areas related to reproductive health which have improved over the past 50 years in our country.

14. Explain with an example for each, how the following provides evidences in favour of evolution in organisms :

(a) Homologous organs (b) Analogous organs (c) Fossils

15. Explain the following : (a) Speciation (b) Natural Selection

16. If the image formed by a mirror for all positions of the object placed in front of it is always erect and diminished, what type of mirror is it ? Draw a ray diagram to justify your answer. Where and why do we generally use this type of mirror ?

17. What is meant by scattering of light ? Use this phenomenon to explain why the clear sky appears blue or the sun appears reddish at sunrise.

18. Differentiate between biodegradable and nonbiodegradable substances with the help of one example each. List two changes in habit that people must adopt to dispose non-biodegradable waste, for saving the environment.

19. Both soap and detergent are some type of salts. What is the difference between them ? Describe in brief the cleansing action of soap. Why do soaps not form lather in hard water ? List two problems that arise due to the use of detergents instead of soaps.

20. (a) Name the human male reproductive organ that produces sperms and also secretes a hormone. Write the functions of the secreted hormone.

(b) Name the parts of the human female reproductive system where

- (i) fertilisation takes place,**
- (ii) implantation of the fertilised egg occurs. Explain how the embryo gets nourishment inside the mother's body**

21. How do Mendel's experiments show that the (a) traits may be dominant or recessive, (b) traits are inherited independently ?

22. What is meant by power of a lens ? Define its S.I. unit. You have two lenses A and B of focal lengths +10 cm and -10 cm respectively. State the nature and power of each lens. Which of the two lenses will form a virtual and magnified image of an object placed 8 cm from the lens ? Draw a ray diagram to justify your answer.

23. One half of a convex lens of focal length 10 cm is covered with a black paper. Can such a lens produce an image of a complete object placed at a distance of 30 cm from the lens ? Draw a ray diagram to justify your answer. A 4 cm tall object is placed perpendicular to the principal axis of a convex lens of focal length 20 cm. The distance of the object from the lens is 15 cm. Find the nature, position and size of the image.

24. Write the importance of ciliary muscles in the human eye. Name the defect of vision that arises due to gradual weakening of the ciliary muscles in old age. What type of lenses are required by the persons suffering from this defect to see the objects clearly ? Akshay, sitting in the last row in his class, could not see clearly the words written on the

blackboard. When the teacher noticed it, he announced if any student sitting in the front row could volunteer to exchange his seat with Akshay. Salman immediately agreed to exchange his seat with Akshay. He could now see the words written on the blackboard clearly. The teacher thought it fit to send the message to Akshay's parents advising them to get his eyesight checked. In the context of the above event, answer the following questions :

- (a) Which defect of vision is Akshay suffering from ? Which type of lens is used to correct this defect ?
- (b) State the values displayed by the teacher and Salman.
- (c) In your opinion, in what way can Akshay express his gratitude towards the teacher and Salman ?

25. What do we observe on pouring acetic acid on red blue litmus papers ?

- (a) Red litmus remains red and blue litmus turns red.
- (b) Red litmus turns blue and blue litmus remains blue.
- (c) Red litmus turns blue and blue litmus turns red.
- (d) Red litmus becomes colourless and blue litmus remains blue.

26. While preparing soap a small quantity of common salt is generally added to the reaction mixture of vegetable oil and sodium hydroxide. Which one of the following may be the purpose of adding common salt ?

- (a) To reduce the basic nature of the soap
- (b) To make the soap neutral
- (c) To enhance the cleansing power of the soap
- (d) To favour the precipitation of the soap

27. A student takes about 4 mL of distilled water in four test tubes marked P, Q, R and S. He then dissolves in each test tube an equal amount of one salt in one test tube, in namely sodium sulphate in P, potassium sulphate in Q, calcium sulphate in R and magnesium sulphate in S. After that he adds an equal amount of soap solution in each test tube. On shaking each of these test tubes well, he observes a good amount of lather (foam) in the test tubes marked

- (a) P and Q**
- (b) Q and R**
- (c) P, Q and S**
- (d) P, R and S**

28. A student was asked to observe and identify the various parts of an embryo of a red kidney bean seed. He identified the parts and listed them as under :

I. Tegmen II. Testa III. Cotyledon IV. Radicle V. Plumule

The correctly identified parts among these are

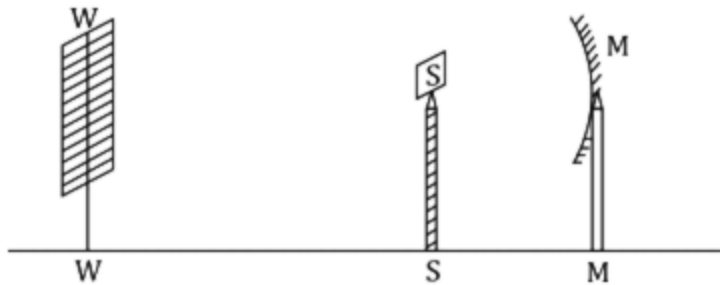
- (a) I, II and III**
- (b) II, III and IV**
- (c) III, IV and V**
- (d) I, III, IV and V**

29. Given below is the list of vegetables available in the market. Select from these the two vegetables having homologous structures :

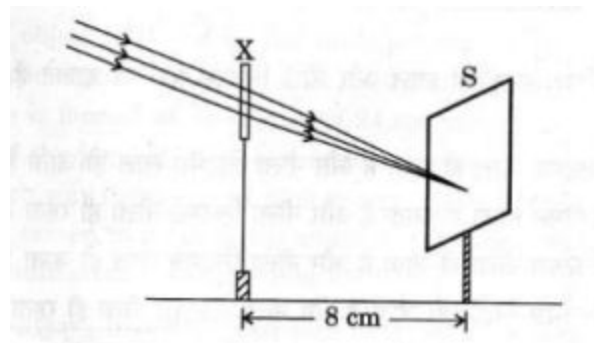
Potato, sweet potato, ginger, radish, tomato, carrot, okra (Lady's finger)

- (a) Potato and sweet potato**
- (b) Radish and carrot**
- (c) Okra and sweet potato**
- (d) Potato and tomato**

30. A student obtains a sharp image of the distant window (W) of the school laboratory on the screen (S) using the given concave mirror (M) to determine its focal length. Which of the following distance should he measure to get the focal length of the mirror ?



31. A student used a device (X) to obtain/focus the image of a well illuminated distant building on a screen (S) as shown below in the diagram. Select the correct statement about the device (X).



- (a) This device is a concave lens of focal length 8 cm.
- (b) This device is a convex mirror of focal length 8 cm.
- (c) This device is a convex lens of focal length 4 cm.
- (d) This device is a convex lens of focal length 8 cm.

32. A student traces the path of a ray of light through a rectangular glass slab for the different values of angle of incidence. He observes all possible precautions at each step of the experiment. At the end of the experiment, on analysing the measurements, which of the following conclusions is he likely to draw ?

- (a) $\angle i = \angle e < \angle r$
- (b) $\angle i < \angle e < \angle r$
- (c) $\angle i > \angle e < \angle r$
- (d) $\angle i = \angle e > \angle r$

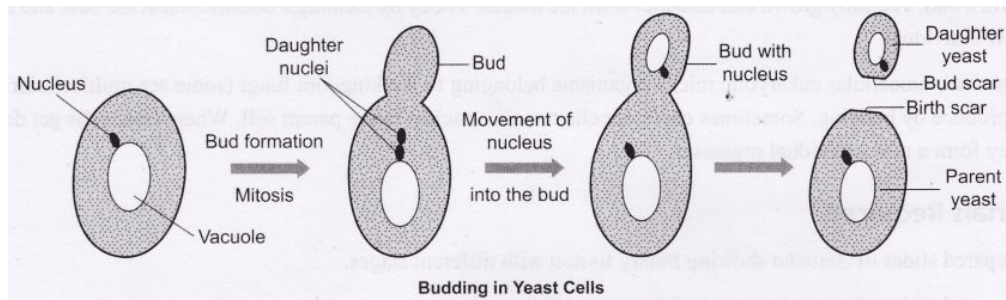
33. A student traces the path of a ray of light through a triangular glass prism for different values of angle of incidence. On analysing the ray diagrams, which one of the following conclusions is he likely to draw ?

- (a) The emergent ray is parallel to the incident ray.
- (b) The emergent ray bends at an angle to the direction of the incident ray.
- (c) The emergent ray and the refracted ray are at right angles to each other.
- (d) The emergent ray is perpendicular to the incident ray.

34. When you add sodium hydrogen carbonate to acetic acid in a test tube, a gas liberates immediately with a brisk effervescence. Name this gas. Describe the method of testing this gas.

35. Students were asked to observe the permanent slides showing different stages of budding in yeast under high power of a microscope.
(a) Which adjustment screw (coarse/fine) were you asked to move to focus the slides ?

(b) Draw three diagrams in the correct sequence showing budding in yeast.



36. A 4 cm tall object is placed on the principal axis of convex lens. The distance of the object from the optical centre of the lens is 12 cm and its sharp image is formed at a distance of 24 cm from it on a screen on the other side of the lens. If the object is now moved a little away from the lens, in which way (towards the lens or away from the lens) will he have to move the screen to get a sharp image of the object on it again ? How will the magnification of the image be affected ?

Answers

Ans 1). There are 7 covalent bond in ethane molecule.

Ans 2). The life process of an organism that helps in the growth of its population is known as Reproduction.

Ans 3). According to the 10% law of energy transfer, 1000 J will be the amount of energy available to the organisms of the 2nd trophic level of a food chain

Ans 4).

(a) Given : $n_g = 4/3$, $n_w = 3/2$, $v_g = 2 \times 10^8$ m/s

We know that, $n_g = c / v_g$
 $c = n_g v_g$

$$4/3 \times 2 \times 10^8 = 2.67 \times 10^8 \text{ m/s}$$

(b) We know $n_w = c / v_w$

$$v_w = c / n_w = 2.67 \times 2 \times 10^8 / 3$$

$$= 1.78 \times 10^8 \text{ m/s.}$$

Ans 5). The Pollution of water of River Ganga due to dumping of untreated sewage and industrial factories wastes into it.

Pollution and contamination of river water is harmful health of the people of neighboring areas because:

a. The contamination of river water leads to the Growth of disease causing Microorganisms.

b. The River water becomes more acidic due to discharge of chemical effluents by the industries or factories which make the soil acidic and affects the productivity of crops.

Ans 6). The variety of life forms found in a particular region forms its biodiversity. If biodiversity of an area is not preserved, it will result in:

1. Natural calamities such as floods, forest fires and hurricanes.
2. Sudden climatic changes and instability in the functioning of the ecosystem.
3. Loss of diversity may lead to a loss of ecological stability.

Ans 7). Carboxylic acid can be distinguished from an alcohol by performing following tests:

a. Test with NaHCO_3 Solution in water: by adding carboxylic acid to baking soda, carbon dioxide is liberated with brisk effervescence. By adding a solution of baking soda to alcohol, no brisk effervescence occurs.

b. Test with Blue litmus Solution: Carboxylic acid turns blue litmus into red. There is no change in color when a blue litmus solution is added to alcohol.

Ans 8). When ethyne is burnt in oxygen, a large quantity of heat along with light is produced. The heat evolved can be used for gas welding which is usually carried to weld small broken pieces of articles made up of iron. We cannot use air instead of oxygen because air contains less percentage of oxygen which results in incomplete combustion of ethyne and temperature required for welding is not acquired.

Ans 9).

S.no	Property	P	Q
1	The no. of electrons in the atom	3,11,19	4,12,20
2	Size of atom	Bigger	Smaller
3	Metallic character	More metallic	Less metallic
4	Tendency to lose electrons	More	Less
5	Oxide Formula	P ₂ O	QO
6	Formula of their chlorides	PCI	QCl ₂

Ans 10). An element whose atomic number is 16 has the electronic configuration: 2,8,6. It has six valence electrons so its valency is two and it is positioned in period 3 and group 16.

$$\text{Valency} = 8 - 6 = 2$$

Ans 11). Specific characteristics of sexual reproduction are:

- (i). Sexual re-production takes place by the combination of special reproductive cells called sex cells.
- (ii). In sexual reproduction, two parents are involved.
- (iii). Variations appear due to a new combination of genes during crossing over.

Ans 12). The thread like structures found in the nucleus at the time of cell division which is called Chromosomes. They are made of proteins and DNA.

In sexually reproducing organisms the Gametes elapse meiosis therefore each Gamete contains only half a set of Chromosomes. When two Gametes combined the Zygote formed contains the full set of Chromosomes. Hence the formation of Gametes by meiosis helps to maintain the number of Chromosomes in the progeny.

Ans 13). Significance of reproductive health in a society:

- (i). Unwanted and teen pregnancies can be avoided.
- (ii). It helps to prevent STD's
- (iii). Better sex education and awareness helps to maintain the population and prevent population explosion.
- (iv). Individuals with sound reproductive health produce better offspring which have better chance of survival.

The areas which are related to the reproductive health which have improved over the past 50 years in our country:

- 1). There is a decrease in STD cases.
- 2). Family planning

Ans 14). (a) **Homologous organs:** Organs which have the same basic structure but different functions are Called homologous organs. Ex: the forelimbs of a man, lizard

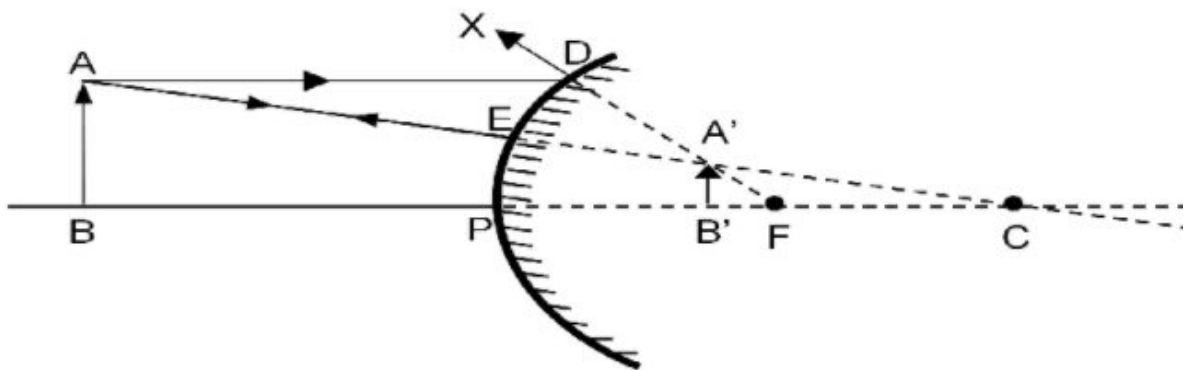
(b) **Analogous organs:** Organs which have different basic structure but similar appearance and perform similar functions are called analogous organs. Ex: The wings of an insect and a bird

(c) **Fossils:** The remains of dead animals or plants which lived in the remote past are called fossils. Ex: a fossil bird called Archaeopteryx looks like a bird, but it has many other features which are found in reptilian

Ans 15). (a) Speciation : Speciation is an evolutionary process of the formation of new and distinct species. The species evolve by genetic modification.

(b) Natural Selection: Natural selection is the process whereby organisms better adapted to their environment tend to survive and produce more offspring, whereas other less favourable traits tend to become eliminated.

Ans 16). A convex mirror produces an erect and diminished image of the object placed in front of it. So, the given mirror is convex mirror.



Formation of image: Virtual, erect and diminished image will be formed behind the mirror between the pole (P) and focus (F) of the mirror.

Uses of convex mirror : 1). Used as rear-view mirrors in vehicles.
2). Used in shops, security mirrors in malls and airports because it forms an erect and diminished image due to which gives a larger field of view.

Ans 17). - Scattering of light - As the white light from the Sun travels through the Earth's atmosphere, it collides with particles of air. The different colour, or wavelengths, of light are scattered by these collisions by different amounts.

The clear sky appears blue or the sun appears reddish at sunrise as blue light (shorter wavelength) is scattered more than red light (longer wavelength). So, when the Sun is high in the sky, blue light is scattered in all directions as sunlight passes through the atmosphere and we see the sky as blue.

Ans 18) .

Biodegradable Waste	Non- Biodegradable Waste
1) The substances which can be easily degraded by the decomposers into substances that go into soil and are harmless to the environment.	1) The substances which cannot be degraded by the decomposers and thus remain in the environment causing pollution.
2) They are natural wastes.	2) They are non - natural wastes.
Ex: Vegetable peels, animal excreta	Ex: plastic, polythene

The changes which people must adopt to dispose non-biodegradable wastes for saving the environment are as follows:

1. Household waste, chemical waste and hospital waste should be disposed of by dumping them in the low-lying areas of the ground called a landfill.
2. Broken plastic articles such as buckets, bowls, cups, plates etc. should be sent to plastic processing factories.

Ans 19). Soap molecules are sodium or potassium salts of long-chain carboxylic acids whereas detergent molecules are ammonium or sulphonate salts of long-chain carboxylic acids.

Cleansing action of soaps: The dirt present on clothes is organic in nature and is insoluble in water. Therefore, it cannot be removed by only washing with water. When soap is dissolved in water, its hydrophobic ends attach themselves to the dirt and remove it from the cloth. Then, the molecules of soap arrange themselves in micelle formation and trap the dirt at the centre of the cluster. These micelles remain suspended in the water and, thus, the dust particles are easily rinsed away by water. Soaps do not form lather in hard water because soap molecules react with calcium and magnesium ions present in hard water to form insoluble substance, called scum which remains after washing in water.

Problems that arise due to the use of detergents instead of soaps are as follows:

1. Being non-biodegradable in nature they get accumulated in the environment and cause soil and water pollution.
2. Their entry into the food chain leads to bio-accumulation in living beings and causes several health issues.

Ans 20). (a) Testis produces sperms and male hormone testosterone. Testosterone helps in formation of sperms and development of secondary sexual characters.

- (b) (i). Fertilization takes place in the oviduct or fallopian tubes.
(ii). Implantation of the fertilized egg occurs in the uterus.

Embryo in the mother is attached by a disc like tissue called placenta. It provides large surface area for glucose and oxygen to pass from the mother's blood to the foetus.

Ans 21). (a) When Mendel cross pollinated pure tall pea plants with pure dwarf pea plants, only tall plants were obtained in F1 generation in 3:1 ratio. Thus the appearance of tall characters in both F1 and F2 shows that it is a dominant character. The absence of dwarf in F1 generation reappears in F2 shows dwarfness in the recessive character.

(b) When Mendel conducted a dihybrid cross having two sets of characters, he obtained only one set of parental characters in F1 generation whereas in F2 generation he obtained both the set of parental characters as 9:3:3:1 ratio. Thus appearance of new generation or recombinants in the F2 generation along with parental type shows that traits are inherited independently.

Ans 22). The power of a lens is defined as the reciprocal of its focal length. It is denoted by the P. The power P of a lens of focal length f is given as:

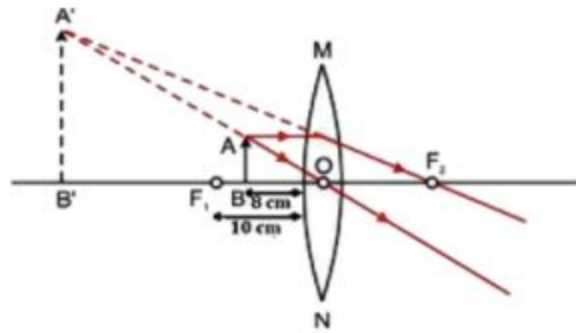
$$P = 1/f$$

Focal length of lens A, $f_A = +10 \text{ cm} = +0.1 \text{ m}$

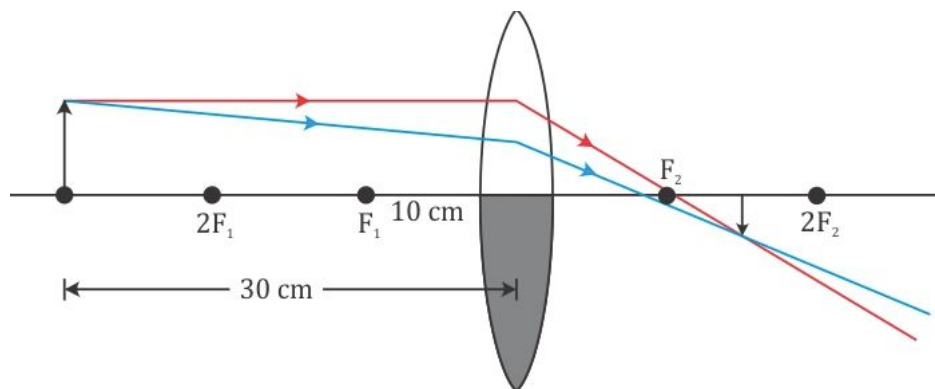
Focal length of lens B, $f_B = -10 \text{ cm} = -0.1 \text{ m}$

Since the focal length is negative,
it is a concave lens. $P_B = 1/f_B = 1/-0.1 = -10\text{D}$

In a convex lens, when the object is placed between the pole and focus, the image formed will be always virtual and magnified. Whereas, a concave lens produces virtual, erect but diminished images.



Ans 23). The convex lens will produce the complete image of the object even though half of the lens is covered. This is because the other half of the lens can refract the light coming from the object. But, the intensity of the light will be reduced.



Given : $h_1 = 4 \text{ cm}$, $f = + 20 \text{ cm}$, $u = -15 \text{ cm}$

We know that,

$$\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$$

$$\frac{1}{v} = \frac{1}{f} + \frac{1}{u} = \frac{1}{20} - \frac{1}{15} = -\frac{1}{60}$$

So, Image distance, $v = - 60 \text{ cm}$ (since $1/v = -1/60$) . Image will be virtual and erect.

Magnification : $m = \frac{h_2}{h_1} = \frac{v}{u}$

$$h_2 = \frac{v}{u} \times h_1 = \frac{-60}{-15} \times 4 = +16 \text{ cm}.$$

So, The size of the image is 16 cm.

Ans 24). - Ciliary muscles adjust the shape of the eye lens in order to focus the light properly for the objects at different distances. Presbyopia is the defect that arises due to gradual weakening of ciliary muscles in old age. It is corrected by using convex lenses.

(a) Akshay is not able to see from a far distance, that's why he is suffering from myopia or nearsightedness. A concave lens must be used to correct this defect.

(b) Salman is a helpful classmate of Akshay and the teacher is caring and concerned about the studies of Akshay.

(c) Akshay can express his gratitude towards the teacher and Salman in front of the entire class.

25. What do we observe on pouring acetic acid on red blue litmus papers ? (a) Red litmus remains red and blue litmus turns red.

(b) Red litmus turns blue and blue litmus remains blue.

(c) Red litmus turns blue and blue litmus turns red.

(d) Red litmus becomes colourless and blue litmus remains blue.

Ans - (a) Red litmus remains red and blue litmus turns red.

Reason: Acids turn blue litmus paper red. They have no effect on red litmus paper.

26. While preparing soap a small quantity of common salt is generally added to the reaction mixture of vegetable oil and sodium hydroxide.

Which one of the following may be the purpose of adding common salt ?

(a) To reduce the basic nature of the soap

(b) To make the soap neutral

(c) To enhance the cleansing power of the soap

(d) To favour the precipitation of the soap

Ans - (d) To favour the precipitation of the soap.

Reason: In the process of saponification, the soap formed remains in a suspended form in the mixture. By adding common salt to the suspension it is precipitated as a solid from the suspension.

27. A student takes about 4 mL of distilled water in four test tubes marked P, Q, R and S. He then dissolves in each test tube an equal amount of one salt in one test tube, in namely sodium sulphate in P, potassium sulphate in Q, calcium sulphate in R and magnesium sulphate in S. After that he adds an equal amount of soap solution in each test tube. On shaking each of these test tubes well, he observes a good amount of lather (foam) in the test tubes marked

- (a) P and Q**
- (b) Q and R**
- (c) P, Q and S**
- (d) P, R and S**

Ans- (a) P and Q

28. A student was asked to observe and identify the various parts of an embryo of a red kidney bean seed. He identified the parts and listed them as under :

I. Tegmen II. Testa III. Cotyledon IV. Radicle V. Plumule

The correctly identified parts among these are

- (a) I, II and III**
- (b) II, III and IV**
- (c) III, IV and V**
- (d) I, III, IV and V**

Ans - (d) III, IV and V

29. Given below is the list of vegetables available in the market. Select from these the two vegetables having homologous structures :

Potato, sweet potato, ginger, radish, tomato, carrot, okra (Lady's finger)

(a) Potato and sweet potato

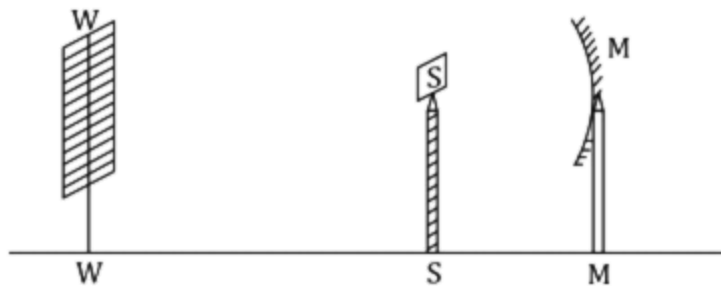
(b) Radish and carrot

(c) Okra and sweet potato

(d) Potato and tomato

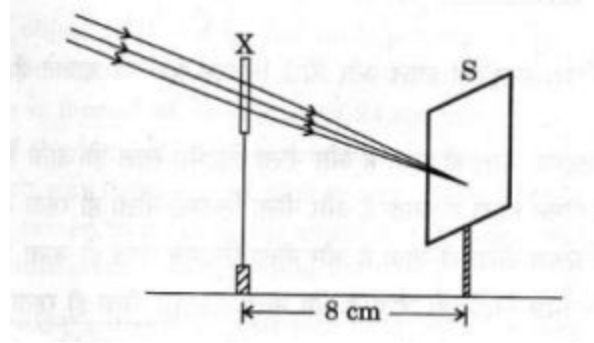
Ans - (b) Radish and carrot

30. A student obtains a sharp image of the distant window (W) of the school laboratory on the screen (S) using the given concave mirror (M) to determine its focal length. Which of the following distance should he measure to get the focal length of the mirror ?



Ans - (b) MS

31. A student used a device (X) to obtain/focus the image of a well illuminated distant building on a screen (S) as shown below in the diagram. Select the correct statement about the device (X).



- (a) This device is a concave lens of focal length 8 cm.
- (b) This device is a convex mirror of focal length 8 cm.
- (c) This device is a convex lens of focal length 4 cm.
- (d) This device is a convex lens of focal length 8 cm.

Ans- (d) This device is a convex lens of focal length 8 cm.

32. A student traces the path of a ray of light through a rectangular glass slab for the different values of angle of incidence. He observes all possible precautions at each step of the experiment. At the end of the experiment, on analysing the measurements, which of the following conclusions is he likely to draw ?

- (a) $\angle i = \angle e < \angle r$
- (b) $\angle i < \angle e < \angle r$
- (c) $\angle i > \angle e < \angle r$
- (d) $\angle i = \angle e > \angle r$

Ans - (d) $\angle i = \angle e > \angle r$

33. A student traces the path of a ray of light through a triangular glass prism for different values of angle of incidence. On analysing the ray diagrams, which one of the following conclusions is he likely to draw ?

- (a) The emergent ray is parallel to the incident ray.
- (b) The emergent ray bends at an angle to the direction of the incident ray.
- (c) The emergent ray and the refracted ray are at right angles to each other.

(d) The emergent ray is perpendicular to the incident ray.

Ans - (b) The emergent ray bends at an angle to the direction of the incident ray.

34. When you add sodium hydrogen carbonate to acetic acid in a test tube, a gas liberates immediately with a brisk effervescence. Name this gas. Describe the method of testing this gas.

Ans - Carbon dioxide, turns lime water milky

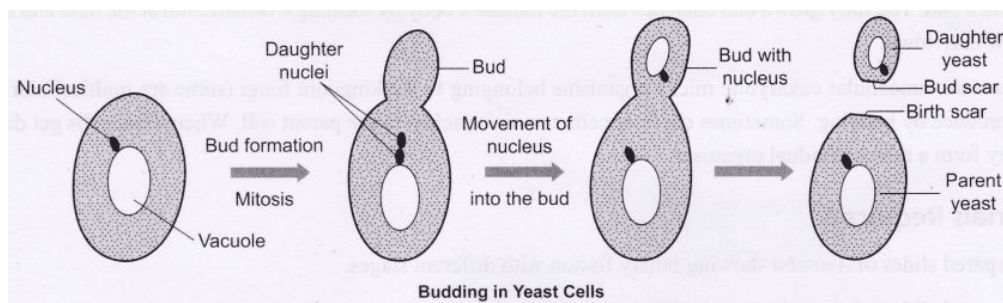
35. Students were asked to observe the permanent slides showing different stages of budding in yeast under high power of a microscope.

(a) Which adjustment screw (coarse/fine) were you asked to move to focus the slides ?

(b) Draw three diagrams in the correct sequence showing budding in yeast.

Ans - (a) Fine

(b)



36. A 4 cm tall object is placed on the principal axis of convex lens. The distance of the object from the optical centre of the lens is 12 cm and its sharp image is formed at a distance of 24 cm from it on a screen on the other side of the lens. If the object is now moved a little away from the lens, in which way (towards the lens or away from the lens) will he have to move the screen to get a sharp image of the object on it again ? How will the magnification of the image be affected ?

Ans - Given that Object distance, $u = -12$ cm Image distance, $v = 24$ cm

$$1/f = 1/v - 1/u$$

$$1/f = 1/24 - 1 / (-12)$$

$$1/f = 1/8$$

Therefore, $f=8$ cm The focal length of the lens is 8 cm. When we move the object away from the lens, the object distance is increased and the screen has to be moved towards the lens.

Magnification is given as $m=v/u$ Because the image distance (v) decreases, the value of magnification also decreases.

CBSE Science 2014

Question Paper (as it is) -

General Instructions:

1) All questions are compulsory.

The question paper consists of 42 questions divided into 4 sections A, B, C and D.

2) Section A comprises questions of 01 mark each, Section B comprises questions of 02 marks each, Section C comprises questions of 03 marks each and Section D comprises questions of 05 marks each.

3) All questions in Section A are to be answered in one word, one sentence or as per the exact requirement of the question.

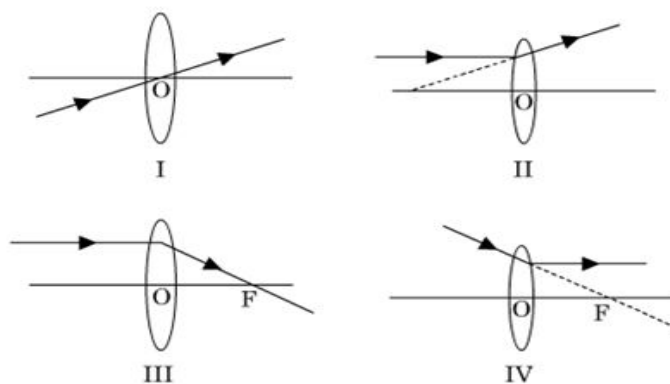
4) There is no overall choice. However, internal choice has been provided wherever necessary. You have to attempt only one of the alternatives in all such questions.

5) In question on construction, drawing should be neat and exactly as per the given measurements.

6) Use of calculators is not permitted.

SECTION A

1. Write the number of horizontal rows in the modern periodic table. What are these rows called?
2. Name the information source for making proteins in the cells.
3. List two measures that you would suggest for the better management of water resources.
4. A student has obtained an image of a distant object on a screen to determine the focal length F_1 of the given lens. His teacher, after checking the image, gave him another lens of focal length F_2 and asked him to focus the same object on the same screen. The student found that to obtain a sharp image, he has to move the lens away from the screen. From this finding, we may conclude that both the lenses given to the student were :Options:
 1. Concave and $F_1 < F_2$
 2. Convex and $F_1 < F_2$
 3. Convex and $F_1 > F_2$
 4. Concave and $F_1 > F_2$
5. A student has obtained the image of a distant object with a concave mirror to determine its focal length. If he has selected a well-illuminated red building as object, which of the following correctly describes the features of the image formed?Options:
 1. Virtual, inverted and diminished image in red shade
 2. Real, erect and diminished image in pink shade
 3. Real, inverted and diminished image in red shade
 4. Virtual, erect and enlarged image in red shade
6. A student has obtained a magnified image of a flame on a screen using a convex lens. To draw the corresponding ray diagram to show the image formation, which of the following two rays whose paths after refraction are shown, should he select ?



- Options:
1. I and II

2. II and III
3. III and IV
4. I and III

7. A student was asked by his teacher to find the image distance for various object distance in case of a given convex lens. He performed the experiment with all precautions and noted down his observations in the following table:

S. No.	Object distance (cm)
1.	60
2.	48
3.	36
4.	24
5.	18
6.	16

After checking the observations table the teacher pointed out that there is a mistake in recording the image distance in one of the observations. Find the serial number of the observations having faulty image distance. Options:

1. 2
2. 3
3. 5
4. 6

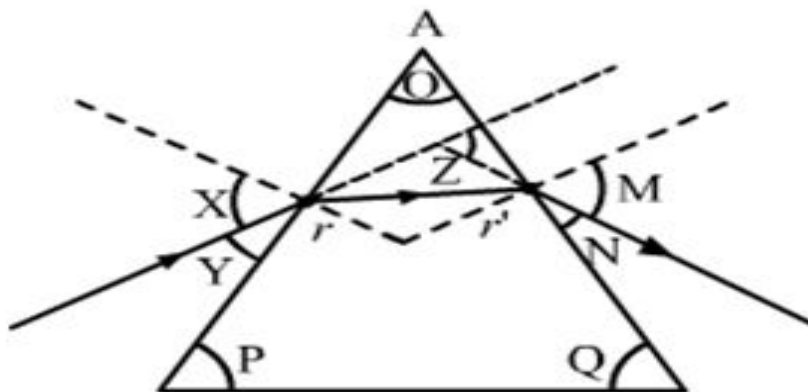
8. A student is observing a diagram showing the path of a ray of light passing through a glass prism. He would find that for all angles of incidence the ray of light bends:

Options:

1. Towards the normal while entering the prism and away from the normal while emerging from the prism
2. away from the normal while entering the prism and towards the normal while emerging from the prism

3. Away from the normal while entering as well as while emerging from the prism
4. Towards the normal while entering as well as while emerging from the prism

9. The path of a ray of light passing through a glass prism is shown below:



In this diagram, the angle of prism, angle of incidence, angle of emergence and angle of deviation, respectively, have been represented by:

Options:

1. O, Y, Z and N,
2. P, Y, M and Z,
3. O, X, M and Z,
4. P, X, Z and N.

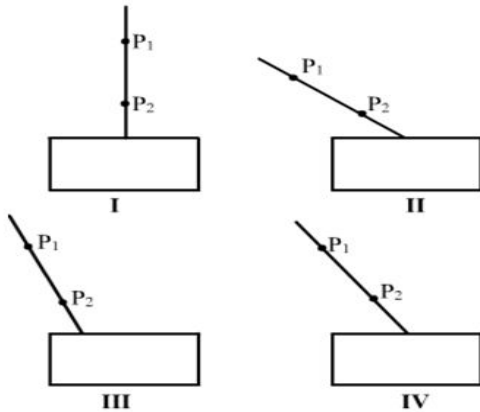
10. On the basis of the experiment, "To trace the path of a ray of light through a rectangular glass slab", students of a class arrived at which one of the following conclusions?

Options:

1. Angle of incidence is greater than the angle of emergence.
2. Angle of emergence is smaller than the angle of refraction.
3. Emergent ray is parallel to the refracted ray.
4. Incident ray and emergent ray are parallel to each other.

11. Study the following four experimental set-ups I, II, III and IV for the experiment, "To trace the path of a ray of light through a rectangular glass slab."

Which of the marked set-ups is likely to give best results (P1 and P2 are the positions of pins fixed on the incident ray)?



Options:

1. I
2. II
3. III
4. IV

12. Four students P, Q, R and S differently reported the following set of organs to be analogous :

P. Forelimb of a frog and forelimb of a lizard

Q. Forelimb of a bird and forelimb of a human

R. Wings of a parrot and wings of a butterfly

S. Wings of a bird and wings of a bat

The two students who have reported correctly are:

Options:

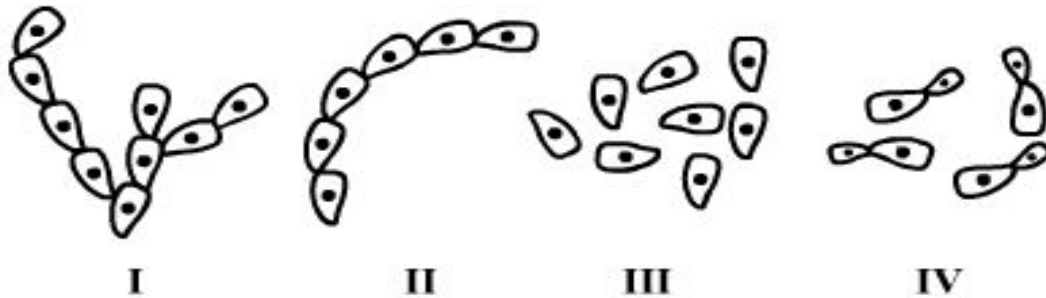
1. P and Q
2. Q and R
3. R and S
4. P and S

13. Which one of the following pairs of vegetables is an example of homologous structures?

Options:

1. Potato and sweet potato
2. Carrot and radish
3. Carrot and tomato
4. Tomato and radish

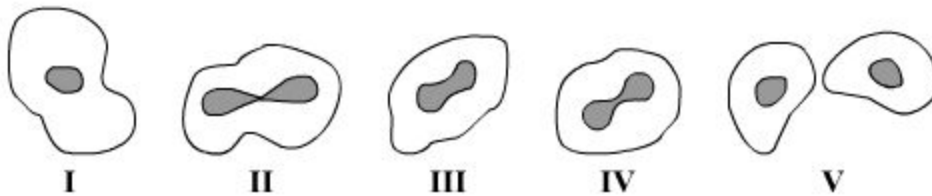
14. Identify the figures showing the process of budding in yeast.



Options:

1. I, II and III
2. II, III and IV
3. I, II and IV
4. III, IV and I

15. Study the following diagrams showing various stages of binary fission in Amoeba:



The correct sequence of these diagrams should be:

Options:

1. I, IV, III, II, V
2. I, III, IV, II, V
3. I, II, IV, III, V
4. I, II, III, IV, V

16. A student adds a few drops of ethanoic acid to test tubes X, Y and Z containing aqueous solutions of sodium chloride, sodium hydroxide and sodium carbonate, respectively. If he now brings a burning splinter near the mouth of the test tubes immediately after adding ethanoic acid in each one of them, in which of the test tube or test tubes the flame will be extinguished?

Options:

1. X and Y
2. Y and Z
3. X and Z
4. only Z

17. When you add about 2 ml of acetic acid to a test tube containing an equal amount of distilled water and leave the test tube to settle after shaking its contents, what will you observe in the test tube after about 5 minutes?

Options:

1. A white precipitate settling at its bottom
2. A clear colourless solution
3. A layer of water over the layer of acetic acid
4. A layer of acetic acid over the layer of water

18. In order to study saponification reaction, we first prepare 20% solution of sodium hydroxide. If we record the temperature of this solution just after adding sodium hydroxide flakes to water and also test its nature using litmus, it may be concluded that the process of making this solution is

Options:

1. Exothermic and the solution is alkaline
2. Endothermic and the solution is alkaline
3. Endothermic and the solution is acidic
4. Exothermic and the solution is acidic

19. While studying saponification reaction for the preparation of soap, a teacher suggested to a student to add a small quantity of common salt to the reaction mixture. The function of common salt in this reaction is to

Options:

1. Reduce the alkalinity of the soap
2. Reduce the acidity of the soap
3. Enhance the cleansing capacity of soap
4. Favour precipitation of soap

20. A student takes about 6 ml of distilled water in each of the four test tubes P, Q, R and S. He then dissolves an equal amount of four different salts namely, sodium chloride in 'P', potassium chloride in 'Q', calcium chloride in 'R' and magnesium chloride in 'S'. Next, he then adds 10 drops of soap solution to each test tube and shakes its contents. The test tubes in which scum (insoluble substance) is formed with soap are:

Options:

1. P and Q
2. Q and R
3. R and S
4. R and S

21. You are asked by your teacher to study the different parts of an embryo of a gram seed. Given below are the steps to be followed for the experiment:

I. Soak the gram seeds in plain water and keep them overnight.

II. Cut open a soaked seed and observe its different parts.

III. Take some dry gram seeds in a petri dish.

IV. Drain the excess water.

V. Cover the soaked seeds with a wet cotton cloth and leave them for a day.

The correct sequence of these steps is :

Options:

1. III, I, V, IV, II
2. III, I, II, IV, V
3. III, IV, V, I, II
4. III, I, IV, V, II

SECTION B

22. List four modes of asexual reproduction.

23. Draw a ray diagram to show the path of the reflected ray corresponding to an incident ray which is directed parallel to the principal axis of a convex mirror. Mark the angle of incidence and the angle of reflection on it.
24. In some states of our country there is a ban on the use of polythene bags for shopping. Why? List three advantages of using jute or cloth bags over polythene bags.
25. List three problems which arise due to construction of big dams. Suggest a solution of these problems.

SECTION C

26. "Our food grains such as wheat and rice, the vegetables and fruits and even meat are found to contain varying amounts of pesticide residues." State the reason to explain how and why it happens?
27. List any four methods of contraception used by humans. How does their use have a direct effect on the health and prosperity of a family?
28. (a) Write the names of those parts of a flower which serve the same function as the following do in the animals :
 - (i) testis,
 - (ii) sperm,
 - (iii) ovary,
 - (iv) egg
- (b) State the function of flowers in the flowering plants.
29. (a) Give the evidence that the birds have evolved from reptiles.
 - (b) Insects, octopus, planaria and vertebrates possess eyes. Can we group these animals together on the basis of eyes that they possess? Justify your answer giving reason.
30. (a) Mendel crossed tall pea plants with dwarf pea plants in his experiment. Write his observations giving reason on the F_1 and F_2 generations.
 - (b) List any two contrasting characters other than height that Mendel used in his experiments in pea plants.
31. State the laws of refraction of light. If the speed of light in vacuum is $3 \times 10^8 \text{ ms}^{-1}$, find the speed of light in a medium of absolute refractive index 1.5.

32. A spherical mirror produces an image of magnification -1 on a screen placed at a distance of 40 cm from the mirror:

(i) Write the type of mirror.

(ii) What is the nature of the image formed?

(iii) How far is the object located from the mirror?

(iv) Draw the ray diagram to show the image formation in this case.

33. Why does the sun seem to rise two minutes before the actual sunrise and set two minutes after the actual sunset ? Explain with the help of labelled diagram.

34. Write the name and general formula of a chain of hydrocarbons in which an addition reaction with hydrogen can take place. Stating the essential conditions required for an addition reaction to occur, write the chemical equation giving the name of the reactant and the product of such a reaction

35. State the meaning of the functional group in an organic compound. Write the formula of the functional group present in alcohols, aldehydes, ketones and carboxylic acids.

36. (a) Define the following terms :

(i) Valency (ii) Atomic size

(b) How do the valency and the atomic size of the elements vary while going from left to right along a period in the modern periodic table?

37. Consider two elements 'A' (Atomic number 17) and 'B' (Atomic number 19) :

(i) Write the positions of these elements in the modern periodic table giving justification.

(ii) Write the formula of the compound formed when 'A' combines with 'B.'

(iii) Draw the electron dot structure of the compound and state the nature of the bond formed between the two elements.

SECTION D

38. State the reason why carbon can neither form C^{4+} cations nor C^{4-} anions but forms covalent compound. Also state the reason to explain why covalent compounds:

- (i) are bad conductors of electricity.
- (ii) have low melting and boiling points.

39. (a) Name the respective part of human female reproductive system:

- (i) that produces eggs,
- (ii) where fusion of eggs and sperm takes place, and
- (iii) where zygote gets implanted.

(b) Describe in brief what happens to the zygote after it gets implanted.

40 (a) Give one example each of a unisexual and a bisexual flower.

(b) Mention the changes a flower undergoes after fertilisation.

(c) How does the amount of DNA remain constant though each new generation is a combination of DNA copies of two individuals?

41. (a) List three common refractive defects of vision. Suggest the way of correcting these defects.

(b) About 45 lac people in the developing countries are suffering from corneal blindness. About 30 lac children below the age of 12 years suffering from this defect can be cured by replacing the defective cornea with the cornea of a donated eye. How and why can students of your age involve themselves to create awareness about this fact among people?

42. A student wants to project the image of a candle flame on the walls of the school laboratory by using a mirror.

(a) Which type of mirror should he use and why?

(b) At what distance, in terms of focal length 'f' of the mirror, should he place the candle flame to get the magnified image on the wall?

(c) Draw a ray diagram to show the formation of the image in this case.

(d) Can he use this mirror to project a diminished image of the candle flame on the same wall? State 'how' if your answer is 'yes' and 'why not' if your answer is 'no.'

CBSE Science 2014

Solutions -

A1. The modern periodic table consists of 7 horizontal rows called periods.

A2. Cellular DNA.

A3. Using rainwater harvesting methods and constructing dams can help in better management of water resources

A4. Answer is B. A real image is formed only by a convex lens. In distant object method, the image distance gives the focal length of the lens. Image distance is the distance between the image (screen) and the lens. As the image distance is more in the second case, the focal length of the second lens is more than that of the first lens. So $F_2 > F_1$.

A5. The object is taken at infinity and hence the image will be real, inverted and diminished image in red shade.

A6. I and III are correct as the rays are converging as in the case of a convex lens while II and IV is incorrect as the rays are diverging.

A7. Focal length that is calculated is 12cm and only in observation number 3 it is 13.26 cm.

A8. Answer: A.

Glass is denser than air. So when the ray of light enters the glass prism it bends towards the normal, and when the light ray emerges from the prism it bends away from the normal.

A9.

O -> angle of prism.

X -> Angle of incidence. It is the angle made by the incident ray with the normal to the surface of the prism.

M -> Angle of emergence. It is the angle made by the emerging ray with the normal to the surface of the prism.

Z -> Angle of deviation. It is the angle made by the emerging ray with the incident ray.

A10. Answer is D

A11. Answer is 2 - II

A12.

Analogous organs are organs that are similar in functions but different in origin. Here R and S represent analogous organs while P and Q do not belong to this category.

A13.

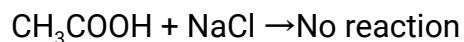
They are similar in origin but differ in their functions. Homologous organs are those organs which have same basic structure and origin but perform different functions.

A14. The nucleus present in the cell gets divided and they move towards a protrusion that is formed within the cell to form a bud. This grows into a new cell and might even undergo further budding while being attached to the parent cell. This is called a budding process and it results in the formation of chain of buds.

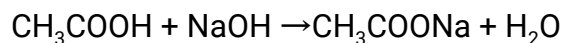
A15. In binary fission, the nucleus elongates first and divides itself. Then the cell membrane divides to form two independent cells with daughter nuclei which are identical to parent cell.

A16. Let us look at the reaction in the three test tubes and how the third test tube carbon dioxide is formed which extinguishes the flame.

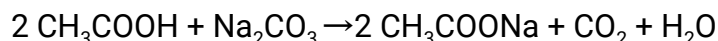
Test tube X:



Test tube Y:



Test tube Z:



A17. Acetic acid is completely miscible in water and hence it forms a clear solution.

A18. The mixing of sodium hydroxide pellets is an exothermic reaction .Because heat is produced when sodium hydroxide is dissolved in water. This will form an alkaline solution as sodium hydroxide is a base and its solution in water will be alkaline when tested with litmus paper turns red litmus to blue.

A18. Common salt helps in precipitation of soap because common salt reduces the solubility of a soap.

A19. When soap reacts with calcium and magnesium salts in water it forms an insoluble precipitate called scum. The test tubes R and S contains these salts and hence scum will be formed in these two test tubes.

A20. Answer is 3

A.21 Correct answer is

A22. Budding, Binary fission, Regeneration and Fragmentation are 4 modes of asexual reproduction.

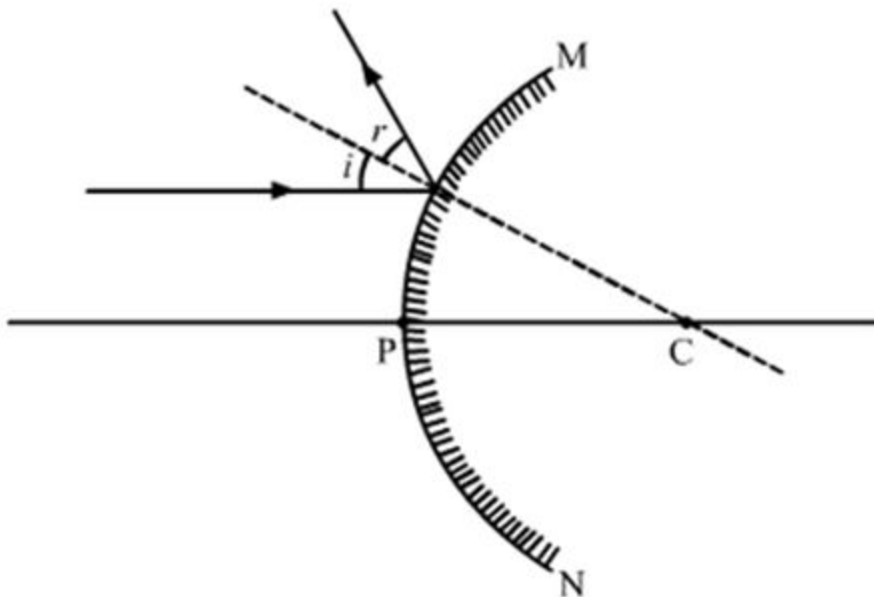
1. Budding - It involves the formation of a special structure called as bud which by detachment from the parent can grow into new individual. e.g. Hydra.

2. Binary fission - It involves the division of one cell into two cells. e.g. Amoeba.

3. Regeneration - It involves the development of complete individual from the cut pieces of the parent. e.g. Planaria.

4. Fragmentation - It involves the development of new individual from one small fragment of the body. e.g. Fungi

A23.



A24. Polythene bags are considered harmful to the environment as they do not degrade easily thereby getting accumulated in the soil. Biodegradation happens by the action of microorganisms but polythene bags are non-biodegradable substances. On burning they release toxic gases which pollute the environment.

Paper bags, jute bags and cloth bags can be used instead of polythene bags.

Ban on usage of polythene increases the usage of alternative bags such as cloth and jute bags. Using them will improve the environment as:-

- 1.They are bio-degradable and will degrade naturally.
- 2.As they are bio-degradable, they do not pollute the environment.
- 3.Jute and cloth bags can be recycled easily.
- 4.They last much longer and they are stronger.

A25. There are mainly three types of problems that arise due to construction of a big dam. They are Social problems, Environmental problems and Economic problems.

Social problems - People lose their habitat to live in. People lose their livelihood.

Environmental problems - Destruction of forests an excess loss of wildlife. Enormous damage is caused to aquatic life.

Economic problems - Lot amount of investment is made readily, which fetches economic gains after a long time.

The above problems can be overcome by relocating the people who lose their habitat, providing employment for them and afforestation.

A26. Chemical pesticides sprayed over crop get settled on the food they produce and enter the food chain.

Pesticides enter the body of animals (primary consumers) and human beings who consume the affected food.

Pesticides enter higher animals and human beings when they consume primary consumers.

Pesticides are absorbed by aquatic organisms when the affected soil is washed away into water resources.

On consumption of aquatic food also leads to accumulation of these chemical pesticides in higher organisms.

Larger amount of pesticides are accumulated in higher organisms leading to biomagnification.

To summarise, we can say that plant products have less amount of pesticide residues than primary consumers which in turn possess less amount of pesticides than secondary consumers.

A27. Natural method, Oral contraceptives, Barrier method, Implants and surgical methods are four methods of contraception used by humans.

(a) Natural method - Sexual act is avoided during the period of 10 - 17 days of the menstrual cycle to avoid sure fertilisation of the egg by sperm.

(b) Oral contraceptives - Fertilisation is prevented by preventing the release of eggs. This is achieved by using oral drugs or tablets.

(c) Barrier method - Fertilisation is prevented by using barriers to avoid contact between the penis of males and vagina of females. Condoms act as barriers to prevent fertilisation.

(d) Implants and surgical methods - Contraceptive devices like copper-T and loop placed in the uterus can prevent fertilisation. Surgical methods like vasectomy and tubectomy also prevent fertilisation.

Effects of contraceptives can be both advantageous and disadvantageous.

1. Prevention of frequent pregnancies by contraceptives helps in maintaining health of females in the society.

2. Over usage of contraceptives may lead to permanent sterility.

3. Usage of contraceptives helps in limiting the number of children in a family which in turn helps in economic development of the family.

4. Contraceptives help in reducing the chances of transmitting sexually transmitted diseases.

A28.

Reproductive organs in animals

Testis

Sperm

Ovary

Egg

Anther - Male reproductive part which producing pollen grains.

Pollen grains - Male gamete which fertilises the egg nucleus.

Ovary - Female reproductive part which encloses the ovules.

Egg - Female gamete present inside the ovary.

(b) Flowers in plants serve as main reproductive structures. Flowers bear the reproductive parts of the plant. The different parts of the flower transform themselves into fruit and seeds after fertilisation process.

A29. (a) Fossils serve as tools for tracing evolutionary relationships.

Archaeopteryx is a fossil bird which is thought to have existed around 150 million years ago forms a connecting link between reptiles and birds. It possesses both reptilian characters which include long and bony tail, strong jaws with teeth and bird like wings with feathers.

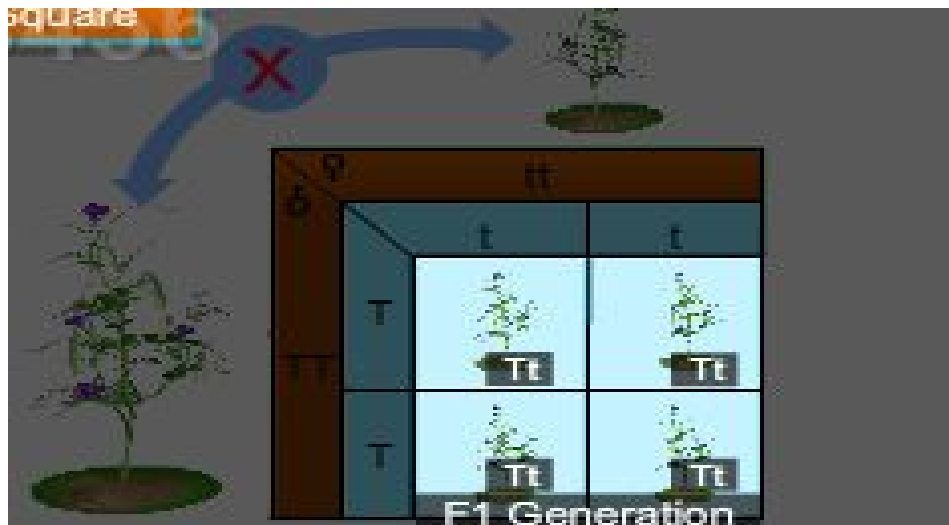
The phenomenon of adaptation can be explained by the fact that birds evolved from reptiles.

Dinosaurs were reptiles and some of them had feathers which were not used for flight but used them to withstand cold. Post evolution, these feathers were used by birds for flight.

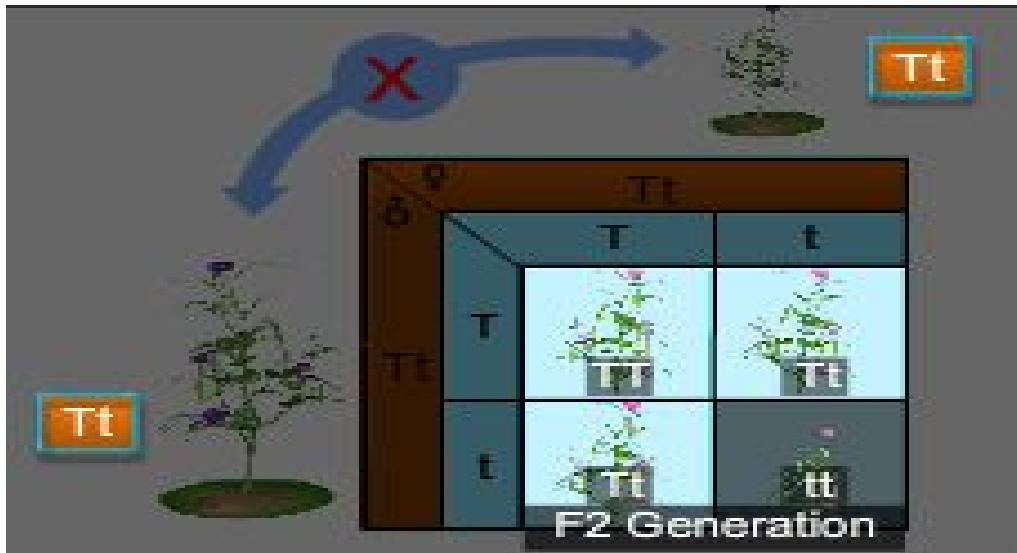
(b) Though insects, octopus, planaria and vertebrates possess eye as characteristic feature they cannot be placed in the same group. These serve an example of biological convergence. The similarities in structure, despite of different origins. Hence, invertebrates (insects, octopus and planaria) cannot be placed along with vertebrates.

A30. (a) In this condition, tall pea plant is crossed with dwarf pea plant.

In monohybrid cross, the F_1 generation were all tall plants. F_2 had tall plants and dwarf plants.



When the plants in the F_1 generation were crossed again, there were short plants in the F_2 generation in the ratio 3:1. The genes consisting of hereditary information were being passed on from one generation to the other.



There were no dwarf plants in the F₁ generation while there were dwarf plants in the F₂ generation.

(b) Mendel actually selected seven characters in pea plant to conduct his experiments.

Other than height two other characters are represented.

Character in a pea plant

Dominant character

Shape of the seed

Round (R)

Colour of cotyledons

Yellow (Y)

A31. Laws of refraction:

First law of refraction:

The first law of refraction or Snell's law states that the ratio of the sine of the angle of incidence to the sine of the angle of refraction is constant.

$$\sin i / \sin r = n_{12}$$

Where, n_{12} is the relative refractive index of medium 1 with medium 2.

Second law of refraction:

The incident ray, the refracted ray and the normal to the interface of two media at the point of incidence lie on the same plane.

If a light ray passes from medium 1 to medium 2, then the refractive index of medium 1 with respect to medium 2 is expressed as:

$$\text{Speed of the light in medium 2} / \text{Speed of the light in medium 1} = v_2/v_1$$

Where v_2 and v_1 are speed of light in medium 2 and 1 respectively.

Speed of light in medium with refractive index 1.5 can be calculated as follows.

$$\text{Speed of light in vacuum} = 3 \times 10^8 \text{ m/s}$$

$$n = \text{Speed of the light in vacuum} / \text{Speed of the light in medium} = 1.5 \Rightarrow 1.5 = 3 \times 10^8 \text{ m/s} / \text{Speed of the light in medium}$$

$$\text{Speed of the light in medium} = 3 \times 10^8 \text{ m/s} / 1.5$$

Speed of light in a medium that has refractive index of 1.5 is equal to 2×10^8 m/s

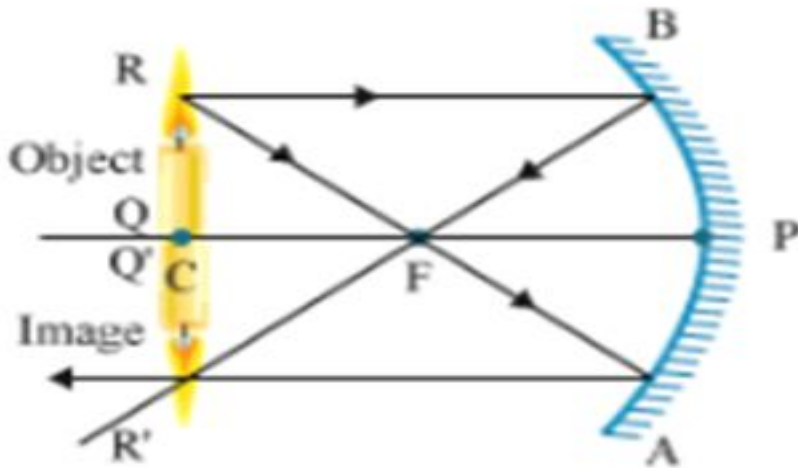
Where is the relative refractive index of medium 1 with medium 2.

A32. (i) Concave

(ii) Real, inverted and of the same size as the object

(iii) Here the object distance = image distance as the object is placed on the center of curvature. Therefore the object is placed at 40 cm from the mirror.

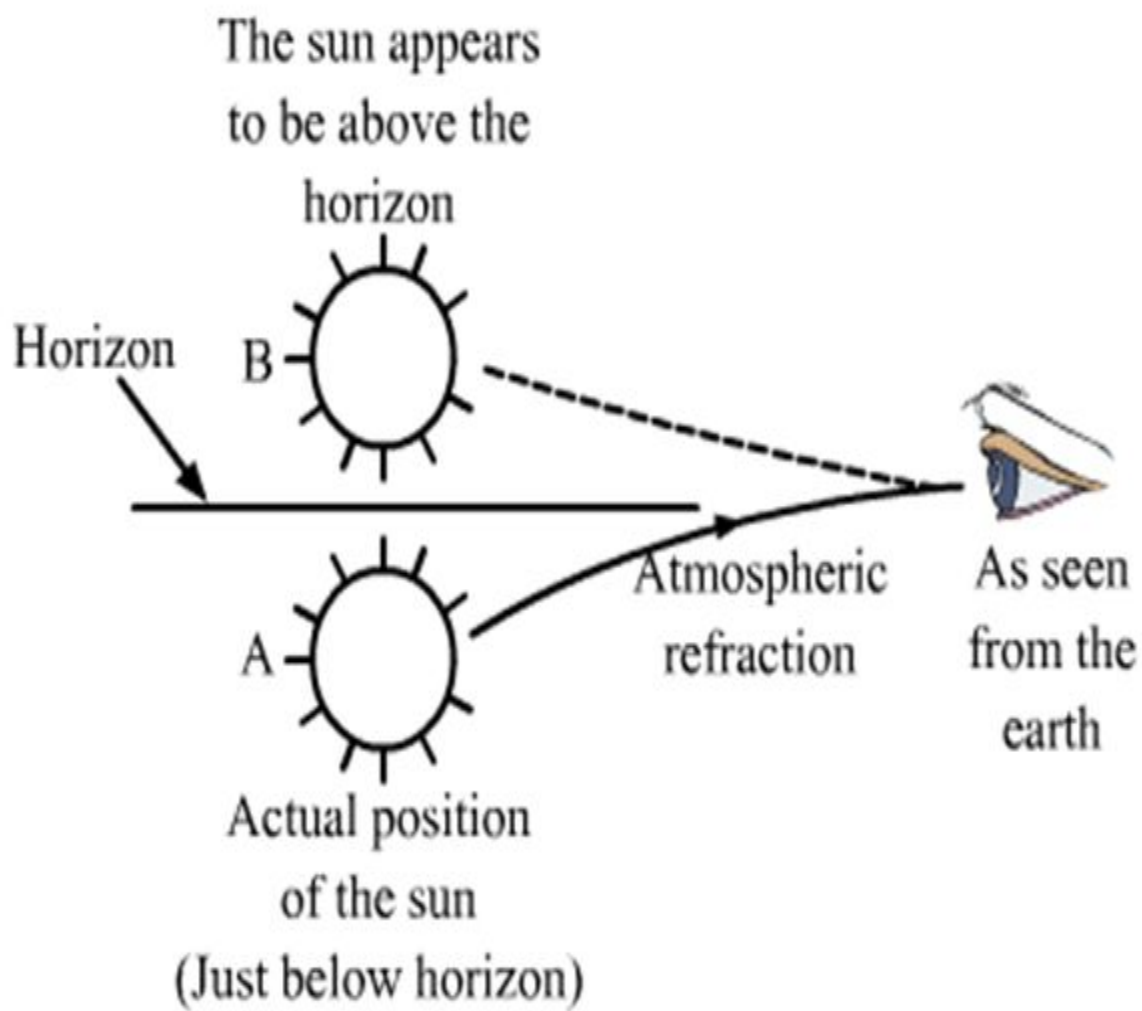
(iv)



A33. The Sun is visible to us two minutes before the sunrise and two minutes after the sunset because of the bending of light due to atmospheric refraction. The atmosphere consists of various layers of air with different densities. As the light moves through these layers refraction takes place, so the light bends and it appears that the sun is rising before it actually rises on the horizon. The same thing applies for a sunset as well.

As the sunrise takes place when the Sun is just above the horizon we see the Sun about two minutes before it is actually above the horizon, due to atmospheric refraction of light.

As the sunset takes place when the Sun is just below the horizon, the Sun appears to be above the horizon due to the atmospheric refraction. This occurs because the light moves from less dense air to more dense air and gets refracted towards the normal.



A34. Hydrocarbons in which an addition reaction with hydrogen can take place are alkenes and alkynes

General formula of Alkene - C_nH_{2n}

General formula of Alkyne - C_nH_{2n-2}

For an addition reaction to occur double and triple bonds must exist between carbon atoms in the hydrocarbon chain. Nickel or platinum is used as catalyst.

The reaction is represented as



Ethyne

A35. An atom or a group of atoms bonded to a carbon chain is commonly referred to as a functional group. It plays a large role in defining the chemical property of the organic compound.

Compound	Functional group
Alcohol	-OH
Aldehyde	-CHO
Ketone	>CHO
Carboxylic acid	-COOH

A36. (a)

(i) The combining capacity of an atom or the number of unpaired electrons in the outermost shell of the atom is called valency

(ii) Atomic size is the distance measured from the outermost shell of an atom to the centre of the nucleus.

(b)

When we move from left to right along a period in the modern periodic table,

Valency - increases till 4 and then decreases.

Valency is equal to the number of unpaired electrons in the outermost shell of the atom known as valence electrons if valence electrons is less than or equal to 4.

Valency = 8 - number of valence electron, if number of valence electrons is more than 4

Atomic size decreases across a period. In a period when we move from left to right the number of the valence shells do not vary but electrons are added by one unit which increases the nuclear charge. This decrease atomic size.

A37.

Element	Period
A	3
B	4

Atomic number of A is 17

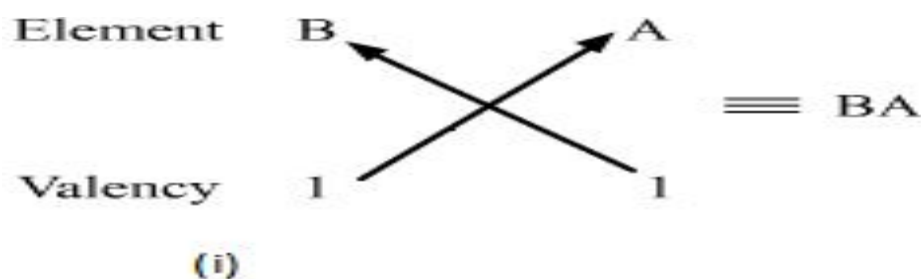
Electronic configuration of A = 2,8,7. Valence electrons present in atom A = 7

Valency of A = $8-7=1$

The atomic number of atom B is 19

Electronic configuration of B = 2,8,8,1. valence valence electrons of B is 1.

valency of B = 1



The bond formed between A and B is ionic bond.

Generally a metal and a non-metal combine by means of an ionic bond.

A38. Carbon has an atomic number of 6.

The electronic configuration of carbon is 2,4.

When we look at the electronic configuration of carbon, it is clear that it has to either gain or lose four electrons, to attain noble gas configuration. Suppose carbon gains four electrons it would form a C^{-4} ion. It is unable to hold four extra electrons. Meaning, it would be difficult for the six protons to hold the ten electrons.

Suppose it loses four electrons it would form a C^{+4} cation which is again a difficult task. It would require a great deal of energy to remove four electrons leaving the cation with six protons in the nucleus and holding only two electrons. This makes either of these possibilities is difficult.

Carbon overcomes this difficulty by sharing its electrons with other atoms of carbon or with atoms of other elements. sharing of electrons results in a covalent bond and the shared electrons belong to either of the atoms, this sharing helps in achieving noble gas configuration.

(i) Covalent compounds don't have free electrons. Hence they are bad conductors of electricity.

The intermolecular force of attraction in a covalent compound is weak and hence they have low boiling point and melting point.

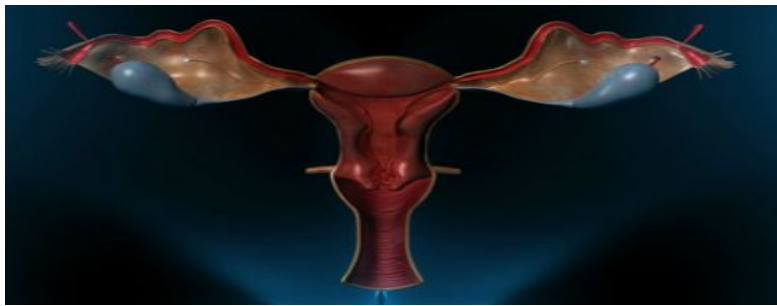
A39. (a)

(i) The organ that produces eggs - Ovary

(ii) The place where fusion of eggs and sperm takes place - Fallopian tube

(iii) The place where zygote is implanted - Uterus

Diagram of the female reproductive system



(b) The zygote after it gets fertilised in the fallopian tube repeatedly divides to form an embryo which travels down to get implanted in the walls of the uterus or endometrium by the process of implantation. The placenta is a connective tissue established between foetus and the mother. It provides a large surface area for the nutrients and oxygen to pass from mother to the embryo.

This is the beginning of pregnancy.

As the months proceed, there are different changes observed in the embryo which gets itself transformed into foetus by giving rise to organs. Fully formed foetus is delivered out by the process of parturition.

A40. (a) Water melon, papaya, cucumber are some of the examples of unisexual flowers.

Rose, hibiscus, lily are some of the examples of bisexual flowers.

(b) Changes in a flower after fertilisation are termed to be post fertilisation changes.

i) A fertilised ovule transforms into a seed with embryo enclosed in it. The nourishing material present in the ovule is retained by cotyledons of the seed. The integuments of the ovule form the thick seed coat.

ii) Mature ovary develops into a fruit enclosing the seed in most cases.

iii) The accessory appendages like sepals, petals, stamens, styles and stigma usually fall off after fertilisation except in certain rare cases.

(c) DNA in the nucleus of the cell stores the genetic information which is to be transferred to the offspring during reproduction.

Male gametes are haploid containing exactly half amount of DNA. Female gametes are also haploid containing exactly half amount of DNA.

During fertilisation, the nuclei of male and female fuse to form a diploid zygote thereby combining the amount of DNA present in them on a total. Hence the amount of DNA remains constant.

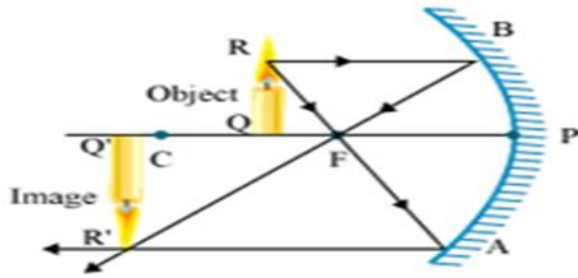
A41. (a) Myopia, Hypermetropia, Presbyopia are the three common refractive defects of vision. To correct Myopia or short-sightedness - Use appropriate concave lenses, Hypermetropia or long sightedness is corrected by using convex lenses of appropriate power and Presbyopia is corrected using bifocal lenses of appropriate power.

(b) Students can easily influence their family members to donate their eyes after their death. By making people aware and by registering to donate their eyes, students can play a very active role in reducing corneal blindness in the world.

A42. (a) A concave mirror produces real images and hence it should be used.

(b) The candle flame should be placed between the focus and centre of curvature of the mirror.

(c)



Yes, If the candle flame is placed at a long distance (infinity) it is possible to get the diminished image of the candle flame on the wall.

CBSE Science 2013

Question Paper (as it is) -

General Instructions:

1) All questions are compulsory.

The question paper consists of 42 questions divided into 4 sections A, B, C and D.

2) Section A comprises questions of 01 mark each, Section B comprises questions of 02 marks each, Section C comprises questions of 03 marks each and Section D comprises questions of 05 marks each.

3) All questions in Section A are to be answered in one word, one sentence or as per the exact requirement of the question.

4) There is no overall choice. However, internal choice has been provided wherever necessary. You have to attempt only one of the alternatives in all such questions.

5) In question on construction, drawing should be neat and exactly as per the given measurements.

6) Use of calculators is not permitted.

SECTION A

1. How many vertical columns are there in the modern periodic table and what are they called?
2. What is speciation?
3. Why should biodegradable and non-biodegradable wastes be discarded in two separate dust bins?
4. A student takes 2 mL acetic acid in a dry test tube and adds a pinch of sodium hydrogen carbonate to it. He makes the following observations:
 - I. A colourless and odourless gas evolves with a brisk effervescence.
 - II. The gas turns lime water milky when passed through it.
 - III. The gas burns with an explosion when a burning splinter is brought near it.
 - IV. The gas extinguishes the burning splinter that is brought near it.

The correct observations are:Options:

1. I, II, and III
 2. II, III and IV
 3. III, IV and I
 4. IV, I and II
5. In an experiment to study the properties of acetic acid a student takes about 2 mL of acetic acid in a dry test tube. He adds about 2 mL of water to it and shakes the test tube well. He is likely to observe that:Options:
 1. The acetic acid dissolves readily in water
 2. The solution becomes light orange
 3. Water floats over the surface of acetic acid
 4. Acetic acid floats over the surface of water
 6. A student prepared 20% sodium hydroxide solution in a beaker containing water. The observations noted by him are given below.
 - I. Sodium hydroxide is in the form of pellets.
 - II. It dissolves in water readily.

III. The beaker appears cold when touched from outside.

IV. The red litmus paper turns blue when dipped into the solution.

The correct observations are:

Options:

1. I, II, and III
2. II, III and IV
3. III, IV and I
4. I, II and IV

7. Read the following statements:

I. When a red litmus paper is dipped into a reaction mixture of a saponification reaction, it turns blue and the reaction is exothermic.

II. When a blue litmus paper is dipped into a reaction mixture of a saponification reaction, its colour does not change and the reaction is exothermic.

III. When a red litmus paper is dipped into a reaction mixture of a saponification reaction, its colour does not change and the reaction is endothermic.

IV. When a blue litmus paper is dipped into a reaction mixture of a saponification reaction, its colour does not change and the reaction is endothermic.

Which of the above statements are correct:

Options:

1. I, and II
2. II and III
3. III and IV
4. I and IV

8. Hard water required for an experiment is not available in a school laboratory. However, following salts are available in the laboratory. Select the salts which may be dissolved in water to make it hard for the experiment.

(1)Calcium Sulphate(2)Sodium Sulphate

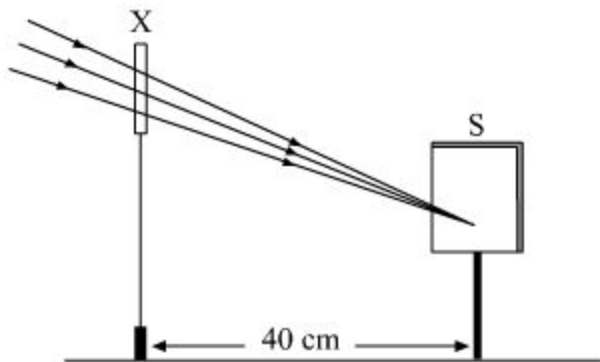
(3)Calcium Chloride(4)Potassium Sulphate

(5)Sodium Hydrogen Carbonate(6)Magnesium Chloride

Options:

- 1, 2 and 4
- 1, 3 and 6
- 3, 5 and 6
- 2, 4 and 5.

9. A student focused the image of a distant object using a device 'X' on a white screen 'S' as shown in the figure. If the distance of the screen from the device is 40 cm, select the correct statement about the device.



Options:

1. The device X is a convex lens of focal length 20 cm.
2. The device X is a concave mirror of focal length 40 cm.
3. The device X is a convex mirror of radius of curvature 40 cm.
4. The device X is a convex lens of focal length 40 cm.

10. A student obtained a sharp image of a burning candle, placed at the farther end of a laboratory table, on a screen using a concave mirror. For getting better value of focal length of the mirror, the subject teacher suggested him for focusing a well illuminated distant object. What should the student do?

Options:

1. He should move the mirror away from the screen.
2. He should move the mirror slightly towards the screen.
3. He should move the mirror as well as the screen towards the newly selected object.
4. He should move only the screen towards the newly selected object

11. After tracing the path of rays of light through a glass slab for three different angles of incidence, a student measured the corresponding values of angle of

refraction r and angle of emergence e and recorded them in the table given

S. No.	$\angle i$	$\angle r$	$\angle e$
I	30°	20°	31°
II	40°	25°	40°
III	50°	31°	49°

below:

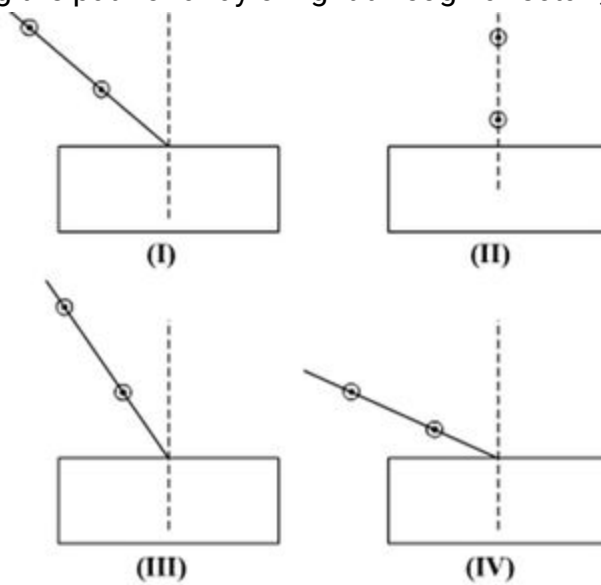
The correct observations are:

Options:

1. I and II
2. II and III
3. I and III
4. I, II and III

12.

Select the best set-up for tracing the path of a ray of light through a rectangular

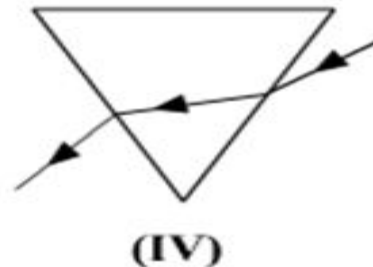
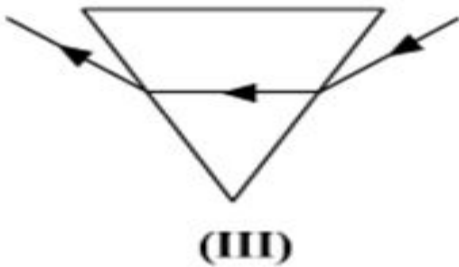
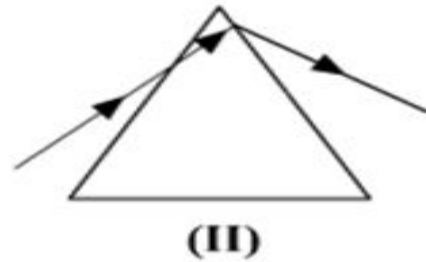
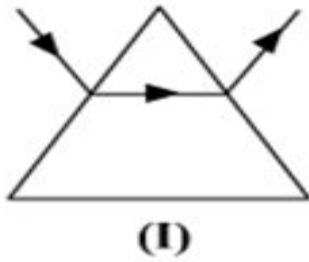


glass slab from the following :

Options:

1. I
2. II
3. III
4. IV

13. While performing the experiment to trace the path of a ray of light passing through a glass prism, four students marked the incident ray and the emergent ray in their diagrams in the manner shown below.



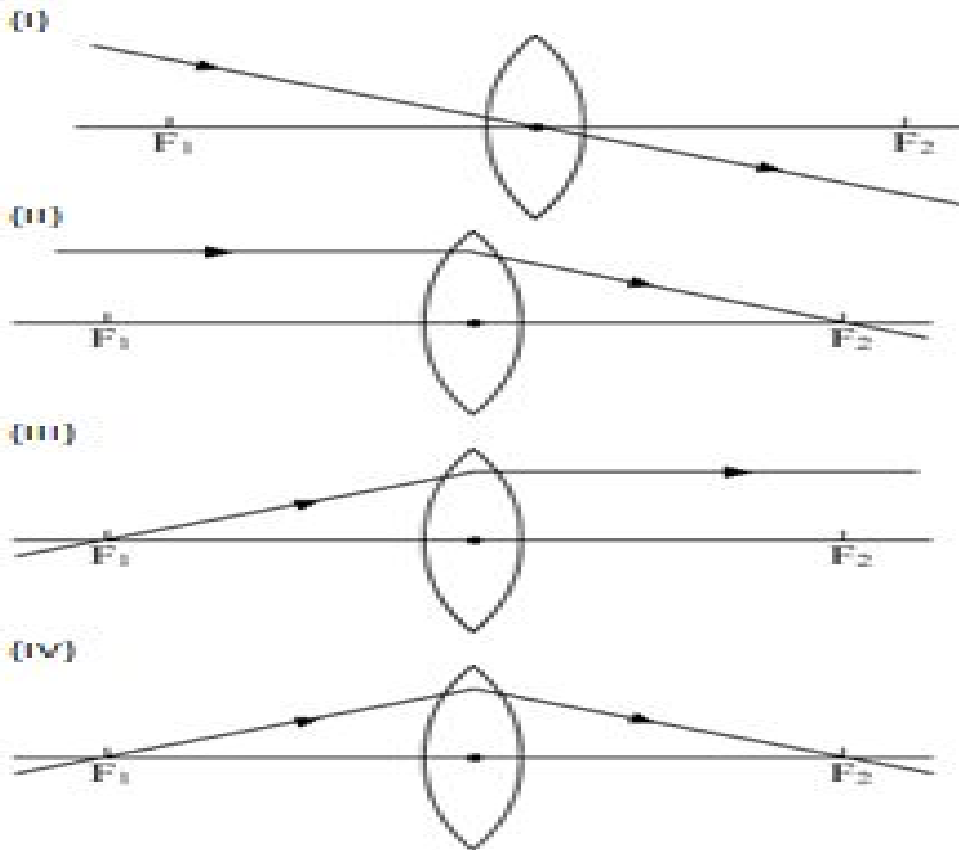
Options:

1. I
2. II
3. III
4. IV

14. In an experiment to trace the path of a ray of light through a triangular glass prism for different values of angle of incidence a student would find that the emergent ray:Options:

1. Is parallel to the incident ray
2. Perpendicular to the incident ray
3. Is parallel to the refracted ray
4. Bends at an angle to the direction of the incident ray.

15. Study the following ray diagrams:

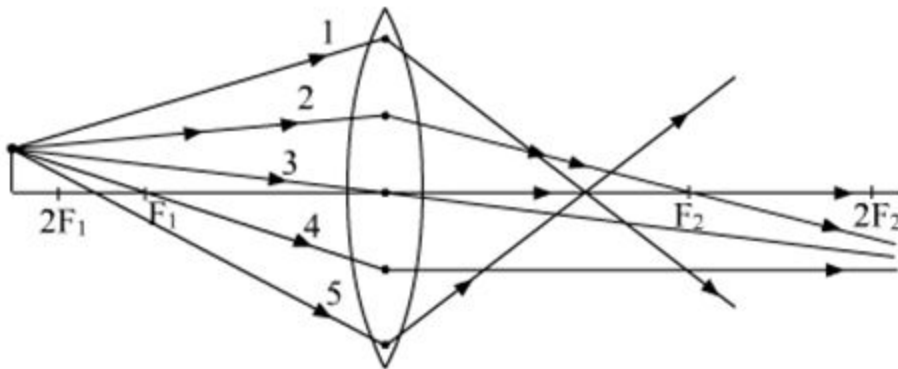


The diagrams showing the correct path of the ray after passing through the lens are:

Options:

1. II and III only
2. I and II only
3. I, II and III
4. I, II and IV

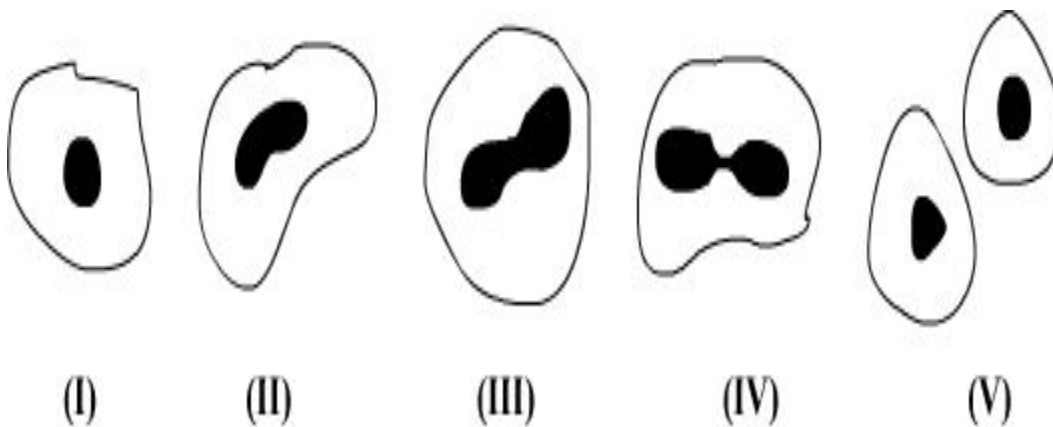
16. Out of the five incident rays shown in the figure find the three rays that are obeying the laws of refraction and may be used for locating the position of image formed by a convex lens:



Options:

1. 1, 2 and 3
2. 2, 3 and 4
3. 3, 4 and 5
4. 1, 2 and 4

17. A student after observing a slide showing different stages of binary fission in amoeba draws the following diagrams. However these diagrams are not in proper sequence:



The correct sequence is:Options:

1. I, V, IV, III, II
2. I, III, IV, V, II
3. I, II, III, IV, V
4. I, IV, V, III, II

18. Select the correct statements for the process of budding in yeast:

- I. A bud arises from a particular region on a parent body.
- II. A parent cell divides into two daughter cells, here the parental identity is lost.
- III. Before detaching from the parent body a bud may form another bud.
- IV. A bud when detaches from the parent body grows into a new individual.

Options:

- 1. I, II and III
- 2. II, III and IV
- 3. III, IV and I
- 4. IV, I and II

19. Study the different conclusions drawn by students of a class on the basis of observations of preserved/available specimens of plants and animals.

- I. Potato and sweet potato are analogous organs in plants.
- II. Wings of insects and wings of birds are homologous organs in animals.
- III. Wings of insects and wings of bats are analogous organs in animals.
- IV. Thorns of citrus and tendrils of cucurbita are analogous organs in plants.

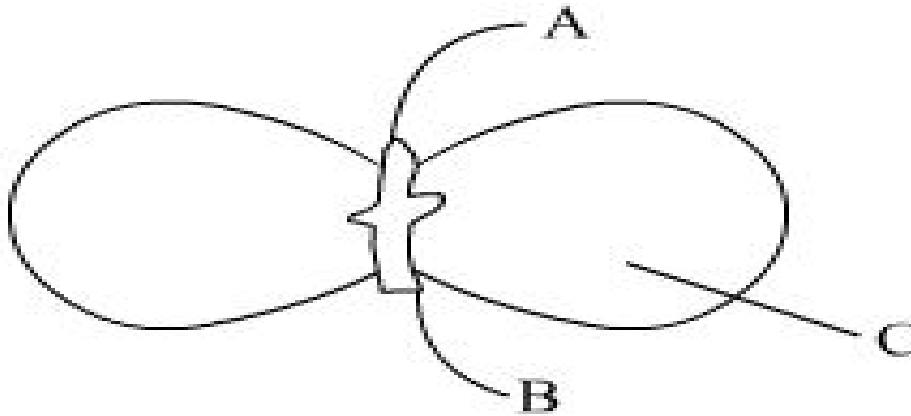
The correct conclusions are: Options:

- 1. I, and II
- 2. II and IV
- 3. I and III
- 4. III and IV

20. You have potato, carrot, radish, sweet potato, tomato and ginger bought from the market in your jute bag. Identify two vegetables to represent the correct homologous structures. Options:

- 1. Potato and tomato
- 2. Carrot and tomato
- 3. Potato and sweet potato
- 4. Carrot and radish

21. In the figure, the parts marked A, B and C are sequentially:



Options:

1. Plumule, Radicle and Cotyledon
2. Radicle, Plumule and Cotyledon
3. Plumule, Cotyledon and Radicle
4. Radicle, Cotyledon and Plumule

22. "The chromosomes number of the sexually reproducing parents and their offspring is the same." Justify this statement.

23. "A ray of light incident on a rectangular glass slab immersed in any medium emerges parallel to itself." Draw labelled ray diagram to justify the statement.

24. We often observe domestic waste decomposing in the bylanes of residential colonies. Suggest ways to make people realise that the improper disposal of waste is harmful to the environment.

25. List and explain any two advantages associated with water harvesting at community level.

SECTION C

26. Write the name and the structural formula of the compound formed when ethanol is heated at 443 K with excess of conc. H_2SO_4 . State the role of conc. H_2SO_4 in this reaction. Write chemical equation for the reaction.
27. Why are homologous series of carbon compounds so called? Write chemical formula of two consecutive members of a homologous series and state the part of these compounds that determines their (i) physical properties, and (ii) chemical properties.
28. Given below are some elements of the modern periodic table:

${}_4\text{Be}$, ${}_9\text{Fe}$, ${}_{14}\text{Si}$, ${}_{19}\text{K}$, ${}_{20}\text{Ca}$

- (i) Select the element that has one electron in the outermost shell and write its electronic configuration.
- (ii) Select two elements that belong to the same group. Give reason for your answer.
- (iii) Select two elements that belong to the same period. Which one of the two has bigger atomic size?
29. Write the number of periods the modern periodic table has. How do the valency and metallic character of elements vary on moving from left to right in a period? How do the valency and atomic size of elements vary down a group?
30. (a) Explain the process of regeneration in Planaria.
- (b) How is regeneration different from reproduction?
31. Write two examples each of sexually transmitted diseases caused by (i) virus, (ii) bacteria. Explain how the transmission of such diseases be prevented?
32. Tabulate two distinguishing features between acquired traits and inherited traits with one example of each.

33. "The sex of a newborn child is a matter of chance and none of the parents may be considered responsible for it." Justify this statement with the help of flow chart showing determination of sex of a newborn.

34. Mention the types of mirrors used as (i) rear view mirrors, (ii) shaving mirrors. List two reasons to justify your answers in each case.

35. An object of height 6 cm is placed perpendicular to the principal axis of a concave lens of focal length 5 cm. Use lens formula to determine the position, size and nature of the image if the distance of the object from the lens is 10 cm.

36. State the difference in colours of the sun observed during sunrise/sunset and noon. Give explanation for each.

37. (a) What is an ecosystem? List its two main components.

(b) We do not clean ponds or lakes, but an aquarium needs to be cleaned regularly. Explain.

SECTION D

38. (a) Define the term 'isomers'.

(b) Draw two possible isomers of the compound with molecular formula C_3H_6O and write their names.

(c) Give the electron dot structures of the above two compounds

39. a) List three distinguishing features between sexual and asexual types of reproduction.

(b) Explain why variations are observed in the offspring of sexually reproducing organisms?

40. (a) Identify A, B and C in the given diagram and write their functions.
- (b) Mention the role of gamete and zygote in sexually reproducing organisms.



41. (a) State the laws of refraction of light. Give an expression to relate the absolute refractive index of a medium with speed of light in vacuum.
- (b) The refractive indices of water and glass with respect to air are $\frac{4}{3}$ and $\frac{3}{2}$ respectively. If the speed of light in glass is $2 \times 10^8 \text{ ms}^{-1}$, find the speed of light in (i) air, (ii) water.
42. (a) A person cannot read newspaper placed nearer than 50 cm from his eyes. Name the defect of vision he is suffering from. Draw a ray diagram to illustrate this defect. List its two possible causes. Draw a ray diagram to show how this defect may be corrected using a lens of appropriate focal length.
- (b) We see advertisements for eye donation on television or in newspapers. Write the importance of such advertisements.

CBSE Science 2013

Solutions -

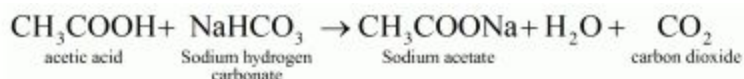
A1. The periodic table consists of vertical columns called groups. There are a total of 18 vertical columns in the periodic table.

A2. Speciation is defined as the process of evolution where one species evolves into or forms one or more than one species.

A3. Biodegradable wastes undergo the process of decomposition whereas the non-biodegradable wastes do not decompose and hence should be broken down in other ways.

It will be easy for selecting the degradation process if both types of wastes are separately dumped in separate dustbins.

A4. CO_2 is the gas which is evolved - This is odourless and colourless, turns lime water milky, and extinguishes the burning splinter.



A5. The acetic acid dissolves readily in water.

A6. The red litmus paper turns blue when dipped into the solution.

A7. Red litmus changes to blue in presence of basic solutions and there is no change in the colour of blue litmus.

A8. Ca^{2+} and Mg^{2+} ions are present in hard water.

A9. Answer is D

Reason: Device used is a convex lens as image formed is real and light rays go through the device. Since the image is focussed on the screen, we can conclude that focal length = 40 cm.

A10.

As we know that if the object is beyond the centre of curvature of the lens the image is formed between the centre of the curvature and the focus of the mirror, if the object is very long we call it as a distant object, its image is formed by the concave mirror at its focus, so we can conclude the answer as:

If a student obtained a sharp image of a burning candle, placed at the farther end of a laboratory table, on a screen using a concave mirror. For getting a better value of focal length of the mirror, by focusing a well illuminated distant object. He should move the mirror slightly towards the screen.

A11. Answer is D.

The conditions given below should be satisfied for a light ray which passes through a slab

(a) Angle of incidence is approximately equal to the angle of emergence and the angle of incidence is greater than angle of refraction.

(b) As incident angle increases, the refracted angle also increases.

All the three given observations satisfy the above conditions and hence the answer is D.

A12. Answer is A.

If the incoming light ray falls along the normal, the light ray emerges through the normal hence the refraction cannot be traced. So the light rays should neither be very close or far from the normal as it is difficult to trace the emergent ray.

A13. Answer is A.

If the incoming light ray falls along the normal, the light ray emerges through the normal hence the refraction cannot be traced. So the light rays should neither be very close or far from the normal as it is difficult to trace the emergent ray.

A14. Answer is D

Light gets refracted twice with different angles, the emergent ray bends at an angle to the direction of incident ray.

A15. Answer is C.

Ray diagrams (I), (II) and (III) are correct.

The light rays remain undeflected if they pass through the optical centre of a lens

The light rays pass through the second focus of the lens if they enter a lens parallel to its principal axis

The light rays become parallel to the principal axis after passing through the lens if they pass through the first focus .

A16. Answer is B.

In (2) the light rays are coming parallel to the principal axis and hence pass through the second focus of lens. In (3), the light rays travelling through the center of the lens pass through without deviation. In (4), Light rays are travelling through first focus of lens and hence it becomes parallel to the principal axis on passing through the lens.

A17. Correct sequence is :- I, II, III, IV, V.

A18. Answer is III.

A19. As per the definition, analogous structures carry out the same function although they do not have the same origin.

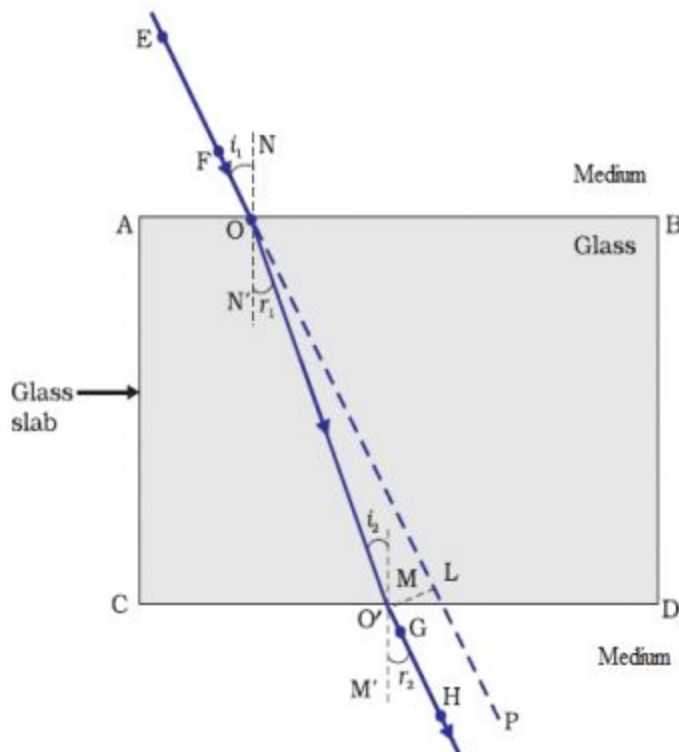
A20. Homologous organs are those organs which have same basic structure and origin but perform different functions.

A21. Answer is 1.

A22. Male and female gametes have exactly half of the number of chromosomes that the parents possess.

Male and female gametes on fusion during reproduction restore the chromosome number in the offspring by adding their individual chromosome number.

A23.



A24. When waste is disposed improperly along bylanes, it can lead to the following problems:-

1. Release of toxic gases into the environment causes the production of foul smell thereby polluting the environment.

2.The area with disposed waste becomes the breeding ground for mosquitoes, flies and various other vectors which spread various diseases.

3.Disposed wastes are carried into water bodies by rain thereby polluting them.

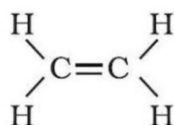
4.The toxic substances released from decomposition of wastes seep into the soil layers thereby polluting the groundwater.

A25. Water harvesting is an integrated multi resource management of land and water. This is the method by which water is not allowed to flow away and is made to percolate into the soil. This may raise the ground water level of the place.

Chaukas, Khadins and Nadis are some of the structures that are used in certain parts of North India for water harvesting purposes. Today many states have made water harvesting mandatory in houses and buildings.

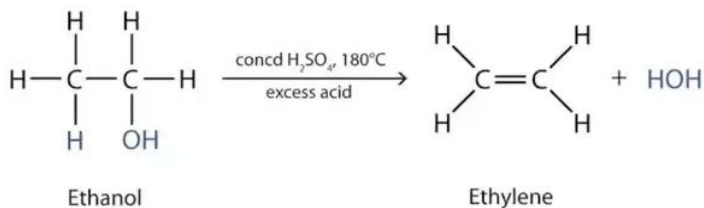
A26. Product formed is Ethene.

Structural formula :-



Ethene

Chemical equation:



H₂SO₄ acts as a dehydrating agent in the reaction.

A27. A series of Carbon compounds with Hydrogen which possess a difference of CH_2 between two successive molecules of series molecules called homologous series of compounds.

The homologous series of carbon compounds are so called because the properties of the compounds are determined by the same functional group and are not dependent on the length of the carbon chain.

Two consecutive members of a homologous series are:-

CH_3OH and $\text{C}_2\text{H}_5\text{OH}$.

In both the OH part determines the chemical properties.

In CH_3OH , CH_3 part determines the physical properties and in $\text{C}_2\text{H}_5\text{OH}$, C_2H_5 part determines the physical properties.

A28. (i) $_{19}\text{K}$.

Electronic configuration is 2 8 8 1

(ii) Among the list, $_4\text{Be}$ and $_{20}\text{Ca}$ belong to Group 2. They belong to the same group as the number of the valence electrons in the shells for both these elements are the same as seen from the configuration given below:-

$_4\text{Be}$ - 2 2

$_{20}\text{Ca}$ - 2 8 8 2

(iii) $_9\text{F}$ and $_4\text{Be}$ belong to Period 2.

Among the two, $_4\text{Be}$ has bigger atomic size than $_9\text{F}$. This is because atomic radius decreases on moving from left to right in the periodic table.

A29. The modern periodic table has 7 periods.

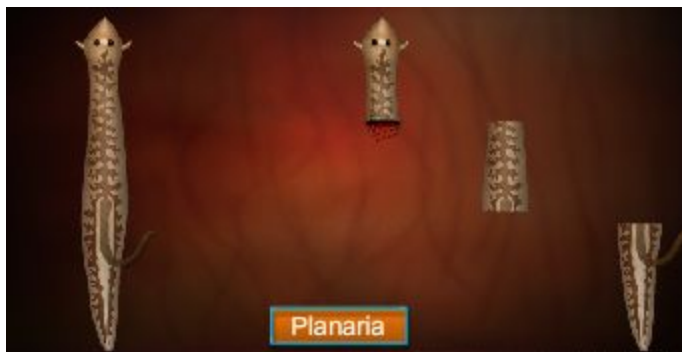
The number of valence electrons in the outermost shell decides the valency of elements. The valence electrons increases in the s block and p block and also turns from positive to negative as you move from left to right in a periodic table.

The nuclear charge on the valence electrons increases and hence the tendency to reduce electrons is lesser which reduces the metallic character of elements as you move from left to right in a periodic table.

As you go down a group in the periodic table, the valency is the same as the valence electrons in a group are the same.

Atomic size of the elements increases on moving down a group because more shells are added as you go down.

A30. (a) Regeneration is a type of asexual reproduction. If the organism is cut up, its pieces can grow into separate individuals. This is possible by specialised cells which rapidly divide to form new individuals. It occurs in some fully differentiated organisms. Regeneration is also called morphallaxis. e.g. Hydra, Planaria.



(b)

Regeneration

Reproduction

It is purely asexual mode of reproduction.

It can be asexual or sexual mode of reproduction.

A single parent is involved.

It may involve one parent or two parents.

Individual is cut into pieces.

Parent either produces the offspring directly or two parents involved produce gametes to form the offspring.

A31. (i) Genital Herpes and AIDS are the two diseases caused in human beings by viruses.

(ii) Gonorrhoea and Syphilis are the two diseases caused in human beings by bacteria.

Transmission of sexually transmitted diseases can be prevented by:

1. Avoiding sexual acts with multiple partners and infected people.
2. Using condoms.
3. Preventing the sharing of needles and syringes between people.
4. Testing blood before transfusion.
5. Sterilisation of the equipment used in surgery and dental care.
6. To provide additional medical treatment to an unborn baby residing in the womb of a diseased mother.

A32.

Inherited Traits

Inherited traits are those which are transmitted from one generation to another. i.e Parents transmit certain traits to their offspring.

e.g. Shape of nose.

Acquired traits

Acquired traits are the changes produced in an individual as a response to the environment. These acquired traits are not purposefully inherited.

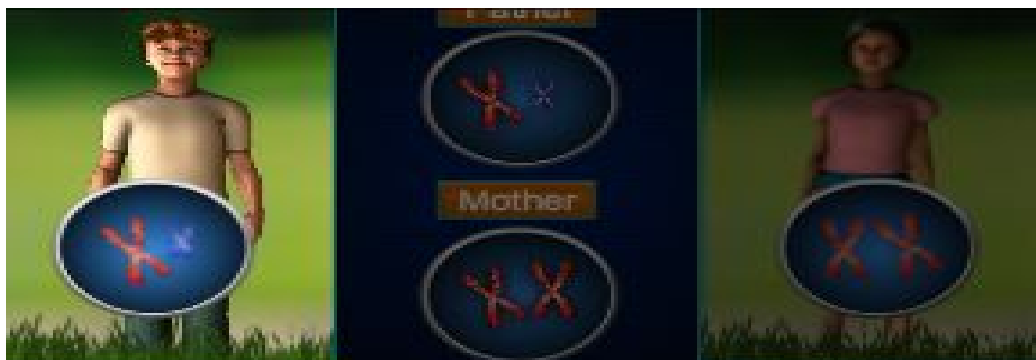
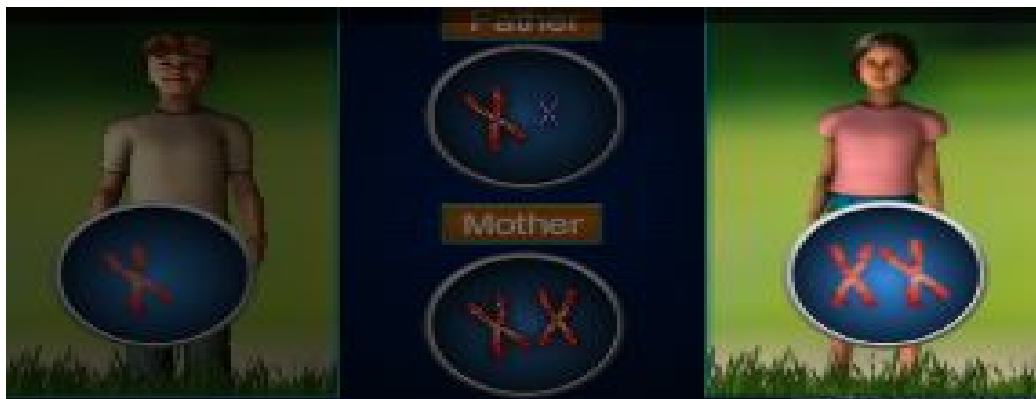
e.g. Malfunctioning of kidney affected by disease.

A33. Of 23 pairs of chromosomes present in human beings, one pair forms the sex chromosomes. Male chromosomal pair is XY and female is XX.



Male gametes are haploid containing 22+ either X or Y chromosome as their sex chromosome. Female gametes are haploid containing 22+ X as sex chromosome.

On zygote formation, offspring will have 23 pairs of chromosomes in total. The sex chromosomal pair is determined to be XY or XX depending upon which male gamete is fusing with the female gamete.



So, one cannot choose the specific sperm cell to fertilise the egg, the sex of a new born child is a matter of chance. None of the parents are responsible for it.

A34. (i) Convex mirrors are used as rear view mirrors

1. Convex mirror forms image which is always erect and virtual

2. Convex mirrors can cover larger area as the images formed are of smaller size

(ii) Concave mirrors are used as shaving mirrors

1. Concave mirror forms images larger in size which helps to see the object clearly

2. Image formed by a Concave mirror is always erect and virtual when the object is near the mirror, which is true in this case.

A35. Height = $h_1 = 6$ cm, Focal length (f) = -5 cm, Object distance (u) = -10 cm

Applying lens formula

$$\frac{1}{v} - \frac{1}{u} = \frac{1}{f} \Rightarrow \frac{1}{v} - \frac{1}{-10} = \frac{1}{-5} \Rightarrow \frac{1}{v} = -\frac{1}{10} \Rightarrow v = -3.33 \text{ cm}$$

$$\text{Magnification (M)} = \frac{v}{u} \Rightarrow \frac{-3.33}{-10} = 0.33$$

Again,

$$\text{Magnification (M)} = \frac{v}{u} = \frac{h_2}{h_1} \Rightarrow \frac{h_2}{6} = 0.33 \Rightarrow h_2 = 2 \text{ cm}$$

A virtual and erect image of height 3 cm is formed at a distance of 3.33 cm from lens.

A36. During sunrise/sunset : The sun is reddish or orange in colour.

This is because during this time, the light from the sun has to travel a long distance due to which the colours having shorter wavelengths get dispersed. After this, only colours of longer wavelengths which are reddish or orange in colour are present in the sunlight.

During noon : Sun appears white in colour

As the sunlight has to travel only a short distance during this time, it will have all the wavelengths present in it. These will combine and form white colour and hence sun appears white during this time

A37. (a) Ecosystem consists of biotic and abiotic components which interact with one another.

Biotic components - These include living organisms on earth

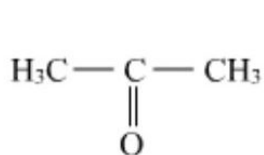
Abiotic components - These include air, soil, water etc.

(b) Ponds and lakes are parts of the natural ecosystem which contain soil as well as bacteria that help in decomposing the complex organic matter existing in them into simple substances.

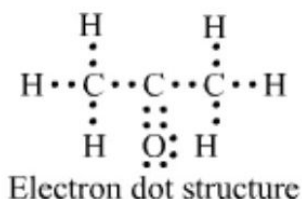
Aquarium is a man-made ecosystem which does not have soil or bacteria to decompose the organic matter naturally. Therefore, it has to be cleaned regularly.

A38. (a) Isomers are molecules whose structural formulae are different but molecular formulae are same

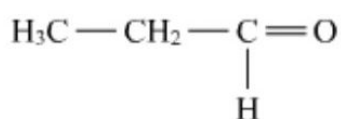
(b)



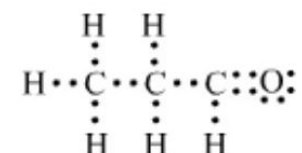
Acetone



Electron dot structure



Propanal



Electron dot structure

(c) Given above

A39. (a)

Asexual reproduction

It is a mode of reproduction in which a single individual is responsible for creating a new generation of species.

Different types of asexual reproduction are fission, fragmentation, regeneration, budding, vegetative propagation and spore formation.

Hydra, Yeast, Amoeba etc. exhibit this mode of reproduction.

Sexual reproduction

It is a mode of reproduction in which two individuals are responsible for creating a new generation of species.

Sexual reproduction involves different process like gamete formation, fertilisation, development of embryo etc.

Higher plants, higher animals and human beings exhibit this mode of reproduction.

(b)

The offspring of sexually reproducing organisms exhibit variations due to chances for recombination of the genetic material obtained from two different individuals considered as parents during the process of meiosis.

A40. The part labelled as A -the Stigma.

Stigma - Stigma helps in trapping the pollen grain and allows it to germinate by its sticky texture.

The part labelled as B -Pollen tube.

Pollen tube - Pollen tube carries the nucleus of the pollen grain into the ovary to fertilise the egg cell.

The part labelled as C -Egg cell.

Egg cell - It acts as the female gamete and gets fertilised by male gamete to form the zygote.

(b) Gamete - These are the sex cells developed by reproductive organs of two individuals of opposite sexes. They carry genetic material of the parents which is to be transmitted to the offspring.

Zygote - The structure formed as result of fusion of female and male gametes. This super cell marks the beginning of a new individual. The zygote divides repeatedly to form a ball of cells making an embryo.

A41. (a) First law of refraction or Snell's law:

It states that the ratio of the sine of the angle of incidence or i to the sine of the angle of refraction or r is constant.

If n_{12} is the relative refractive index of medium 1 with respect to medium 2, then the law is given by

$$\sin i / \sin r = n_{12}$$

Second law of refraction:

As per this law, if there are two media, the incident ray, the refracted ray and the normal to the interface of the two media at the point of incidence are all on the same plane.

If a ray of light is travelling from medium 1 to medium 2, then refractive index of medium 1 with respect to medium 2 is given by

$n_{12} = \frac{\text{Speed of light in medium 1}}{\text{Speed of light in medium 2}} = \frac{v_1}{v_2}$, where v_1 is the speed of the light in medium 1 and v_2 is the speed of the light in medium 2.

Absolute refractive Index of the medium = $\frac{\text{Speed of light in vacuum}}{\text{Speed of light in medium}}$.

(b)

Refractive index of water with respect to air = $4/3$

Refractive index of glass with respect to air = $3/2$

$2 \times 10^8 \text{ ms}^{-1}$

i. Refractive index of glass/Refractive index of air = Speed of light in air/Speed of light in glass

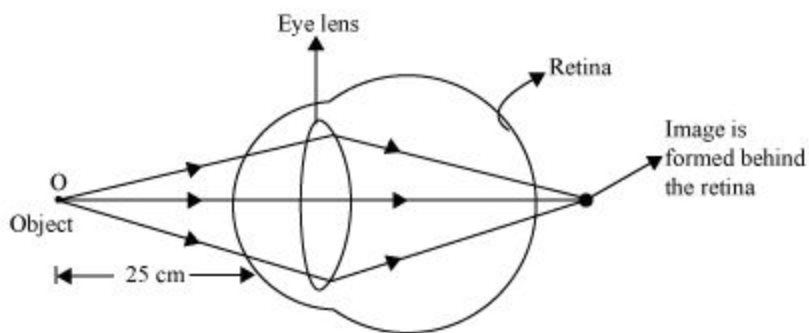
Speed of light in air = $(3 \times 10^8) \times 2 \times 10^8 = 3 \times 10^8 \text{ ms}^{-1}$

ii. Refractive index of glass/Refractive index of water = Speed of light in water/Speed of light in glass

Speed of light in water = Refractive Index of glass/refractive Index of water $\times 2 \times 10^8 \text{ ms}^{-1} = 2.25 \times 10^8 \text{ ms}^{-1}$.

A42. (a) The person is suffering from long sightedness, also called hypermetropia

Ray diagram to show hypermetropia:

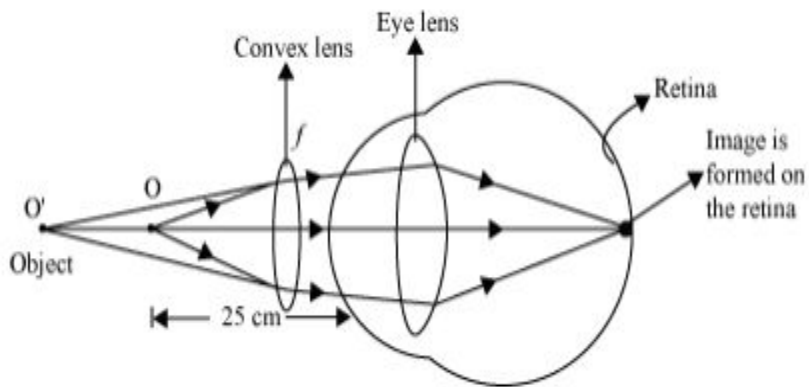


Causes of the defect:

The eyeball has become too short in length

The focal length of the eye lens has become long

Correction of Hypermetropia:



As shown in the diagram, usage of convex lens having the required focal length can correct the defect

(b) The eyes of a dead person can be used on another blind person to restore his or her vision. By giving advertisements in newspapers, people will be made aware of this as well as encouraged to donate their own eyes after death.

CBSE Science 2012

Question Paper (as it is) -

General Instructions:

1) All questions are compulsory.

The question paper consists of 42 questions divided into 4 sections A, B, C and D.

2) Section A comprises questions of 01 mark each, Section B comprises questions of 02 marks each, Section C comprises questions of 03 marks each and Section D comprises questions of 05 marks each.

3) All questions in Section A are to be answered in one word, one sentence or as per the exact requirement of the question.

4) There is no overall choice. However, internal choice has been provided wherever necessary. You have to attempt only one of the alternatives in all such questions.

5) In question on construction, drawing should be near and exactly as per the given measurements.

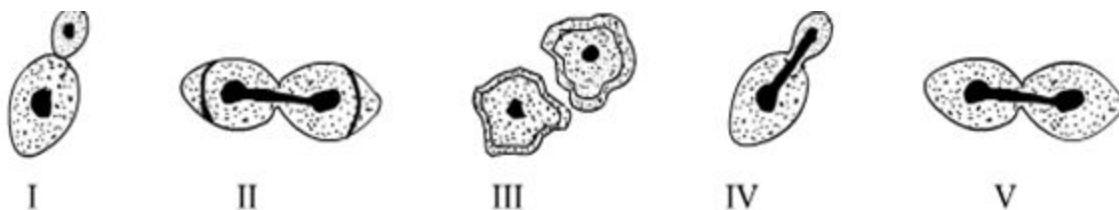
6) Use of calculators is not permitted.

SECTION A

1. Write the name and formula of the first member of the carbon compounds having functional group – CHO.
2. State one role of ciliary muscles in the human eye.
3. Write the name and formula of a molecule made up of three atoms of oxygen.
4. Name two decomposers operating in our ecosystem.
5. The following figure illustrates binary fission in Amoeba in an incorrect sequence.

Options:

1. III, II, IV, I
 2. III, IV, II, I
 3. II, III, IV, I
 4. IV, III, II, I
6. From the following diagrams, select the correct ones showing stages of binary fission in amoeba



7. Following diagrams were drawn by different students on having seen prepared slides of budding in yeast.



Correct diagrams are

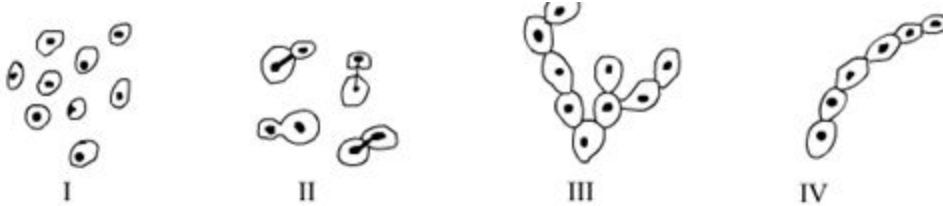
Options:

1. I, II, III
2. II, III, IV

3. III, IV, V

4. I, IV, V

8. In which of the following figures is budding not shown?



Options:

1. I
2. II
3. III
4. IV

9. In the experiment for determining the percentage of water absorbed by raisins, we do the final weighing of the raisins after keeping them dipped in water for about one hour. For the accuracy of the result, the extra water from the surface of the soaked raisins is removed by

Options:

1. Rubbing with cotton cloth
2. Hot air blower
3. Dry cotton wool
4. Filter paper

10. On adding 2 mL acetic acid to 2 mL of water in a test tube, it was observed that

Options:

1. a clear and transparent solution is formed
2. a white precipitate is formed almost immediately
3. two separate layers were formed
4. a colourless and odourless gas is evolved

11. On adding acetic acid to sodium hydrogen carbonate in a test tube, a student observes

Options:

1. No reaction
2. A colourless gas with pungent smell
3. Bubbles of a colourless and odourless gas
4. A strong smell of vinegar

12. Which one of the following are the correct observations about acetic acid?

Options:

1. It turns blue litmus red and smells like vinegar
2. It turns blue litmus red and smells like burning sulphur
3. It turns red litmus blue and smells like vinegar
4. It turns red litmus blue and has a fruity smell

13. The aqueous solutions of copper sulphate and zinc sulphate appear

Options:

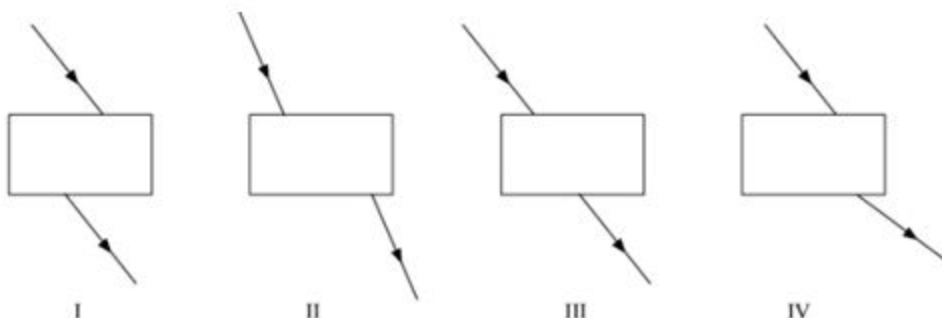
1. Blue and green respectively
2. Green and colourless respectively
3. Blue and brown respectively
4. Blue and colourless respectively.

14. Solutions of copper sulphate, iron sulphate and zinc sulphate are prepared and marked I, II and III respectively. Few pieces of aluminum are added to each solutions. After some time a change will be observe in.

Options:

1. I and II
2. II and III
3. III and I
4. All the three

15.. Four students showed the following traces of the path of a ray of light passing through a rectangular glass slab.



16. While performing the experiment on tracing the path of a ray of light through a rectangular glass slab, in which of the following experimental set-ups is a student likely to get best results? P1 and P2 are the positions of pins fixed by him.

Options:

1. I
2. II
3. III
4. IV

17. If you are to determine the focal length of a convex lens, you should have

Options:

1. a convex lens and a screen
2. a convex lens and a lens holder
3. a lens holder, a screen holder and a scale
4. a convex lens, a screen, holder for them and a scale

18. A student obtained a sharp inverted image of a distant tree on a screen placed in front of the concave mirror. He then removed the screen and tried to look into the mirror. He would now see

Options:

1. a very blurred image on the wall opposite to the mirror
2. an erect and magnified image of the tree in the mirror
3. no image as the screen has been removed
4. a highly diminished inverted image of the tree at the focus of the mirror

19. A student has to determine the focal length of a concave mirror by obtaining the image of a distant object on a screen. For getting best result he should focus

Options:

1. a distant tree or an electric pole
2. a well-illuminated distant building
3. well-lit grills of the nearest window
4. a burning candle placed at the distant edge of the laboratory table

SECTION B

20. Why do all the elements of the (a) same group have similar properties, (b) same period have different properties?

21. An element E has following electronic configuration:

KLM

2 8 6

(a) To which group of the periodic table does element E belong?

(b) To which period of the periodic table does element E belong?

(c) State the number of valence electrons present in element E.

(d) State the valency of the element E.

22. Why is vegetative propagation practiced for growing some types of plants? List two plants which are grown by this method.

23. State the role of placenta in the development of embryo.

24. To construct ray diagram we use two light rays which are so chosen that it is easy to know their directions after reflection from the mirror. List these two rays and state the path of these rays after reflection. Use these rays to locate the image of an object placed between centre of curvature and focus of a concave mirror.

25. What is the colour of the clear sky during day time? Give reason for it.

26. Draw a labelled ray diagram to illustrate the dispersion of a narrow beam of white light when it passes through a glass prism.

27. List the products of combustion of fossil fuels. What are their adverse effects on the environment?

28. List three problems which arise due to construction of big dams. Suggest a solution for these problems.

29. What are hydrocarbons? Write the name and general formula of (i) saturated hydrocarbons, (ii) unsaturated hydrocarbons, and draw the structure of one hydrocarbon of each type. How can an unsaturated hydrocarbon be made saturated?

30. What are detergents chemically? List two merits and two demerits of using detergents for cleansing. State the reason for the suitability of detergents for washing, even in the case of water having calcium and magnesium ions.

SECTION C

31. State the meaning of inherited traits and acquired traits. Which of the two is not passed on to the next generation? Explain with the help of an example.

32. How are fossils formed? Describe in brief, two methods of determining the age of fossils.

33. If we pure-bred tall (dominant) pea plant with pure-bred dwarf (recessive) pea plant we will get pea plants of F_1 generation. If we now self-cross the pea plant of F_1 generation, then we obtain pea plants of F_2 generation.

(a) What do the plants of F_2 generation look like?

(b) State the ratio of tall plants to dwarf plants in F_2 generation.

(c) State the type of plants not found in F_1 generation but appeared in F_2 generation, mentioning the reason for the same.

34. A 5 cm tall object is placed perpendicular to the principle axis of a convex lens of focal length 12 cm. The distance of the object from the lens is 8 cm. Using the lens formula, find the position, size and nature of the image formed.

35. State the types of mirrors used for (i) headlights and (ii) rear view mirror, in cars and motorcycles. Give reason to justify your answer in each case.

36. An old man cannot see objects closer than 1 m from the eye clearly. Name the defect of vision he is suffering from. How can it be corrected? Draw ray diagram for the (i) defect of vision and also (ii) for its correction.

37. Name the oxidizing agent used for the conversion of ethanol to ethanoic acid. Distinguish between ethanol and ethanoic acid on the basis of (i) litmus test, (ii) reaction with sodium hydrogen carbonate.

38. List and explain in brief three methods of contraception.

39. Na, Mg and Al are the elements having one, two and three valence electrons respectively. Which of these elements (i) has the largest atomic radius, (ii) is least reactive? Justify your answer stating the reason for each.

40. List the new Cartesian sign convention for reflection of light by spherical mirror. Draw a diagram and apply these conventions for calculating the focal length and nature of a spherical mirror which forms a $\frac{1}{3}$ times magnified virtual image of an object placed 18 cm in front of it.

OR

With the help of a ray diagram, state what is meant by refraction of light. State Snell's law for refraction of light and also express it mathematically.

The refractive index of air with respect to glass is $\frac{2}{3}$ and the refractive index of water with respect to air is $\frac{4}{3}$. If the speed of light in glass is 2×10^8 m/s, find the speed of light in (a) air, (b) water.

SECTION D

41. . Distinguish between unisexual and bisexual flowers giving one example of each. Draw a diagram showing process of germination of pollen grains on stigma and label the following parts:

(a) Female germ cell

(b) Male germ cell

(c) Ovary

OR

Draw a diagram of human female reproductive system and label the part.

(i) That produces eggs.

(ii) Where fusion of egg and sperm take place.

(iii) Where zygote is implanted.

42. What happens to human egg when it is not fertilised?

CBSE Science 2012

Solutions –

A1. Methanal is the first member of the carbon compounds having a function group of -CHO

A2. The ciliary muscles are mainly responsible for a function called accommodation. They support the lens and hold it in place and has an important job of changing the shape of the lens by contracting and relaxing it.

A3. Ozone is a molecule that is made of up three atoms of oxygen and its formula is O_3 .

A4. Bacteria and Fungi break down the dead plants and animals to convert them into soil nutrients. The two typical decomposers are Bacteria and Fungi.

A5. In an amoeba undergoing binary fission, the nucleus divides first and then the cytoplasm divides to give two daughter cells.

A6. II, III and V are the stages which represent binary fission in amoeba while I and IV represent the budding process in yeast.

A7. Nuclei are seen in the figures I, IV, and V. Nuclei are not present in the buds shown in II and III.

A8. In budding process, a new bud remains attached to the parent till it is matured.

A9. Excess water is removed using filter paper.

A10. Acid and water both are miscible liquids they form a clear and transparent solution.

A11. Correct Option:

When Acetic acid is mixed with sodium hydrogen carbonate, sodium acetate salt and water is formed with the evolution of CO_2 . This is colourless and odourless gas and so you can observe bubbles of this gas coming out of the liquid.

A12. Acetic acid turns blue litmus to red and smells like vinegar. Because 5-8% solution of acetic acid is called vinegar.

A13. Correct option

The color of copper sulphate solution is blue and the zinc sulphate solution is colorless.

A14. All three solutions will show change. Aluminum is more reactive than all the metals mentioned above and hence it will displace these metals in its sulphate solution and precipitate in the bottom.

A15. Answer is C. The trace of third student is likely to be correct.

A16. The correct option is C. The student will get best results when he places the pins as placed in the experimental set up III.

A17. Answer is D. A convex lens, a screen to view the image, a scale to measure distances and holders for lens and screen are all required in the determination of focal length of convex mirror.

A18. Answer is D. We will be able to see the image of the tree in the mirror.

A19. Correct Option:

In distant-object method, the object should be far away (at infinity) from the mirror; only then the light rays coming from the object will be parallel to the principal axis and the image will be formed at the principal focus. The distance between the mirror and the screen gives the focal length. Also the object should be well illuminated (i.e. bright); only then a well defined image will be formed. So the correct answer is B: a well-illuminated distant building.

A20.

a. Since all the elements in a group have the same number of valence electrons they exhibit similar properties to one another.

b. Similarly elements in the same period have different valence electrons and hence they exhibit different properties.

A21. a. Group 16 or (VI)

b. 3rd period

c. 6 valence electrons

d. Two possibilities - +6 or -2

A22. Advantages of vegetative propagation:

- 1) To produce exact copies of the parent plant with desired characters.
- 2) To propagate the plants which do not produce viable seeds.
- 3) For proper transferring of characteristics from parent plant to the progeny.

Sugarcane, Potato, Ginger are few examples of the plants which are vegetatively propagated.

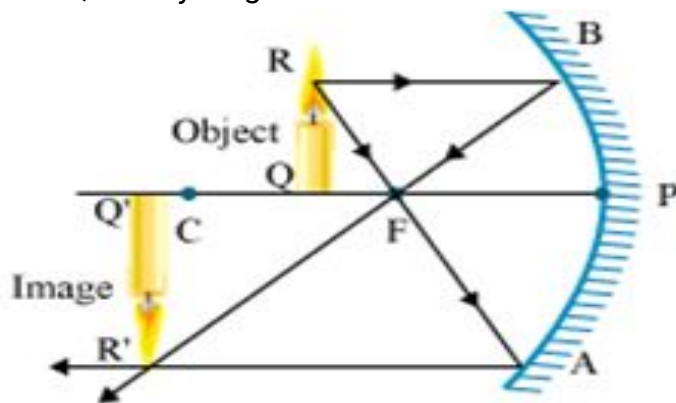
A23. The placenta is a connective tissue established between foetus and the mother. It provides a large surface area for the nutrients and oxygen to pass from mother to the embryo.

It also plays a critical role in transferring the waste generated in the embryo to the mother's blood that undergoes purification.

A24. The two rays that can be used to locate an image are:

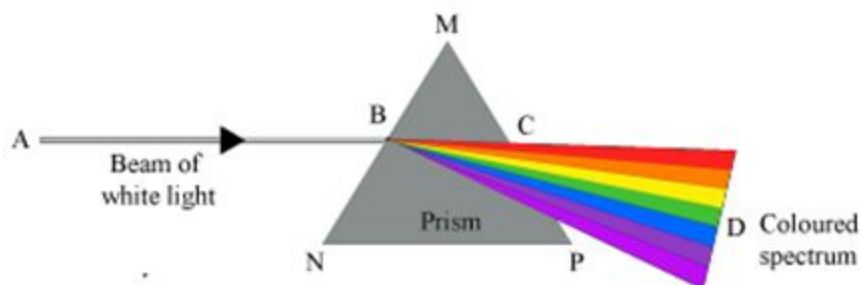
- (i) a ray parallel to the principal axis of the concave mirror after reflection will pass through the principal focus;
- (ii) a ray passing through the principal focus will emerge parallel to the principal axis after reflection.

If the object is placed between the center of curvature and the focus of a concave mirror, the ray diagram will look like this.



A25. The sky appears blue during daytime. The scattering of blue component of the white sun light by air molecules present in the atmosphere causes the blue colour of sky. The air molecules and other fine particles in the atmosphere have size smaller than the wavelength of visible light. When sunlight passes through the atmosphere, the fine particles in air scatter the blue colour (shorter wavelengths) more strongly than red. The scattered blue light enters our eyes. That is why sky appears blue.

A26. When a ray of light falls on a prism, refraction occurs and different components of white light travel with different speeds through the glass prism. Hence a set of seven colours appear as a patch on the screen kept on the other side of the prism.



A27. Fossil fuels with constituents like carbon, hydrogen, nitrogen and sulphur, on combustion, release water, carbon dioxide, oxides of nitrogen and sulphur.

These in turn form greenhouse gases in the atmosphere.

Increased levels of carbon dioxide and other greenhouse gases in atmosphere are the major causes of global warming.

Global warming causes melting of polar ice caps.

A28. There are mainly three types of problems that arise due to construction of a big dam. They are Social problems, Environmental problems and Economic problems.

Social problems - People lose their habitat to live in. People lose their livelihood.

Environmental problems - Destruction of forests an excess loss of wildlife. Enormous damage is caused to aquatic life.

Economic problems - Lot amount of investment is made readily, which fetches economic gains after a long time.

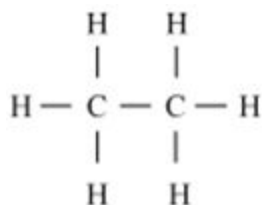
The above problems can be overcome by relocating the people who lose their habitat, providing employment for them and afforestation.

A29. Compounds that are formed by hydrogen and carbon are called hydrocarbons.

Saturated hydrocarbon: Compounds of carbon and hydrogen that contain only carbon-carbon single bonds are known as saturated hydrocarbons.

General formula of alkane is C_nH_{2n+2}

Example: Ethane - C_2H_6



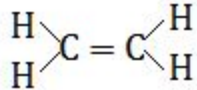
(ii) Unsaturated Hydrocarbons - Compounds of carbon and hydrogen that contain atleast one double covalent bond or a triple covalent bond between carbon atoms are called unsaturated hydrocarbons.

Alkenes and Alkynes are comes under unsaturated hydrocarbons

General formula of alkene - C_nH_{2n}

Example:

Ethene C_2H_4



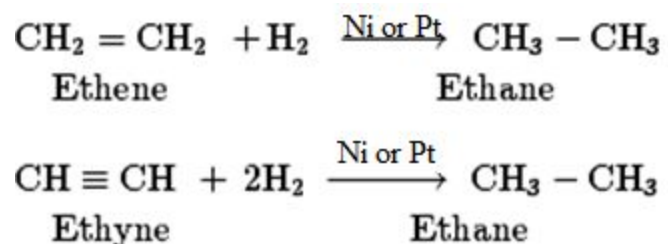
General formula of alkyne - C_nH_{2n-2}

Example:

Ethyne C_2H_2 whose structural formula is $\text{H}-\text{C} \equiv \text{C}-\text{H}$

An unsaturated hydrocarbon is made to saturated hydrocarbon by doing addition reaction with hydrogen in the presence of a catalyst.

For example Ethene And Ethyne are converted into Ethane by reacting with hydrogen in the presence of Ni or Platinum catalyst.



A30. Detergents are ammonium or sulphonate salts of long chain carboxylic acids.

The main advantages of Detergents are

- (a) Detergents work better in hard water
- (b) Detergents can clean better than soap

Demerits of detergents

- (i) Detergents are not biodegradable.
- (ii) As the detergents are non biodegradable they cause environmental pollution like water and soil pollution.

One major advantage of detergents is that it is an alternative to soap when washing has to be done with hard water. As far as detergents are concerned the charged end of the compounds do not form insoluble precipitates with the calcium and magnesium ions that are present in the hard water. Hence, they are useful when washing with hard water.

A31. Inherited characters are those which are transmitted from one generation to another. i.e Parents transmit certain characters to their offspring.

Acquired characters are the changes produced in an individual as a response to the environment. These acquired characters are not purposefully inherited.

Acquired characters are not exactly passed on to next generation.

Example of inherited character - Shape of nose. shape of the nose can be inherited by the offspring from one of its parents.

Example of acquired characteristic - Malfunctioning of kidney affected by disease. This character present in the parent need not be passed on to the child.

A32. Formation of fossils is called as fossilisation. Fossils are in one way a glimpse to the history of the earth in terms of what animals and plants existed many years ago.

The quick burial of plant and animal remains in moist sediments that are acted over by particular pressure and temperature results in the formation of fossils.

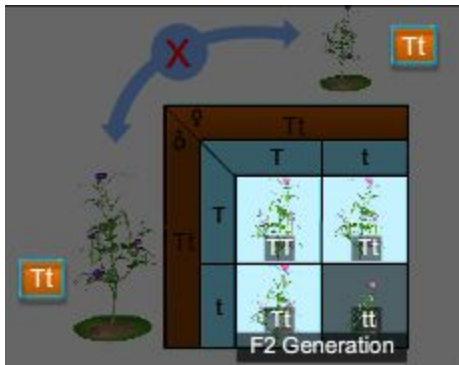
The age of fossils can be identified either by determining the layer in which the fossil is found or by the technique of radiocarbon dating.

A33. In this condition, tall pea plant is crossed with dwarf pea plant.

(a) In monohybrid cross, the F_1 generation were all tall plants. F_2 had tall plants and dwarf plants.



(b) When the plants in the F_1 generation were crossed again, there were short plants in the F_2 generation in the ratio 3:1. The genes consisting of hereditary information were being passed on from one generation to the other.



(c) There were no dwarf plants in the F_1 generation while there were dwarf plants in the F_2 generation.

A34. Given: Object height $h = 5$ cm

Focal length of convex lens $f = 12$ cm

Object distance $u = -8$ cm

Lens formula is given by

$$\frac{1}{v} - \frac{1}{u} = \frac{1}{f}$$

$$\frac{1}{v} - \frac{1}{-8} = \frac{1}{12}$$

$$\Rightarrow v = -24 \text{ cm}$$

The image is formed on the same side of the convex lens as the object, at a distance of 24 cm.

Magnification $m = \frac{h'}{h} = \frac{v}{u}$

$$\frac{h'}{5} = \frac{-24}{(-8)} = 3$$

$$\Rightarrow h' = 15 \text{ cm}$$

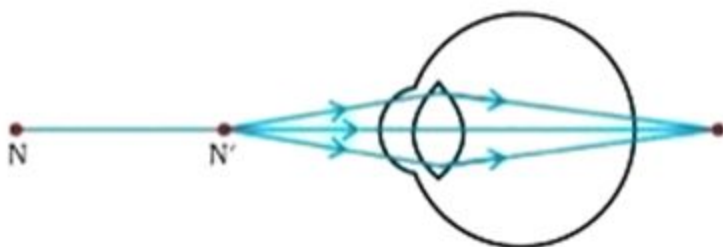
Magnification is positive. The image formed is erect and virtual.

The image is enlarged as its height is 3 times that of the object height.

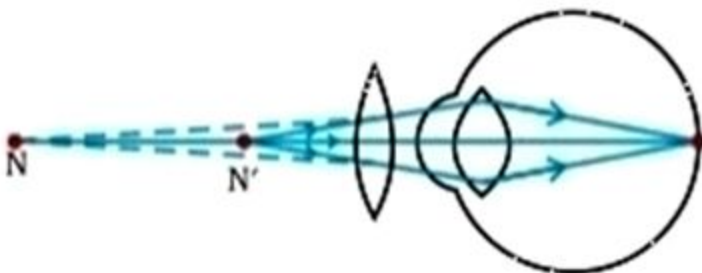
A35. A concave mirror is used as a reflector in the headlights of vehicles because it produces a strong parallel beam of light when the bulb is placed at its principal focus. In case of a rear view mirror, the primary need is to give as wide a view to the driver as possible. Hence a convex mirror is used for that. It also gives an image that is erect.

A36. The old man is suffering from presbiopia. It is the defect of vision due to which an old person cannot see nearby objects clearly due to loss of power of accommodation of the eye. This defect can be corrected by wearing eye-glasses with converging (convex) lenses of appropriate focussing power. The ray diagrams for the (i) defect of vision and (ii) for its correction, respectively, are given below.

Condition where presbyopia exists



Condition for resolving presbyopia



A37. We need to use an oxidising agent like alkaline KMnO_4 (potassium permanganate) or $\text{K}_2\text{Cr}_2\text{O}_7$ (acidified potassium dichromate) for oxidising alcohols.

To differentiate between ethanol and ethanoic acid.

(i) Litmus test - Ethanol will have no effect on the litmus paper. Ethanoic acid will change blue litmus paper into red.

(ii) Reaction with sodium hydrogen carbonate - Ethanol has no reaction with sodium hydrogen carbonate (NaHCO_3) but in the case of Ethanoic acid it reacts with NaHCO_3 which gives CH_3COONa , CO_2 and H_2O . The reaction is evident as the carbon dioxide will turn the lime water milky.

A38. (a) Oral contraceptives - Fertilisation is prevented by preventing eggs from being released. This is achieved by using oral drugs or tablets.

(b) Barrier method - Fertilisation is prevented by using barriers to avoid contact between the penis of males and vagina of females. Condoms act as barriers to prevent fertilisation.

(c) Implants and surgical methods - Planting contraceptive devices like copper-t and loop in uterus is also used as a contraception method. Surgical methods like vasectomy and tubectomy also prevent fertilisation. Vasectomy is done to block sperms from being transferred by blocking vas deferens. Tubectomy is when fallopian tubes are blocked preventing release of eggs to uterus.

A39. All these elements belong to the third period and among them Na has the largest atomic radius.

As we move from left to right in a period the nuclear charge increases and it pulls the electrons closer to the nucleus. This increased attraction will cause the atomic size to reduce.

Since Al is smaller in size it has higher attractive force and hence tends to hold the electron together with a stronger force.

A40. The Cartesian sign conventions are as follows.

(i) The object is always placed to the left of the mirror, i.e. the light from the object falls on the mirror from the left-hand side.

(ii) All distances parallel to the principal axis are measured from the pole of the mirror. (The principal axis is taken along the x-axis with pole as the origin.)

(iii) All the distances measured to the right of the pole are taken as positive while those measured to the left of the pole are taken as negative.

(iv) Distances measured perpendicular to and above the principal axis are taken as positive.

(v) Distances measured perpendicular to and below the principal axis are taken as negative.

Object distance $u = -18$ cm

Magnification $= 1/3 = -v/u$

$\Rightarrow v = 6$ cm (image distance)

v is positive and hence the image is formed on the other side of the mirror.

So we have a diminished erect virtual image at the back of the mirror. So the mirror is a convex mirror.

Now let us use the mirror formula to calculate the focal length.

Mirror formula:

$$\frac{1}{v} + \frac{1}{u} = \frac{1}{f}$$

$$\frac{1}{6} + \frac{1}{-18} = \frac{1}{f}$$

$$\Rightarrow f = 9 \text{ cm.}$$

(The positive focal length confirms that the mirror is convex.)

OR

The bending of a light ray when it travels from one transparent medium to another is called refraction. Refraction is due to change in the speed of light that occurs when it enters from one transparent medium to another. The speed of light in a medium is dependent on the refractive index of the medium. The speed of light is higher in a rarer medium (medium with lower refractive index) than in a denser medium (medium with greater refractive index). Thus, a ray of light travelling from a rarer medium to a denser medium slows down and bends towards the normal. When it travels from a denser medium to a rarer medium, it speeds up and bends away from the normal. Snell's law states that the ratio of the sine of the angle of incidence to the sine of angle of refraction is a constant.

Mathematically it can be expressed as follows:

$$\sin i \sin r = \text{constant} = \frac{1}{n_{ab}}$$

where n_{ab} is the refractive index of medium B with respect to medium A.

The refractive index of air with respect to glass is $\frac{2}{3}$ and the refractive index of water with respect to air is $\frac{4}{3}$. If the speed of light in glass is 2×10^8 m/s, find the speed of light in (a) air, (b) water.

(i) Given: Refractive index of air with respect to glass $n_{ag} = \frac{2}{3} = \frac{v_g}{v_a}$

$$\text{Speed of light in glass } v_g = 2 \times 10^8 \text{ m/s}$$

$$\text{Therefore } v_a = v_g n_{ag} = 2 \times 10^8 \text{ m/s} / (\frac{2}{3})$$

$$= 3 \times 10^8 \text{ m/s}$$

$$\text{Speed of light in air} = 3 \times 10^8 \text{ m/s}$$

(ii) Refractive index of water with respect to air $n_{wa} = \frac{4}{3} = \frac{v_a}{v_w}$

$$\text{Therefore } v_w = 3 \times 10^8 \text{ m/s} / (\frac{4}{3})$$

$$= 2.25 \times 10^8 \text{ m/s.}$$

$$\text{Speed of light in water} = 2.25 \times 10^8 \text{ m/s}$$

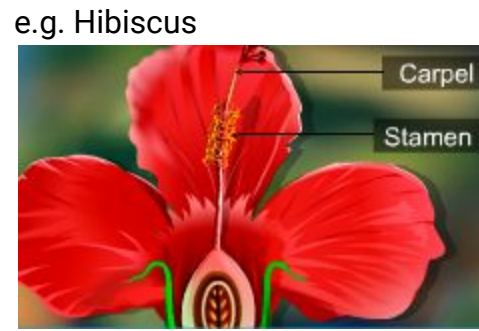
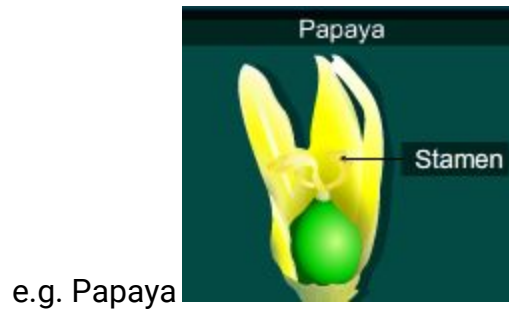
A41. Flowers are the reproductive organs in plants. They can be unisexual or bisexual.

Unisexual Flower

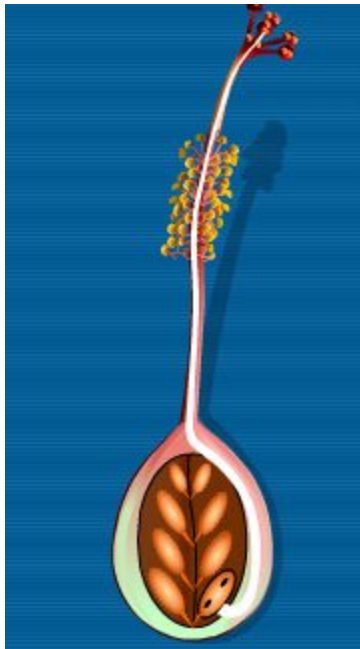
Bisexual Flower

The flower with reproductive parts of either of sex. i.e male or of female

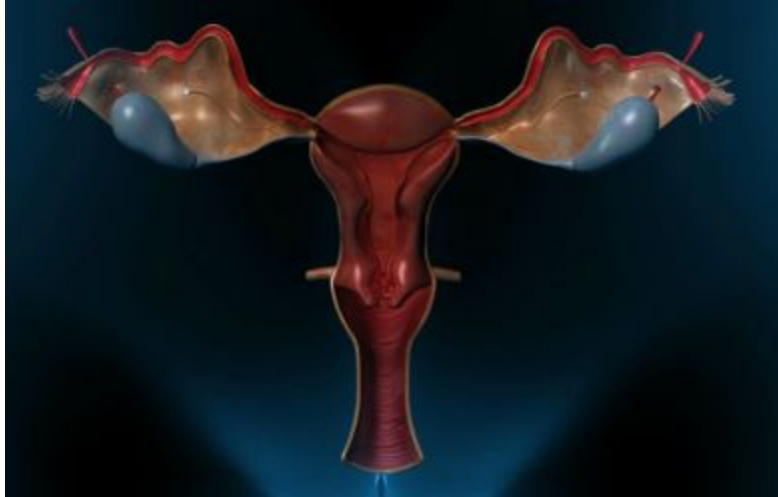
The flower with reproductive parts of both the sexes



Germination of Pollen grain on stigma



OR



(i) Ovary - The organ that produces eggs.

(ii) Fallopian tube - The place where fusion of egg and sperm take place.

(iii) Uterus - The place where zygote is implanted.

A42. The uterus in its regular biological process, prepares itself to receive the fertilised egg. The inner lining becomes thick and has rich supply of blood to nourish the fertilised egg, once it has received. In case it doesn't receive the fertilised egg, the uterus lining is released in the form of blood and mucus through the vagina. This is a 2 - 8 day process called menstruation.

CBSE Science 2011

Question Paper (as it is) -

General Instructions:

1) All questions are compulsory.

The question paper consists of 42 questions divided into 4 sections A, B, C and D.

2) Section A comprises questions of 01 mark each, Section B comprises questions of 02 marks each, Section C comprises questions of 03 marks each and Section D comprises questions of 05 marks each.

3) All questions in Section A are to be answered in one word, one sentence or as per the exact requirement of the question.

4) There is no overall choice. However, internal choice has been provided wherever necessary. You have to attempt only one of the alternatives in all such questions.

5) In question on construction, drawing should be neat and exactly as per the given measurements.

6) Use of calculators is not permitted

SECTION A

- Q.1. What are the various steps in a food chain called?
- Q.2. What is the important function of the presence of ozone in earth's atmosphere?
- Q.3. Write the electron dot structure of ethane molecule, C_2H_6 .
- Q.4. What makes the earth's atmosphere a heterogeneous mixture?
- Q.5. A student was given two permanent slides, one of binary fission in amoeba and another of budding in yeast. He was asked to identify any one difference in the nucleus of the two. One such difference he identified correctly was

Options:

1. Presence of one nucleus in amoeba, two in yeast cell and one in bud.
 2. Presence of two nuclei in centrally constricted amoeba, one in yeast cell and one in its bud.
 3. Presence of two distant nuclei in amoeba, one in yeast cell and two in bud.
 4. Presence of a single nucleus each in amoeba, yeast cell and its attached bud.
- Q.6. Binary fission is observed in which one of the following figures? Options:
1. A
 2. B
 3. C
 4. D

Q.7. To determine the percentage of water absorbed by raisins, raisins are soaked in water for:

Options:

1. 30 seconds
2. 10 minutes
3. 2 to 3 hours
4. 24 hours

Q.8. Raisins are wiped off gently before final weighing with help of

Options:

1. a filter paper
2. a cotton piece
3. a cloth piece
4. a polythene piece

Q.9. The step(s) necessary for determining the percentage of water absorbed by raisins is/are:

Options:

1. Raisins should be completely immersed in water
2. Raisins should be soaked in water for sufficient time
3. Gently wipe dry the soaked raisins
4. All of the above steps.

Q.10. Rahim recorded the following sets of observations while tracing the path of a ray of light passing through a rectangular glass slab for different angles of incidence. The correct observation is recorded at serial number:

Options:

1. I
2. II
3. III
4. IV

Q.11. Four students A, B, C and D traced the paths of incident ray and the emergent ray by fixing pins P and Q for incident ray and pins R and S for emergent ray for a ray of light passing through a glass slab. The correct emergent ray was traced by the student:

Options:

1. A
2. B
3. C
4. D

Q.12. Mohan obtained a sharp inverted image of a distant tree on the screen placed behind the lens. He then moved the screen and tried to look through the lens in the direction of the object. He would see:

Options:

1. A blurred image on the wall of the laboratory.
2. An erect image of the tree on the lens.
3. No image as the screen has been removed
4. An inverted image of the tree at the focus of the lens.

Q.13. For finding the focal length of a convex lens by obtaining the image of a distant object, one should use it as the object.

Options:

1. A well lit distant tree
2. Window grill in the classroom
3. Any distant tree
4. A lighted candle kept at the other end of the table.

Q.14. To find the focal length of a concave mirror Rahul focuses a distant object with this mirror. The chosen object should be:

Options:

1. A tree
2. A building

3. A window

4. The sun

Q.15. The colour of an aqueous solution of zinc sulphate as observed in the laboratory is:

Options:

1. Green

2. Yellow

3. Blue

4. Colourless

Q.16. To show that zinc is a more active metal than copper, the correct procedure is to:

Options:

1. Add dilute nitric acid on strips of both the metals.

2. Observe transmission of heat through strips of zinc and copper.

3. Prepare solution of zinc sulphate and hang strip of copper into it.

4. Prepare solution of copper sulphate and hang strip of zinc into it.

Q.17. Acetic acid smells like:

Options:

1. A banana

2. Vinegar

3. An orange

Q.18. Acetic acid solution turns:

Options:

1. Blue litmus red

2. Red litmus blue

3. Blue litmus colourless

4. Red litmus colourless

Q.19. On adding NaHCO_3 to acetic acid, a gas is evolved which turns lime water milky due to the formation of:

Options:

1. Calcium bicarbonate
2. Calcium hydroxide
3. Calcium carbonate
4. Calcium acetate

Q.20. A yeast cell in which budding occurs was seen to have:

Options:

1. one bud cell
2. two bud cell
3. three bud cell
4. a chain of bud cells

SECTION B

Q.21. List any four characteristics of a good fuel.

Q.22. What are non-renewable resources of energy? Give two examples of such resources.

Q.23. (i) How do you calculate the possible valency of an element from the electronic configuration of its atoms?

(ii) Calculate the valency of element X whose atomic number is 9.

Q.24. On the basis of electronic configuration, how will you identify the first and the last element of a period?

Q.25. State the two laws of reflection of light.

Q.26 The stars appear higher from the horizon than they actually are. Explain why it is so.

Q.27 Explain why the planets do not twinkle but the stars twinkle.

Q.28 Write any two differences between binary fission and multiple fission in a tabular form as observed in cells of organisms.

Q.29 Why is DNA copying an essential part of the process of reproduction?

Q.30 a) In a tabular form, differentiate between ethanol and ethanoic acid under the following heads:

(i) Physical state

(ii) Taste

(iii) NaHCO_3 test

(iv) Ester test

(b) Write a chemical reaction to show the dehydration of ethanol.

Q.31. (a) What is a soap? Why are soaps not suitable for washing clothes when the water is hard?

(b) Explain the action of soap in removing an oily spot from a piece of cloth.

SECTION C

Q.32. Explain the terms:

(i) Speciation

(ii) Natural selection

Q.33. Explain how equal genetic contribution of male and female parents is ensured in the progeny.

Q.34. Out of HCl and CH_3COOH , which one is a weak acid and why? Describe an activity to support your answer.

Q.35. Two elements X and Y belong to group 1 and 2 respectively in the same period of periodic table. Compare them with respect to:

(i) the number of valence electrons in their atoms

(ii) their valencies

(iii) metallic character

(iv) the sizes of their atoms

(v) the formulae of their oxides

(vi) the formulae of their chlorides

Q.36. Draw the ray diagram and also state the position, the relative size and the nature of the image formed by a concave mirror when the object is placed at the centre of curvature of the mirror.

Q.37. (i) "The refractive index of diamond is 2.42". What is the meaning of this statement?

(ii) Name a liquid whose mass density is less than that of water but it is optically denser than water.

Q.38. What is hypermetropia? Describe with a ray diagram how this defect of vision can be corrected by using an appropriate lens.

Q.39.

(a) List two sexually transmitted diseases in each of the following cases:

(i) Bacterial infections

(ii) Viral infections

(b) How may the spread of such diseases be prevented?

Q.40. Explain Mendel's law of independent inheritance. Give one example.

SECTION D

Q.41. (a) If the image formed by a lens is diminished in size and erect, for all positions of the object, what type of lens is it?

(b) Name the point on the lens through which a ray of light passes undeviated.

(c) An object is placed perpendicular to the principal axis of a convex lens of focal length 20 cm. The distance of the object from the lens is 30 cm. Find (i) the position (ii) the magnification and (iii) the nature of the image formed.

Q.42.

(a) Draw a diagram of the longitudinal section of a flower and label it sepal, petal, ovary and stigma.

(b) Write the names of male and female reproductive parts of a flower.

OR

(a) What is fragmentation in organisms? Name a multicellular organism which reproduces by this method.

(b) What is regeneration in an organism? Describe regeneration in planaria with the help of a suitable diagram.

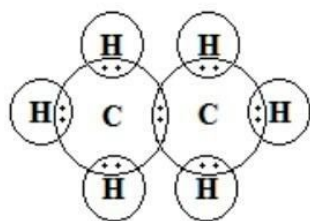
CBSE Science 2011

Solutions –

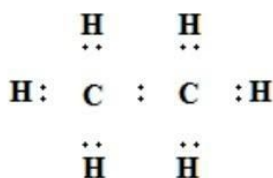
A1. The individual steps in a food chain are known as trophic levels.

A2. The ozone layer in the atmosphere acts as a protective layer preventing the entry of harmful UV rays into the earth's atmosphere.

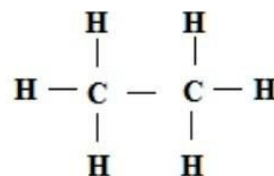
A3.



Structure of Ethane molecule



Electron dot structure of Ethane molecule



Structural formula of Ethane

A4. The earth's atmosphere is heterogeneous as it is a combination of different gases in different proportions.

Nitrogen - 78%

Oxygen - 21%

Argon - 0.93%

Carbon dioxide - 0.03%

Other gases - 0.04%

A5. Correct Option: Nucleus divides completely before the cell divides in the amoeba. Nucleus after division is distributed among the parent cell and its bud.

A6. Correct Option: A

A7. Correct Option: 2 to 3 hours

A8. Correct Option: a filter paper

A9. Correct Option: All of the above steps.

A10. Correct Option:

When a light ray travels from a rarer medium to a denser medium, the refracted ray bends towards the normal. When a light ray travels from a denser medium to a rarer medium, the refracted ray bends away from the normal. So the incident ray, after passing through the glass slab, emerges with a lateral shift called emergent ray. The emergent ray is parallel to the incident ray.

A11. Correct Option:

When a light ray travels from a rarer medium to a denser medium, the refracted ray bends towards the normal. When a light ray travels from a denser medium to a rarer medium, the refracted ray bends away from the normal and $\angle i = \angle e$ and $\angle r < \angle i$ in case of the light ray refracted through a rectangular glass prism.

A12. Correct Option:

Answer is D

A13. Correct Option:

The image of a distant object is formed at the focus of the convex lens, So a well lit distant tree is suitable for finding the focal length of a convex lens by obtaining the image of a distant object.

A14. Correct Option:

The image of a distant object is formed at the focus of the concave mirror, So the sun is suitable for finding the focal length of a concave mirror by obtaining the image of a distant object.

A15. Correct Option:

Zinc sulphate solution is colorless.

A16. Correct Option:

Prepare a solution of copper sulphate and hang strips of zinc into it. Observe the color change. The blue color copper sulphate solution turns into colorless solution and Cu metal is deposited.

A17. Correct Option:

To recall the physical properties of acetic acid

A18. Correct Option:

Acetic acid solution turns blue litmus to red

A19. Ethanoic acid reacts with bicarbonates with the release of carbon dioxide gas. The CO_2 gas when passed through freshly prepared lime water turns it milky due to the formation of calcium carbonate.

A20. Correct Option:

After the completion of one budding process, yeast has one bud attached to it.

A21. Good fuel should have the following characteristics:

- a. Low ignition temperature
- b. Storage and transportation of the fuel should be easy
- c. The fuel should burn completely without leaving behind any residue
- d. The fuel should be available at cheap cost

A22. Non-renewable resources of energy are those whose consumption rate is very much higher than the replenishment rate.

The energy resources that are consumed at a rate faster than the rate at which they are replenished are called Non-renewable resources of energy.

Examples: Petroleum, natural gas.

A23.

(i) The combining power of an atom is called its valency is defined as the number of unpaired electrons in the outermost shell of the atom.

Valency = number of unpaired electrons in the outermost shell of the atom known as valence electrons if valence electrons is less than or equal to 4.

Valency = $8 - \text{number of valence electron}$, if number of valence electrons is more than 4

(ii) Electronic configuration of element X = 2,7

From this we can see that valence electrons = 7

Hence valency = $8 - 7 = 1$

A24. In the period the first element has 1 valence electron and the last element in the period has 8 valence electrons.

A25. First law:

The angle of incidence is equal to the angle of reflection.

Second law:

The incident ray, reflected ray and the normal all will lie on the same plane.

A26. It is because of refraction. The light from the stars are refracted towards the normal by the atmosphere and hence the stars appear higher from horizon than they actually are. This position too changes.

A27. Stars appear as small point size sources of light and they twinkle because of the refraction of the light from the stars by the atmosphere.

Planets appear as circular objects as they are nearer to the earth than the stars. The light from the planets is not blocked completely, even if light from one point is blocked, the other parts of the planet will be visible and hence planets do not twinkle.

A28. i) Binary Fission

The process results in the formation of two cells from a single cell.

The process can occur either longitudinally or in any plane

ii) Multiple fission

The process results in the formation of many cells from a single cell

The process can occur only in one plane.

A29. DNA copying is important because when cells multiply to form new cells, equal quantities of DNA are passed on to the new cell after the process of cell division.

DNA is the hereditary material that stores information for the next generation in the form of code made up of different combinations of four nitrogenous bases (Adenine, Thymine, Guanine and Cytosine). Hence, it plays an important role in the process of reproduction.

A30.

A25. S.NO	Property	Ethanol	Ethanoic acid
i)	Physical state	Liquid with pleasant smell	Liquid with pungent smell
ii)	Taste	Bitter	Sour
iii)	NaHCO ₃ test	No reaction	Carbondioxide gas is evolved when ethanoic acid reacts with sodium hydrogen carbonate
iv)	Esterification	Ester is produced when ethanol reacts with ethanoic acid	Ester is produced when ethanoic acid reacts with ethanol



b) Ethanol Ethene

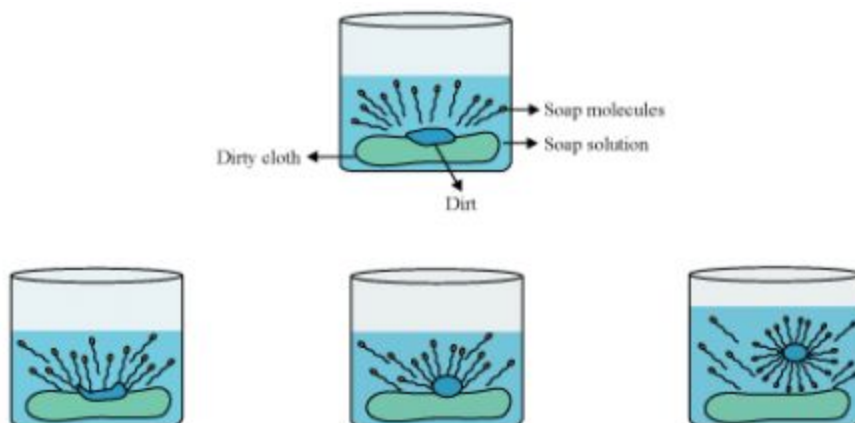
A31. a) Soaps are salts of sodium or potassium of higher fatty acids.

Examples: stearic acid, oleic acid and palmitic acid.

The water which does not give lather with soap is called hard water. The hardness of water is due to the presence of magnesium and calcium salts.

When soap is mixed with hard water the calcium and magnesium salts displace the salts of sodium and potassium present in the soap and forms scum which is not soluble. Hence soaps are not effective in hard water for washing clothes.

The cleaning action of soap is due to micelle formation and emulsion formation. Inside water a unique orientation forms clusters of molecules in which the hydrophobic tails are in the interior of the cluster and the ionic ends on the surface of the cluster. This results in the formation of micelle. Soap in the form of micelle cleans the (dirt) oil as the oil will be collected at the centre of micelle. This property of soap makes it an emulsifier. The dirt suspended in micelles is easily rinsed away. This is known as cleaning action of soap



A32. (i) Speciation is an event that splits a population into two independent species which cannot reproduce among them.

Speciation can be categorised into 3 models:-

1. The species that will form new species are in the same geographical location.

2. The species that will form new species are in nearby geographical locations and hence they can move between the locations.

3. The species that will form new species are in geographical locations which are distant from each other and hence the locations are isolated.

(ii) Natural selection is the theory proposed by Charles Darwin. Natural selection is the process by which individuals who are well adjusted in the environment can survive and reproduce better.

A33. DNA in the nucleus of the cell stores the genetic information which is to be transferred to the offspring during reproduction.

Of 23 pairs of chromosomes present in human beings, one pair forms the sex chromosomes. Male chromosomal pair is XY and that of the female is XX.

Male gametes are haploid containing 22+ either X or Y chromosome as their sex chromosome. Female gametes are haploid containing 22+ X as sex chromosome.

On zygote formation, offspring will have 23 pairs of chromosomes in total. The sex chromosomal pair is determined to be XY or XX depending upon which male gamete is fusing with the female gamete.

A34. Weak acids do not dissociate completely into ions in solution and they do not conduct electricity or conduct less amount of electricity. Strong acids dissociate completely into ions in solution and conduct electricity.

CH_3COOH is a weak acid as it does not dissociate completely into ions in solution.

HCl dissociates completely into ions in solution and hence is a strong acid.

Activity:

Take two corks, two nails and 2 beakers. Now fit into each cork. Place these corks in both beakers. Then connect the nails to two different terminals of a battery (6V) to which a bulb and switch are attached.

Then pour dil. HCl in the beaker one turn the switch on.

Pour CH_3COOH in the 2nd beaker and turn the switch on.

Observations:

The bulb glows in the beaker with dilute HCl whereas it does not glow with CH_3COOH .

It can be inferred that:-

HCl dissociates into H^+ and Cl^- ions which conduct electricity when the switch is turned on. Hence the bulb glows.

CH_3COOH does not dissociate completely into ions and so do not conduct electricity. Therefore the bulb does not glow.

This proves that CH_3COOH is a weak acid and HCl is a strong acid.

A.35 (i) Number of valence electrons in

X = 1 and Y = 2

(ii) Valency of

X = 1 and Y = 2

(iii) Metallic character of X is more than Y

(iv) Atomic size of X is more than that of Y

(v) Oxide of X = X_2O and that of Y = YO

(vi) Chloride of X = XCl and that of Y = YCl_2

A.36 When the object is placed at the centre of curvature of the mirror, the image will have following characteristics:-

Position: at centre of curvature

Size: Magnified

Nature of image: Real and inverted

A.37 (i) As we know that the refractive index is the ratio of sine of angle of incidence to sine of angle of refraction, we can say that the ratio of sine of angle of incidence to sine of angle of refraction of the diamond = 2.42, If refractive index of diamond is 2.42

(ii) The liquid whose mass density is less than that of water but it is optically denser than water is kerosene (Refractive index of kerosene = 1.44, refractive index of water = 1.33).

A.38 Hypermetropia is an eye defect where the person can see distant objects clearly but cannot see objects that are near clearly.

Causes of Hypermetropia:

The eyeball has become too short in length

The focal length of the eye lens has become long.

A.39

(a) (i) Gonorrhoea and Syphilis are the two diseases caused by bacteria in human beings.

(ii) Genital Herpes and AIDS are the two diseases caused by viruses in human beings.

(b) Transmission of sexually transmitted diseases can be prevented by:

1. Avoiding sexual acts with multiple partners and infected people.
2. Using condoms.
3. Preventing the sharing of needles and syringes between people.
4. Testing blood before transfusion.
5. Sterilisation of the equipment used in surgery and dental care.
6. To provide additional medical treatment to an unborn baby residing in the womb of a diseased mother.

A.40 Mendel's law of independent inheritance states that when two pairs of characters such as, round and yellow as one pair and wrinkled and green as another pair, are combined to form a hybrid, one pair of characters will get separated and will be independent of the other pair.

Example:

In a dihybrid cross, Mendel crossed two pea plants with Round, Yellow seeds (RRYY) and Wrinkled, Green seeds (rryy).

They produced 4 types of gametes => RY, Ry, rY, ry in F1 progeny.

He observed that all of these are separate and each of them will have a frequency of 25% of the total gametes produced.

F2 progeny exhibited new combinations Round yellow, Wrinkled yellow, Round green, and Wrinkled green in 9:3:3:1 ratio.

A.41 (a) Concave lens

(b) Pole

$$(c) \frac{1}{f} = \frac{1}{v} - \frac{1}{u} \Rightarrow v = \frac{uf}{u + f} \Rightarrow v = \frac{-30 \times 20}{-30 + 20}$$

$$v = \frac{-600}{-10} \Rightarrow v = 60 \text{ cm .}$$

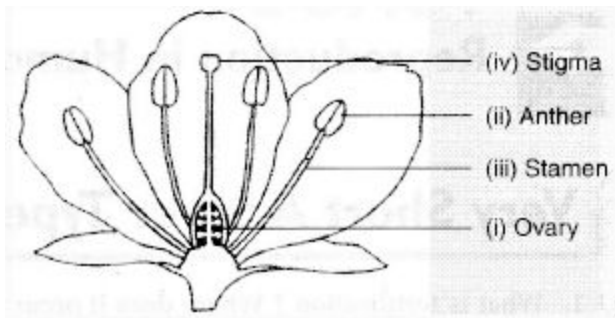
(i) Position = 60 cm on the other side of the optical centre.

(ii) To find magnification:-

$$m = -\frac{v}{u} \Rightarrow m = -\frac{60}{-30} \Rightarrow m = 2$$

(iii) Nature of image = Inverted.

A.42 (a)



(b)

The stamen is the male reproductive part that consists of filament and anther. The anther produces male gametes in the form of pollen grains.

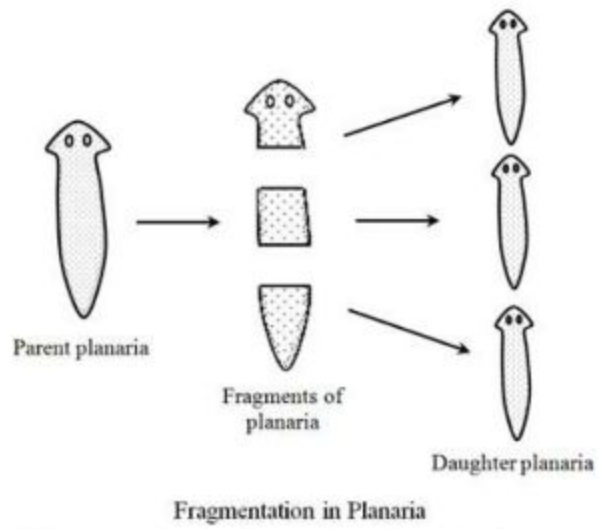
The carpel is the female reproductive organ located at the centre of the flower. It consists of the ovary, style and stigma. The ovary is the swollen part at the bottom of the carpel. Ovary contains the female gametes in the form of eggs.

OR

(a) Fragmentation is one of the asexual method of reproduction. This is the process in which the organism breaks up into smaller pieces on maturation. Each fragment grows into a new individual. e.g. Spirogyra.

(b) Regeneration is a type of asexual reproduction. If the organism is cut up, its pieces can grow into separate individuals. This is possible by specialised cells which rapidly

divide to form new individuals. It occurs in some fully differentiated organisms. Regeneration is also called morphallaxis. e.g. Hydra, Planaria.



CBSE Science 2010

Question Paper (as it is) –

General Instructions:

1) All questions are compulsory.

The question paper consists of 27 questions divided into 4 sections A, B, C and D.

2) Section A comprises questions of 01 mark each, Section B comprises questions of 02 marks each, Section C comprises questions of 03 marks each and Section D comprises questions of 05 marks each.

3) All questions in Section A are to be answered in one word, one sentence or as per the exact requirement of the question.

4) There is no overall choice. However, internal choice has been provided wherever necessary. You have to attempt only one of the alternatives in all such questions.

5) In question on construction, drawing should be near and exactly as per the given measurements.

6) Use of calculators is not permitted.

SECTION A

1. Name the part of our eyes that helps us to focus near and distant objects in quick succession.
2. The outer surface of a hollow sphere of aluminum of radius 50 cm is to be used as a mirror. What will be the focal length of this mirror? Which type of spherical mirror will it provide?
3. What is the nature of the image formed by a concave mirror if the magnification produced by the mirror is + 4?
4. A charged particle enters at right angles into a uniform magnetic field as shown. What should be the nature of charge on the particle if it begins to move in a direction pointing vertically out of the page due to its interaction with the magnetic field?
5. On what basis is a chemical equation balanced?
6. State two characteristic features of carbon which when put together give rise to a large number of carbon compounds.
7. Name the hormone that helps in regulating the level of sugar in our blood. Name the gland that secretes it.

8. A person lives near a forest. Make a list of four items which he can get from the forest to meet his daily needs.
9. Name the green dot like structures in some cells observed by a student when a leaf peel was viewed under a microscope. What is this green colour due to?

SECTION B

10. Write any two observations in an activity which may suggest that a chemical reaction has taken place. Give an example in support of your answer.
11. What are fossil fuels? Write two disadvantages of burning fossil fuels
12. Two coils A and B of insulated wires are kept close to each other. Coil A is connected to a galvanometer while coil B is connected to a battery through a key. What would happen if
 - (i) a current is passed through coil B by plugging the key, and
 - (ii) the current is stopped by removing the plug from the key?

Explain your answer mentioning the name of the phenomena involved.

13. What is a solenoid? Draw the pattern of magnetic field lines of a solenoid through which a steady current flows. What does the pattern of field lines inside the solenoid indicate?
14. What is Hypermetropia (far sightedness)? Draw a ray diagram to show how this defect can be corrected using a lens.

15. Mention any four limitations in harnessing wind energy on a large scale.
16. Write the names and symbols of two most reactive metals belonging to group 1 of the periodic table. Explain by drawing electronic structure how either one of the two metals reacts with a halogen. With which name is the bond formed between these elements known and what is the class of the compound so formed known? State any four physical properties of such compounds.
17. What is meant by refining of metals? Name the most widely used method of refining impure metals produced by various reduction processes. Describe with the help of a labelled diagram how this method may be used for refining of copper.
18. What is phototropism? Describe an activity to demonstrate phototropism.
19. List any two differences between pollination and fertilisation.
20. Give one example for each of characters that are inherited and the ones that are acquired in humans. Mention the difference between the inherited and the acquired characters.

SECTION C

21. At what distance should an object be placed from a lens of focal length 25 cm to obtain its image on a screen placed on the other side at a distance of 50 cm from the lens? What will be the magnification produced in this case?
22. Atoms of eight elements A, B, C, D, E, F, G and H have the same number of electronic shells but different number of electrons in their outermost shell. It was found that elements A and G combine to form an ionic compound. This compound is added in a small amount to almost all vegetable dishes during cooking. Oxides of elements A and B are basic in nature while those of E and F are acidic. The

oxide of D is almost neutral. Based on the above information answer the following questions:

- (i) To which group or period of the periodic table do the listed elements belong?
- (ii) What would be the nature of compound formed by a combination of elements B and F?
- (iii) Which two of these elements could definitely be metals?
- (iv) Which one of the eight elements is most likely to be found in gaseous state at room temperature?
- (v) If the number of electrons in the outermost shell of elements C and G be 3 and 7 respectively, write the formula of the compound formed by the combination of C and G.

23. No chemical reaction takes place when granules of a solid, A, are mixed with the powder of another solid, B. However when the mixture is heated, a reaction takes place between its components. One of the products, C, is a metal and settles down in the molten state while the other product, D, floats over it. It was observed that the reaction is highly exothermic.

- (i) Based on the given information make an assumption about A and B and write a chemical equation for the chemical reaction indicating the conditions of reaction, physical state of reactants and products and thermal status of reaction.
- (ii) Mention any two types of reactions under which above chemical reaction can be classified.

24. Name the functional group of organic compounds that can be hydrogenated. With the help of suitable example explain the process of hydrogenation mentioning the conditions of the reaction and any one change in physical property with the formation of the product.

- Name any one natural source of organic compounds that are hydrogenated.
25. How is ozone formed in the higher level of atmosphere? "Damage to the ozone layer is a cause of concern". Justify this statement.
26. Write the full form of DNA. Name the part of the cell where it is located? Explain its role in the process of reproduction of the cell.
27. Derive the expression for the heat produced due to a current 'I' flowing for a time interval 't' through a resistor 'R' having a potential difference 'V' across its ends. With which name is the relation known? How much heat will an instrument of 12W produce in one minute if it is connected to a battery of 12V?

OR

- Explain with the help of a labelled circuit diagram how you will find the resistance of a combination of three resistors, or resistance R₁, R₂ and R₃, joined in parallel. Also mention how you will connect the ammeter and the voltmeter in the circuit when measuring the current in the circuit and the potential difference across one of the three resistors of the combination.
28. Explain the process of digestion of food in the mouth, stomach and small intestine in the human body.

OR

- (a) List the three events that occur during the process of photosynthesis. Explain the role of stomata in this process.
- (b) Describe an experiment to show that "sunlight is essential for photosynthesis".

CBSE Science 2010

Solutions –

1. Eye lens
2. Focal length of a spherical mirror = $\frac{1}{2}$ of radius
Hence focal length = 50 cm = 25 cm
The type of spherical mirror = convex mirror
3. Erect, virtual image which is 4 times to the size of the object.
4. Positive charge.
5. The balancing of the chemical equation is based on law of conservation of mass.
The equation is balanced such that left side of the equation and the right side of the equation will have equal number of atoms of each element.
6. State two characteristic features of carbon which when put together give rise to a large number of carbon compounds.
7. The hormone that helps in regulating level of sugar in our blood - Insulin. The endocrine gland that secretes insulin - Pancreas.
8. The person living near a forest can live comfortably by obtaining his food (fruits, vegetables, honey), firewood, medicines, latex (rubber), gum etc. from the same.
9. A section cutting of a leaf, when observed under microscope exhibits green colour structures in many of the cells. These are chloroplasts. The green colour is because of the pigment chlorophyll they contain, which is green.
10. We can know that a chemical reaction has taken place if:-
 - (a) Any gas has evolved
 - (b) Change in temperature has taken place

Example:-

In the above reaction, CO₂ is evolved which shows that a reaction has taken place

A large amount of heat is produced in the above reaction. Since there is a change in temperature, it confirms that a chemical reaction has taken place.

11. Fossil fuels are hydrocarbons formed by plants and animals which have been buried in the earth for a long time under special temperature and pressure. e.g. Natural gas, coal, petroleum etc.

Disadvantages of burning fossil fuels:

1. Combustion of fossil fuels release lot of smoke.

2. Burning of fossil fuels releases lot of gases such as nitrogen dioxide and sulphur dioxide which combine with rain water to form acid rain.

12. (i) The galvanometer shows a deflection as current passes through coil A due to the mutual induction.

(ii) In this case also galvanometer shows deflection, but it would be in the opposite direction as current passes through coil A in the opposite direction.

The phenomenon is called electromagnetic induction

When there is a change of current flow in coil B, it produces a change in magnetic field around coil B as well as coil A which is kept near coil B.

In (i), current through B changes suddenly from 0 to maximum, whereas in (ii), it changes from maximum to zero at once. In both the cases, there is a change in magnetic field around coil B and hence this causes current flow in coil A.

13. A solenoid is a coil made up of either insulated or enamelled wire which can conduct electricity (usually copper) wound in the shape of a cylinder. It is used to produce magnetic fields when electricity is passed through the wire

The pattern of the field lines inside the solenoid indicate that the magnetic field has the same strength in all places inside the solenoid.

14. Hypermetropia is an eye defect where the person can see distant objects clearly but cannot see the nearer objects clearly.

To correct the defect:

Hypermetropia can be corrected by using a suitable convex lens .

15. 1.Land should be available at a large scale to set up windmills

2.Initial cost to set up the wind mills is very high

3.To harness wind energy, the speed of the wind must be minimum 15 km/hr

4.Wind mills and plants to produce wind energy can be set up only where there is high speed wind blowing for the majority of the year.

16. Sodium and Potassium are the two most reactive elements in group 1.

Sodium- Na

Potassium - K

The above reaction takes place between Na and Cl as Na ion is positively charged and will attract the negatively charged Cl ions.

Bond formed between these elements is electrostatic bond otherwise known as ionic bond

The compound formed is sodium chloride. It is ionic compound.

Ionic compounds have following physical properties:-

1.High boiling point and high melting point.

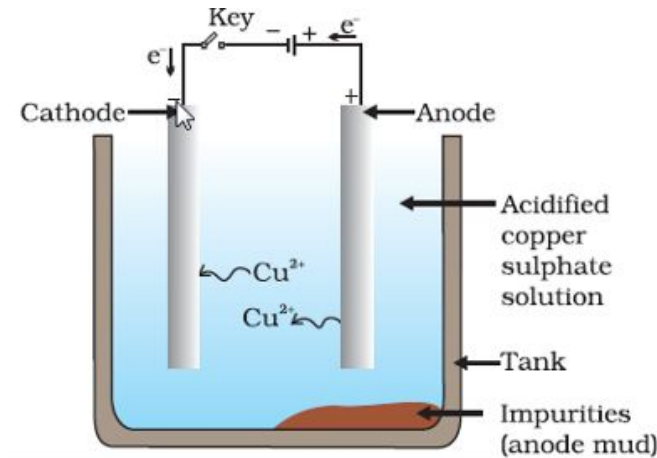
2.They are solids.

3.When ionic compounds are in molten state, they conduct electricity

4.They dissolve in polar solvents and do not dissolve in non-polar solvents.

17. Refining is the process used for extracting pure metals from impure metals

Most widely used method : Electrolytic refining



The diagram given above shows the electrolytic refining of copper

Cathode = pure metal, thin strip

Anode = impure metal, big block

Electrolyte = copper sulphate solution(acidified)

Pass electricity through the electrolyte. The positive metal ions in the copper sulphate solution, Cu^{2+} , are attracted towards the cathode and hence move towards the cathode. They gain electrons from cathode and as a result Cu gets deposited on the cathode. As the process keeps repeating for some time, the size of the cathode block increases.

Meanwhile the anode discharges ions into the electrolyte solution when the positive charges move towards cathode. The anode keeps becoming thinner as the process keeps repeating for some time.

Thus the pure metal is deposited on the cathode. The soluble impurities from anode move into the solution and insoluble impurities, known as anode mud, settle down in the container and are found in the bottom of the container.

18. The movement by growth exhibited by plants towards light as stimulus is called as phototropism.

Activity:

Phototropism can be explained by placing a potted plant outside in sunlight. We can observe that the shoot of the plant exhibits growth in the direction of sunlight. i.e. phototropism.

19. Pollination is the transfer of pollen grains from anther to stigma of the carpel whereas fertilisation is the fusion of male germ cell with the female germ cell to form a zygote, future embryo.

Pollination requires external agents to help in the process whereas fertilisation just requires the presence of male and female germ cells.

Pollination in plants can be cross-pollination or self-pollination whereas fertilisation in plants is called as syngamy taking place inside the ovary.

20. Example of inherited character - Shape of nose.

Example of acquired character - Malfunctioning of kidney affected by disease.

Inherited characters are those which are transmitted from one generation to another. i.e Parents transmit certain characters to their offspring.

Acquired characters are the changes produced in an individual as a response to the environment. These acquired characters are not purposefully inherited.

21. Image distance (v) = 50cm

Focal length (f) = 25 cm

Using lens formula:

$$\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$$

$$\Rightarrow \frac{1}{u} = \frac{1}{v} - \frac{1}{f}$$

$$\Rightarrow \frac{1}{u} = \frac{1}{50} - \frac{1}{25}$$

$$\Rightarrow \frac{1}{u} = -\frac{1}{50} \Rightarrow u = -50$$

Using this we can find the magnification

Magnification = v/u

$$\Rightarrow \text{Magnification} = 50/50 = -1$$

Therefore we get magnification as -1, so the object should be placed 50 cm away from the lens.

22. (i) All of these belong to the 3rd period.

They belong to the following groups:-

A - group 1

B - group 2

C - group 3

D - group 14

E - group 15

F - group 16

G - group 17

H - group 18

(ii) Elements B and F will form ionic compounds

(iii) A and B belong to group 1 and 2 respectively and are definitely metals

(iv) Element H

(v) CG3

23. (i)

'A' can be assumed to be MnO_2 and 'B' can be assumed to be Al

In this reaction, Mn is product C and is produced in molten state because large amount of heat is released during reaction. Product D is Al_2O_3 which floats over the Mn.

(ii)

Above chemical reaction can be classified as:-

Displacement reaction.

Redox reaction.

24. Alkenes and Alkynes are the functional group of organic compounds which can be hydrogenated. When hydrogen is added with Ni as catalyst to unsaturated hydrocarbons, they become saturated hydrocarbons. Change in physical property:- Unsaturated hydrocarbons:- Liquid state. Unsaturated hydrocarbons become saturated hydrocarbons. Saturated hydrocarbons :- Solid state Natural source of organic compound - Vegetable oil
25. Ozone molecule is the combination of three oxygen atoms. Oxygen is split into nascent oxygen on exposure to UV- rays, part of sun's radiation. At higher level of atmosphere, nascent oxygen reacts with oxygen molecule to form ozone. The ozone layer over Antarctica, in the South pole and over Arctic, at the North pole is getting depleted every year by the increased usage of ChloroFluoroCarbons(CFCs). This damage to the ozone layer is allowing harmful UV rays to reach the earth's atmosphere.
- 1) These UV rays are dangerous for mankind as they may cause skin cancer, cataracts and ageing.
 - 2) UV rays can also cause the death of phytoplanktons which in turn cause global warming.
 - 3) Global warming results in the melting of ice cap in the polar regions thereby rising the sea level.
- This is the reason why it is said that, "Damage to the ozone layer is a cause of concern."
26. The acronym of DNA can be expanded as Deoxyribonucleic Acid. Maximum amount of DNA is found in the nucleus of the cell. Small amount of DNA is also found in mitochondria. DNA contains the genetic information that is to be carried on to the new cell after the process of cell division. DNA is the hereditary material that stores information for next generation in the form of code made up of different combinations of

four nitrogenous bases (Adenine, Thymine, Guanine and Cytosine). Hence, it plays an important role in the process of reproduction of the cell, the cell division. Replication of DNA results in the formation of two copies of DNA to be transferred to two daughter cells. Three types of DNA replication are semi-conservative, conservative and dispersive.

27. Let us assume that current 'I' is flowing through a resistor with resistance 'R' and potential difference 'V' across it.

Let the 'Q' quantity of charge flow in time 't' through it.

Let W be the work done to move charge Q

$$W = VQ \dots (1)$$

As we know current = charge/time

$$Q = I \times t \text{ ----}(2)$$

Replacing (2) in (1)

$$W = V \times I \times t$$

As heat is produced during the work,

If 'H' is the heat produced

$$H = W = VIt \text{ -----}(3)$$

As per Ohm's law,

$$V = IR.$$

Putting this in equation (3),

$$H = IR \times It$$

We get $H=I^2Rt$.

The above relation is called Joule's law of heating.

If P is the power,

We know that $P = 12 \text{ W}$ and $V = 12 \text{ V}$

Let t be the time duration for the flow of current

$$t = 1 \text{ min} = 60 \text{ s}$$

Heat generated $H = P \times t$

$$= 12 \text{ W} \times 60 \text{ s}$$

$$= 720 \text{ J}$$

OR

If I_1 , I_2 and I_3 are the currents flowing through the resistors R_1 , R_2 and R_3 respectively and I is the total current, then

$$I = I_1 + I_2 + I_3$$

Ohm's law can be applied to all the resistors independently

If R_{eq} is the equivalent resistance of the whole circuit, applying Ohm's law to the whole circuit, we get.

In order that current measured in ammeter is the same as the total current through the circuit, the ammeter has to be connected in series with the combination of the individual resistors.

To measure the potential difference of one resistor, voltmeter should be connected parallel to it.

28. Digestion is the process of breaking down complex food substances into simple absorbable molecules.

The process of digestion mainly takes place in three regions namely, mouth (buccal cavity), stomach and small intestine.

Digestion in mouth - The process of digestion starts in the mouth and is brought about by three pairs of salivary glands. The salivary glands secrete saliva, a mixture of water and hydrolytic enzymes. The main enzyme present in the saliva is the salivary amylase. It breaks down starch in the food into simple sugars.

Digestion in stomach - Food is mixed with gastric juice during its storage in the stomach. Gastric juice is a combination of HCl, mucus and enzymes like pepsinogen, gastric lipase.

HCl - It provides an acidic medium for certain enzymes to get activated and act upon food molecules.

Mucus - It protects the inner lining of the stomach from being damaged by the action of HCl.

Pepsinogen - The inactive enzyme gets converted to pepsin by acidic medium provided by HCl. Pepsin aids in digestion of the proteins into peptides.

Digestion in small Intestine - Digestion in this part is brought about by enzymes like invertase, maltase, lipase etc.

Small intestine receives the bile secreted by liver. Bile converts acidic food, received from stomach into alkaline to be acted over by enzymes. Bile also aids in emulsification of fats.

Small intestine also receives pancreatic juice from pancreas that digests emulsified fats as well as proteins.

Intestinal glands secrete intestinal enzymes which bring about digestion of carbohydrates, proteins and fats.

Carbohydrates, proteins and fats are simplified into glucose, amino acids, fatty acids and glycerol respectively.

Post digestion, this food is absorbed by the walls of the intestine.

OR

(a)

Photosynthesis is the physico-chemical process by which plants can convert light energy into chemical energy, in the form of food using atmospheric carbon dioxide and water as raw materials.

Photosynthesis involves a series of photochemical reactions in two phases - Light reactions and Dark reactions.

1) Light reaction occurs in the grana of chloroplasts. Using light energy, water molecules split out to release oxygen.

2) The chlorophyll pigments trap light energy and excite an electron. This excited electron converts light energy into chemical energy. This chemical energy is stored as ATP (Adenosine Tri Phosphate) and NADPH (Nicotinamide Adenine Dinucleotide Phosphate).

3) Dark reaction takes place in the stroma of the chloroplasts by reducing carbon dioxide to carbohydrates, utilising energy from ATP.

Stomata are tiny pores on the surface of the leaves. Stomata help in exchange of gases during photosynthesis. The opening and closing of stomata are brought about by guard cells.

(b)

Experiment:

Place a healthy, green potted plant in a dark room for a couple of days. This ensures that there is no starch left on the green leaves as the plant uses up all its stored food.

After two days, take a strip of black paper and cover a small portion of one green leaf on both sides using a clip.

Take this potted plant outside and keep it in bright sunlight. After keeping it outside for some hours, remove the leaf which is covered with a black strip. Boil it in alcohol for 10 minutes to get rid of the green colour. Pour little of iodine solution on this leaf.

Observation:

We can see that uncovered parts of the leaf as shown in the diagram, turned blue-black when iodine was used whereas the covered part was left white or had no colour change.

Inference:

The iodine solution helps in confirming the presence of food. After photosynthesis, food prepared is stored as starch. This starch reacts with iodine to give a blue-black colour.

The uncovered portions of the leaf had starch suggesting that photosynthesis has taken place as these portions received sunlight. Thus, these portions turned blue-black when iodine was used.

No photosynthesis occurred in the covered portion to prepare starch. Hence, there is no colour change when iodine is applied here.

This experiment shows that sunlight is essential for photosynthesis.

CBSE Science 2009

Question Paper (as it is) -

General Instructions:

1) All questions are compulsory.

2) The question paper consists of 27 questions divided into 4 sections A, B, C and D. Section A comprises questions of 01 mark each, Section B comprises questions of 02 marks each, Section C comprises questions of 03 marks each and Section D comprises questions of 05 marks each.

3) All questions in Section A are to be answered in one word, one sentence or as per the exact requirement of the question.

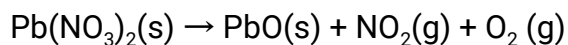
4) There is no overall choice. However, internal choice has been provided wherever necessary. You have to attempt only one of the alternatives in all such questions.

5) In question on construction, drawing should be neat and exactly as per the given measurements.

6) Use of calculators is not permitted

SECTION A

Q.1 Balance the following chemical equation:

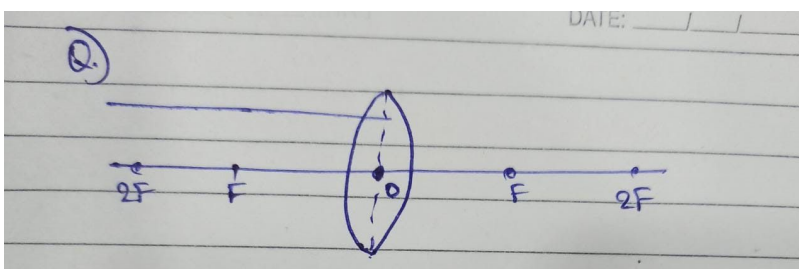


Q.2 Fresh milk has a pH of 6. When it changes into curd (yogurt) will its pH value increase or decrease? Why?

Q.3 Name a reducing agent that may be used to obtain manganese from manganese dioxide.

Q.4 Why does a ray of light bend when it travels from one medium into another?

Q.5 Draw the given diagram in your answer book and complete it for the path of ray of light beyond the lens.



Q.6 Why does the sky look blue on a clear day?

Q.7 What are the two main components of our environment?

Q.8 What will happen to a plant if its xylem is removed?

Q.9 Name two tissues that provide control and coordination in multicellular animals.

SECTION B

Q.10 A compound which is prepared from gypsum has the property of hardening when mixed with a proper quantity of water. Identify the compound. Write the chemical equation for its preparation. For what purpose is it used in hospitals?

Q.11 a) What is the colour of ferrous sulphate crystals? How does this colour change after heating?

(b) Name the products formed on strongly heating ferrous sulphate crystals.

Q.12 What is the minimum number of rays required for locating the image formed by a concave mirror for an object? Draw a ray diagram to show the formation of a virtual image by a concave mirror.

Q.13 A piece of wire of resistance $20\ \Omega$ is drawn out so that its length is increased to twice its original length. Calculate the resistance of the wire in the new situation.

Q.14 What are natural resources? State two factors that work against an equitable distribution of these resources.

Q.15 What is water harvesting? Mention any two water harvesting structures.

Q.16 What are 'nastic' and 'curvature' movements? Give one example of each.

Q.17 What is biogas? Why is biogas considered an ideal fuel for domestic use?

Q.18 (a) Distinguish between renewable and non-renewable sources of energy.

(b) Choose the renewable sources of energy from the following list:

Coal, biogas, sun, natural gas

SECTION C

Q.19 What is meant by 'rusting'? With labelled diagrams describe an activity to find out the conditions under which iron rusts.

Q.20 Give reasons for the following observations:

(a) The element carbon forms a very large number of compounds.

(b) Air holes of a gas burner have to be adjusted when the heated vessels get blackened by the flame.

(c) Use of synthetic detergents causes pollution of water.

Q.21 What is hypermetropia? State the two causes of hypermetropia. With the help of ray diagrams, show:

(i) the eye-defect hypermetropia (ii) correction of hypermetropia by using a lens

Q.22 Two resistors, with resistances $5\ \Omega$ and $10\ \Omega$, respectively, are to be connected to a battery of emf $6\ \text{V}$ so as to obtain:

(i) minimum current flowing (ii) maximum current flowing

(a) How will you connect the resistances in each case?

(b) Calculate the strength of the total current in the circuit in the two cases.

Q.23 Explain analogous organs and homologous organs. Identify the analogous and homologous organs amongst the following:

Wings of an insect, wings of a bat, forelimbs of frog, forelimbs of a human.

Q.24 (a) Explain the terms:

(i) implantation (ii) Placenta

(b) What is the average duration of human pregnancy?

SECTION D

Q.25 (a) Which two criteria did Mendeleev use to classify the elements in his periodic table?

(b) State Mendeleev's periodic law.

(c) Why could no fixed position be given to hydrogen in Mendeleev's periodic table?

(d) How and why does the atomic size vary as you go:

(i) from left to right along a period?

(ii) down a group?

Q.26 (a) What is a magnetic field? How can the direction of magnetic field lines at a place be determined?

(b) State the rule for the direction of the magnetic field produced around a current carrying conductor. Draw a sketch of the pattern of field lines due to a current carrying conductor. Draw a sketch of the pattern of field lines due to a current flowing through a straight conductor.

OR

(a) What is a solenoid? Draw a sketch of the pattern of field lines of the magnetic field through and around a current carrying solenoid.

(b) Consider a circular loop of a wire lying in the plane of the table. Let the current pass through the loop clockwise. Apply the right hand rule to find out the direction of the magnetic field inside and outside the loop.

Q.27 (a) Draw a diagram of the human alimentary canal and label it.

Oesophagus, Gallbladder, Liver and Pancreas.

(b) Explain the statement, 'Bile does not contain any enzyme but it is essential for digestion.'

OR

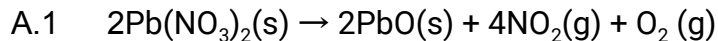
(a) Draw a diagram of excretory system in human beings and label on it:

Aorta, vena cava, urinary bladder, urethra.

(b) List two vital functions of the kidney

CBSE Science 2009

Solutions -

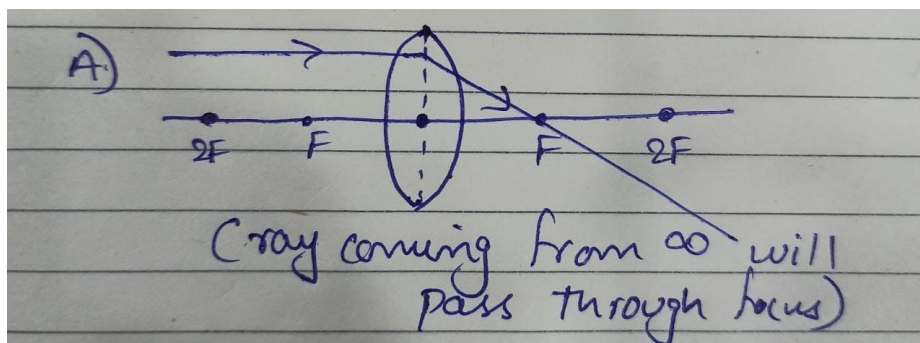


A.2 The pH of a substance helps in identifying the acidic or alkaline nature of the substance. A neutral substance will have a pH of 7 while alkaline substances have pH greater than 7 and acidic substances have less than 7. Milk has a pH of 6. When milk turns into curd there is a high presence of lactic acid in the liquid. The presence of lactic acid will make curd acidic and hence it will decrease the pH value of the liquid.

A.3 Aluminium (Al) is a good reducing agent that can be used to obtain manganese from manganese dioxide.

A.4 When a ray of light travels from one medium to another, its speed changes and this change in speed of light causes a part of wave to travel slower than the other part. Thus, bending of light takes place in refraction.

A.5



A.6 The scattering of blue component of the white sun light by air molecules present in the atmosphere causes the blue colour of sky. The air molecules and other fine particles in the atmosphere have size smaller than the wavelength of visible light. When sunlight passes through the atmosphere, the fine particles in air scatter the blue colour (shorter wavelengths) more strongly than red. The scattered blue light enters our eyes. That is why sky appears blue.

A.7 The two main components of our environment are biotic and abiotic components.

A.8 Xylem is a tissue in the plant, responsible for transportation of water. If the xylem is removed, the plant will dry up and die because there will be no tissues to transport water to various parts of the plant.

A.9 There are various tissues in multicellular animals that are required for the complex functioning of the body. The control and coordination functions are carried out with mutual exchange of impulses between the nervous and muscular tissues.

A.10 This compound is popularly called as Plaster of Paris. The chemical name for this compound is calcium sulphate hemihydrate.

Chemical equation $\text{CaSO}_4 \cdot 2 \text{H}_2\text{O}(s) \xrightarrow{\Delta} \text{CaSO}_4 \cdot \frac{1}{2} \text{H}_2\text{O}(s) + \frac{3}{2} \text{H}_2\text{O}(l)$

The main use of plaster of Paris is for hospitals that use it for making a cast for the broken bones to rest and get rejoined to each other.

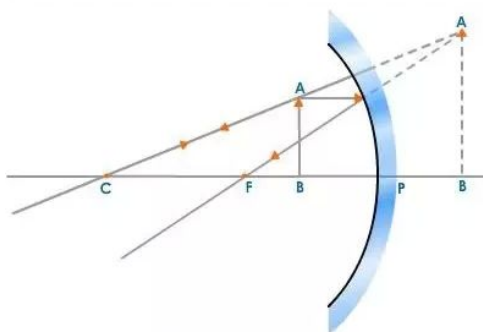
A.11 (a) Ferrous crystals are green in colour. The chemical formula for ferrous sulphate crystal is given by $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$. On heating, the green ferrous sulphate crystals lose the water of crystallization and turn into a dirty yellow colour.

(b) Strong heating would create a decomposition reaction that will change the ferrous sulphate crystals into a combination of ferric oxide Fe_2O_3 , Sulphur dioxide (SO_2) and sulphur trioxide (SO_3).



A.12 The minimum number of rays required to locate the image formed by a concave mirror is two.

A virtual image is formed by a concave mirror when the object is kept in front of the mirror between the principal focus and the pole of the mirror. In the above diagram, AB is the object and A'B' is the image. MPN is the concave mirror and C and F are the centre and principal focus of the mirror, respectively.



A.13 Let L and r be the length and radius of the wire.

Volume of the wire $V = \pi r^2 L$.

Resistance $R = \rho L/A$, where ρ is the resistivity of the material of the wire and $A = \pi r^2$, the area of the cross section of the wire.

When the wire is stretched, L becomes $2L$. But V does not change. So

$$\pi r^2 L = \pi r'^2 \cdot 2L$$

$$r'^2 = r^2/2$$

$$\text{New area of cross section } A' = \pi r'^2 = \pi r^2/2 = A/2$$

The new resistance of the wire will be:

$$R' = \rho 2L/A'$$

$$= \rho 2L/(A/2)$$

$$= 4 \rho L/A = 4R$$

We know that the resistance of the wire, $R = 20 \Omega$

Therefore, the new resistance of the wire is:

$$= 4 \times 20 = 80 \Omega$$

A.14 Natural resources are the materials provided by nature. Some of the natural resources are water, coal, petroleum, forests etc. These are the resources present in the environment naturally and can be used for our different needs.

2 important factors that are working against equitable distribution of these resources are -

- i) over exploitation and corruption.
- ii) people are trying to exploit these natural resources for financial gain.

A.15 Water harvesting is the method by which water is not allowed to flow away and is made to percolate into the soil. This may raise the ground water level of the place. This is an integrated multi resource management of land and water.

Chaukas, Khadins and Nadis are some of the structures that are used in certain parts of North India for water harvesting purposes.

A.16 Nastic movements are the movements independent of growth. They refer to the specific movements in response to stimuli like light, temperature etc. The most important aspect of the nastic movement is that it is non directional in nature. e.g. Irrespective of the direction of the source of light, the flower blooms.

Curvature movement refers to specific directional movement towards stimuli. A classic example is how a tip of the stem in a plant bends itself towards the source of light under the influence of auxin, a plant hormone.

A.17 The gas produced from the anaerobic decomposition of agricultural and animal wastes is called **biogas**.

Biogas is today widely used for domestic purposes because it:

- (i) burns without smoke
- (ii) leaves no residue on burning
- (iii) has a high calorific value
- (iv) burns without any explosion

A.18

Renewable	Non-Renewable
Renewable sources of energy are the ones which will not get over soon. It gets replenished faster than it is consumed.	Non-renewable sources of energy get depleted fast. They get over faster than it is replenished.
Renewable sources of energy do not get exhausted.	Non-renewable sources of energy get exhausted.
They are unlimited.	They are limited.
Examples: Wind, tides, geothermal energy, sun	Examples: Fossil fuels like coal, petroleum

A.19 The exposure of iron (or an alloy of iron) to oxygen in the presence of moisture leads to the formation of rust. This reaction is not instantaneous, it generally proceeds over a considerably large time frame. The oxygen atoms bond with iron atoms, resulting in the formation of iron oxides. This weakens the bonds between the iron atoms in the object/structure. This process is called **rusting**.

For illustrating the process of rusting we need to prove that a bunch of iron nails rusts when there is both moisture and oxygen and it doesn't rust when there is an absence of either moisture or oxygen. Take three test tubes that can be closed properly.

In the first test tube keep partially submerged iron nails. In the second test tube keep iron nails fully submerged in water with a layer of oil separating the water and air in the test tube. In the third test tube keep iron nails with some amounts of anhydrous calcium chloride.

Observe these test tubes for 3 weeks. And these are the results.

The first test tube that has got abundant amounts of air and moisture will have rusted iron nails. The second test tube that has abundant moisture but with no access to air hence the iron nails will not have rust. The third test tube has anhydrous calcium chloride and this absorbs all the moisture in the air. Hence the third test tube will have abundance of air, but no moisture. The iron nails in the third test tube also will not have rust. Hence only the test tube with air and moisture gathers rust on the iron nails. Test tubes that provide only one of air or moisture doesn't provide an atmosphere for the iron nails to rust.

A.20 a) 1.Catenation - Carbon has this unique ability to easily combine with other atoms of carbon in different combinations.

2. Carbon atoms have also got another unique ability to combine with other elements like nitrogen, oxygen, chlorine, bromine etc.

b) Blackening is the phenomenon when unburnt carbon particles get attached to vessels. This occurs when the combustion is incomplete or not happening properly and gas is getting wasted.

Since carbon is being wasted due to incomplete combustion we have to adjust the airflow so that oxygen rich air allows the gas to burn completely. Hence air holes have to be adjusted to ensure that blackening doesn't happen.

c) Synthetic detergents are compounds that do not get decomposed by microorganisms. Or in other words detergents are not biodegradable and hence they stay in the water for a very long period as a pollutant.

A.21 A disease in which a person can see objects that are far away but not the objects that are close, is called hypermetropia. It is also called long-sightedness.

Reasons :

- i) Decrease in the size of the eyeball.
- ii) Change or reduction in the curvature of the lens.

A.22

(a)

(i) For minimum current flow - the two resistors should be connected in series

(ii) For maximum current flow - The two resistors should be connected in parallel.

(b)

Calculate the strength of the total current in the circuit in the two cases.

(i) Minimum current flowing

- Resistors connected in series

If the two resistors are connected in series,

Equivalent resistance = $R = R_1 + R_2 = 5 + 10 = 15 \Omega$

According to Ohm's law $V = IR$. Substituting $V = 6V$ and $R = 15 \Omega$, we get $I = 0.4 A$

(ii) Maximum current flowing

-Resistors connected in parallel

If the two resistors are in parallel,

Equivalent resistance is calculated using $\frac{1}{R} = (\frac{1}{R_1} + \frac{1}{R_2})$

$$R = \frac{5 \times 10 \times 10}{5 + 10} = \frac{50}{15} = 3.3 \Omega$$

We have $V = IR$.

Substituting $V = 6 V$ and $R = 3.3 \Omega$, we get $I = 1.8 A$

A.23 Analogous organs like the name refers to, are those organs that have the same function but are different in structure and origin.

Homologous organs are those organs which have the same basic structure and origin but perform different functions.

Wings of an insect and those of a bat are examples of analogous organs.

Forelimbs of frogs and those of a human are examples of homologous organs

A.24 (i) Implantation - The process by which the zygote, future embryo, formed by the fusion of sperm and egg nuclei travels down from the fallopian tubes to get embedded into the wall of the uterus inside the female body is called implantation.

(ii) Placenta - The placenta is a connection established by blood vascular tissue between foetus and the mother. It is significant in its role as the growing embryo receives nutrients and oxygen from the mother's blood through placenta. Placenta is a vascular structure on the inner lining of the uterus which is connected to the umbilical cord of the foetus.

(b) Duration of pregnancy is known as gestation period. The average length of human gestation period is 280 days or 40 weeks or roughly 9 months.

A.25 a) Mendeleev used two criteria for classifying elements in the periodic table.

i) Atomic Mass - The elements in the periodic table are arranged according to the increasing order of their Atomic mass

ii) The formulae of their hydrides and oxides were also used to classify them in the periodic table.

b) Mendeleev's periodic law is that the chemical properties of the elements are periodic functions of their atomic mass. That means the characteristics or properties get repeated periodically.

c) Hydrogen displayed both the property of alkali metals and halogens. Hydrogen like alkalis forms compounds when it reacts with halogen, oxygen and sulphur. These reactions produce compounds that have a similar formulae when alkali metals react with these elements. So Mendeleev positioned Hydrogen in the first column above the Alkali metals in the table. At the same time, hydrogen, a diatomic molecule is a gas and can form covalent compounds like halogens. Hence Hydrogen can also be placed above the halogen group.

d)

(i) From left to right the nuclear charge increases and hence the atomic size decreases.

(ii) From top to bottom the atomic size increases as new rings are added to the atom.

A.26 (a) Magnetic field is the region around a magnet in which a magnetic material experiences a force because of that magnet.

The direction of magnetic field lines at a place can be determined by placing a magnetic compass in the field. The direction along which the magnetic needle of the compass aligns itself gives the direction of the magnetic field lines.

(b) We can obtain the magnetic field produced around a current carrying conductor by using the right hand thumb rule.

If you hold a current carrying conductor in your right hand in such a way that the thumb points towards the direction of current, the direction in which the fingers fold around the conductor will give the direction of the magnetic field.

OR

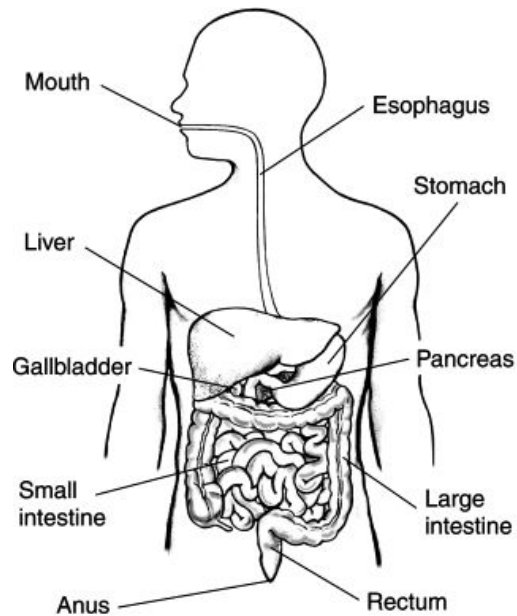
(a) A solenoid is a coil of several circular turns of insulated conducting wire, wrapped closely in the shape of a cylinder.

(b) The direction of current inside the loop will be downwards and outside the loop will be upwards.

This is obtained using the right hand thumb rule that says if you hold a current carrying conductor in your right hand in such a way that the thumb points towards the direction

of current, the direction in which the fingers fold around the conductor will give the direction of the magnetic field.

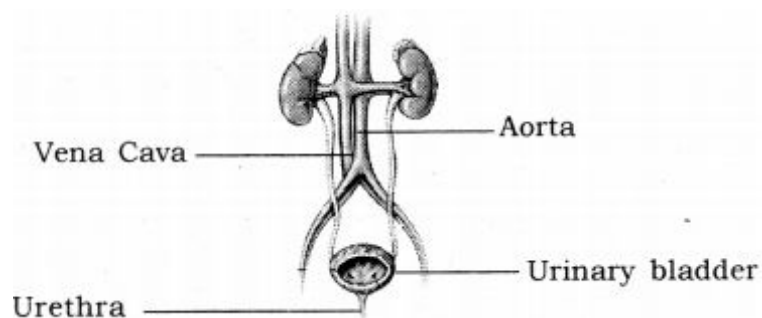
A.27 (a)



(b) Bile is dark green or yellowish fluid secreted by the exocrine gland, liver. Bile contains bile salts that break down the larger fat molecules into smaller globules, called emulsified fats. Bile juice also makes the acidic food entering the small intestine, alkaline for pancreatic and intestinal enzymes to act on it.

OR

(a)



(b) Kidneys serve as the main excretory organs in human beings. They play an important role in the removal of nitrogenous wastes from the body in the form of urine. They also maintain salt-water balance in the body by the process of reabsorption.