



**BAL BHARATI PUBLIC SCHOOL**  
**PRE-BOARD EXAMINATION (2023-24)**

**CLASS -XII**

**BIOLOGY (044)**

**CODE - BIO/12/A/B**

**ANSWER KEY**

**SECTION-A**

- Q1. 1**  
**Q2. 1**  
**Q3. 4**  
**Q4. 3**  
**Q5. 4**  
**Q6. 4**  
**Q7. 2**  
**Q8. 4**  
**Q9. C**  
**Q10. 3**  
**Q11. 4**  
**Q12. 1**  
**Q13. A**  
**Q14. D**  
**Q15. A**  
**Q16. B**

**SECTION-B**

- Q17.** If the female parent produces unisexual flowers, there is no need for emasculation. The female flower buds are bagged before the flowers open. When the stigma becomes receptive, pollination is carried out using the desired pollen and the flower rebagged. 2
- Q18.** a prophase I/ first prophase 0.5  
b i. gene linkage/genes located on the same chromosome 0.5  
ii. independent assortment does not occur 0.5  
iii. no recombination unless there is crossing over (between the genes) 0.5
- Q19.** They are considered good biocontrol agents because: 2 points 1+1  
i They are species specific.  
ii They have narrow insecticidal spectrum.  
iii They have no negative impact on the non-target organism's plants and animals.
- Q20.** Gross productivity: the amount of chemical energy that is stored as biomass per unit time  
Energy transferred from primary producers to primary consumers =  $20000 \text{ kJm}^{-2} \text{ y}^{-1}$  0.5  
Energy lost by tertiary consumers by cellular respiration =  $80 \text{ kJm}^{-2} \text{ y}^{-1}$  0.5  
Percentage of the energy passed from primary producers to primary consumers is lost to cellular respiration by tertiary consumers =  $80/20000 \times 100 = 0.4\%$  1

**OR**

- i) Exponential growth 0.5  
ii) r –intrinsic rate of natural increase 0.5  
iii) J shaped growth curve 0.5  
iv) Resources will be unlimited. 0.5
- Q21.** In order to make the bacterial cells competent, they are first treated with a specific concentration of a divalent cation, such as calcium. It increases the efficiency with which DNA enters the bacterium through pores in its cell wall 2

### SECTION-C

- Q22.** i X-RNA polymerase 0.5  
ii Y-promoter 0.5  
iii a. lactose binds to repressor protein 0.5  
b. repressor protein (with lactose bound) cannot block/bind to the promoter/Y 0.5  
c. RNA polymerase/X binds to the promoter/transcribes the gene 0.5  
d. lactase produced (if lactose present)/lactase production inhibited if lactose absent 0.5
- Q23.** When alien species (those species which are introduced from elsewhere into a particular region) are introduced deliberately into an ecosystem for some purpose, some of them may become invasive and cause damage and decline or even extinction of the native species in the ecosystem. The introduction Nile perch into Lake Victoria in Africa led to the extinction of more than 200 species of cichlid fish in that lake. 2+1  
Carrot grass (Parthenium) and Lantana introduced into our country have become invasive and caused environmental damage; they pose a threat to the native species of plants in our forests
- Q24.** (a) Two girls are suffering from Severe Combined Immuno Deficiency (SCID) which is caused by deficiency of adenosine deaminase (ADA). This disorder is caused due to the deletion of gene for a adenosine deaminase. 1  
(b) Girl A, was treated by enzyme replacement therapy in which functional ADA is given to the patient by injection. The approach is not completely curative. The patient requires periodic infusion of enzyme replacement. 1  
(c) Girl B must have been treated using gene-therapy where the gene isolate from marrow cells producing ADA was introduced into cells at an early embryonic stage for a possible permanent cure. 1
- OR
- i-It is thermostable / remains active during the high temperature induced denaturation of double stranded DNA bacterium *Thermus aquaticus*. 1
- ii-a-foam control system  
b-temperature regulation  
c-pH control system  
d-The sampling ports allow withdrawal of small volume of culture at periodic intervals. 1  
iii- The product has to be formulated with suitable preservatives, in case of drugs, these formulations must undergo clinical trials. Strict quality control testing is required for each product. 1
- Q25.** a) The clot buster is used to dissolve clot is Streptokinase. It is obtained from bacteria *Streptococcus*. 1  
(b) The bio-active molecule is Cyclosporin A. It is obtained from *Trichoderma polysporum*. 1  
(c) The blood cholesterol lowering agent is Statins. It is produce by the yeast *Monascus purpureus*. 1
- Q26.** A-Genotypic ratio-1:1 ratio of carriers affected 0.5  
Phenotypic ratio- 50% will not show major symptoms will 50% will show the Symptoms 0.5  
b-yes 0.5  
since both proteins are produced/both types of RBCs are visible, it is codominance. 0.5  
c- Thalassaemia is a quantitative problem where less amount of haemoglobin is formed. 0.5  
Sickle cell anaemia is a qualitative problem where defective haemoglobin is formed 0.5
- Q27.** a) The theory is known as the 'Darwinian Theory of evolution'. Salient features of this theory are: 2  
1. There was varying degree of similarities between the existing and the life forms that existed millions of years ago.  
2. Evolution has been gradual which came at different times.  
3. There is only the survival of the fittest.  
4. The population that will survive better in the natural conditions will survive better than the

others known as natural selection.

5. Adaptability is inherited and fitness is the end result of the ability to adapt.

b) Alfred Wallace, a naturalist who worked in the Malay Archipelago had also come to similar conclusions around the same time. 1

- Q28.** (1) 0.27 $\mu$ g 1  
(II) both rise initially, hCG in early pregnancy, progesterone peaks in late pregnancy  
small initial peak of progesterone; low level/small peak of hCG in late pregnancy;  
sites of production 1  
hCG-fertilised egg/zygote/blastocyst/chorion/embryo 0.5  
progesterone corpus luteum/placenta 0.5  
functions  
hCG maintains corpus luteum; up to three months 0.5  
progesterone maintains uterus, lining/complexity: relaxes uterine muscle 0.5

#### SECTION-D

- Q29.** i- mutualism 1  
ii-herbivores OR B 1  
iii-co-exist 1  
iv-In this case, the ants get living space and food and protect the plant from other herbivorous insects.  
b-The Acacia shoots show a very high number of herbivorous insects in the absence of the resident ant species. Hence, Acacia shoots will have higher rates of growth with resident ant species. 1

- Q30.** (i)There is a considerable decrease in the level of serum cholesterol after 144 hrs. as compared to 24 hrs. 1  
(ii) ●Infection by RNA viruses / Retrovirus 1  
●mobile genetic elements / transposons /jumping genes

OR

siRNA (small interfering RNA) is able to regulate the expression of genes, by a phenomenon known as RNAi (RNA interference)

(iii) Using Agrobacterium vectors, nematode-specific genes are introduced into the host plant, introduced DNA forms both sense and anti-sense RNA in the host cell, these two RNAs being complementary to each other form a dsRNA (double stranded RNA), that initiates RNAi thus silencing the specific mRNA of the nematode, nematode is unable to survive in the transgenic plant 2

#### SECTION-E

- Q31.** A)Continued self-pollination results in inbreeding depression, flowering plants have developed out-breeding devices to discourage self-pollination and to encourage cross-pollination.  
1.Pollen grains are released before the stigma becomes receptive or stigma becomes receptive before pollens are released.  
2. In some species the anthers and stigma are placed in different position, so that pollen cannot come in contact with stigma of the same flower.  
3. Self-incompatibility, it is a genetic mechanism were pollens are prevented from fertilizing the ovule by inhibiting pollen tube germination.  
4. By-production of unisexual flowers. 0.5x4=2  
ii) The tender coconut water represents the free nuclear endosperm while, the white kernel is the cellular endosperm. The water and kernel of the endosperm are both triploid. 0.5+0.5+0.5=1.5  
iii)Diagram NCERT 1  
i-cotyledon ii-Epicotyl (1/4+1/4=0.5)

OR

- (a) Amniocentesis – It involves taking a sample of the amniotic fluid and testing it for genetic abnormalities. 0.5+0.5=1
- (b) Medical Termination of Pregnancy (MTP) 1
- (c) Yes, it is currently safe 1
- This option should be considered before the completion of the first trimester, as it might be riskier after this period. 1
- (d) MTP is illegal in cases involving determining the gender of the unborn child and female foeticide 1
- Q32. A)** Normal cells have a property called. contact inhibition. which means the contact of normal cells with other cells inhibit their uncontrolled growth. 1
- b) Tumour cells have been shown to avoid detection and destruction by immune system. Therefore, the patients are given substances called biological response modifiers such as  $\alpha$ -interferon which activate their immune system, slow the growth of tumours and help in destroying the tumour. 2
- c) Vaccine provides active immunity, in which antibodies are produced by our B-lymphocytes in response to the antigen/pathogen injected in the form of vaccine. 0.5
- The immunity remains for long period, may be lifetime. 0.5
- Antitoxin
- It provides passive immunity as preformed antibodies are injected. 0.5
- It is carried out when a person is infected by deadly microbe, to which a quick immune response is required. 0.5
- Passive immunity remains for shorter period.

OR

- Heroin, commonly called smack is chemically diacetylmorphine which is a white, odourless, bitter crystalline compound. Taking smack is considered as abuse because it is highly addictive drug. It is a depressant and slows down body functions. It can cause psychological and physical dependence. 2
- B- Morphine: 0.5+0.5=1
- Source: opium poppy, *Papaver somniferum*.
- Effect on the human body: Fatigue – Morphine affects the central nervous system.
- Mood Swings, Gastrointestinal Impairment
- Cocaine: 0.5+0.5=1
- Source:
- The source of cocaine is Erythroxylon coca
- Effect on the human body: Feelings of euphoria, Increased energy.
- Marijuana: 0.5+0.5=1
- Source: The main source is leaves and stems of the female Cannabis plant.
- Effect on the human body: Impaired body movement. The difficulty with thinking and problem-solving, Impaired memory, Hallucinations (when taken in high doses)
- Q33. (a)** - Amino acylation or charging of RNA. 0.5
- The amino acid binds at the 3' end of RNA. 0.5
- (b) Peptide bond formation during translation requires energy. This energy is provided during the activation of amino acids. 1
- (c) (i) The mRNA transcribed is 5'-AUGCAGGCACUG-3' 1
- ii) The sequence is ad $\rightarrow$ cb 1
- (c) - Anticodon is a sequence of three bases on tRNA, that is complementary to the bases of the codon on mRNA. -Through its anticodon, the tRNA recognises the codon of the amino acid it carries and forms hydrogen bonds following complementarity of bases. 0.5+0.5=1

OR

i-only males, are colour-blind / colour-blindness is more common in males / no females are colour-blind / person 1 and 2 had two male colour-blind children (but no female colour-blind children)

ii-  $X^A X^a$

iii- 1 correct genotype for person 3, i.e.  $(X)A(X)a$

2 correct genotype for person 4, i.e.  $X^A Y$

3-offspring genotypes

4-Probability of a child having colour blindness

1

1

0.5

0.5

1

1

**expected answer:**  
**genotype (person 3)**  $X^A X^a$  × (person 4)  $X^A Y$   
**gametes**  $X^A, X^a$  +  $X^A, Y$   
**offspring genotypes**  $X^A X^A, X^A X^a, X^A Y, X^a Y$   
**offspring phenotypes**  
 female with normal colour vision  
 female with normal colour vision  
 male with normal colour vision  
 male with colour blindness)  
**probability** 0.25 / 25% / 1 in 4 /  $\frac{1}{4}$

# SET –B

## SECTION-A

- 1 4  
2 2  
3 2  
4 4  
5 B  
6 3  
7 4  
8 3  
9 2  
10 3  
11 1  
12 2  
13 C  
14 B  
15 A  
16 A

## SECTION-B

- 17 Q.NO.21  
18 Q.NO.20  
19 (a) (i) Phenylketonuria is the disorder that occur in humans due to the mutation in the gene (phenylalanine) that codes for an enzyme phenylalanine hydroxylase. Accumulation of these in the brain results in mental retardation. These are also excreted through urine because of its poor absorption by the kidney. 1  
b) Klinefelter's syndrome is the disorder that occur in humans if the karyotype is XXY. In Klinefelter's syndrome, the males start developing feminine characters (such as the development of breast). Such individuals are sterile. 1  
20 i-A 1  
ii-The primary effluent is aerated allowing the growth of flocs (a meshwork of fungi and aerobic bacteria). These microbial flocs oxidise the organic matter present in the primary effluent, reducing the BOD (Biochemical Oxygen Demand). 1

OR

- The primary lymphoid organs are the red bone marrow, in which blood and immune cells are produced, and the thymus, where T-lymphocytes mature. 1  
The lymph nodes and spleen are the major secondary lymphoid organs; they filter out pathogens and maintain the population of mature lymphocytes. 1  
21 (a) Two characteristic features of wheat flowers that make it a good example of wind pollination:  
(1) Light pollen grains and pollen grains more in number. 0.5  
(2) Exposed stamen and feathery stigma. 0.5  
(b) Plant breeders carrying out wheat hybridisation often take pollen grains from the 'pollen banks' and it is a good way of using the pollen grains that are more viable. As the pollen grains in the pollen banks increase the viability of wheat pollen grain is only 30 minutes and so it can be stored in pollen bank for a long period of time. 1

## SECTION-C

- 22 Q.NO.28  
23 (a) The specific name of the genus Plasmodium that causes one of the most serious types of disease in humans is Plasmodium falciparum. The disease is called malaria. 1  
b) When a female Anopheles mosquito bites an infected person, these parasites enter the saliva and multiplies to form sporozoites that enter the salivary glands. When these mosquitoes bite a human, the sporozoites are transferred into the body of the human being. 1  
(c) The parasites initially enter the blood stream and reach the liver where they multiply to form a schizont. From here, schizonts enter the red blood cells (RBCs) and lead to the rupture of

- RBCs which release a toxic substance, haemozoin, which is responsible for the chill and high fever recurring every three to four days. 1
- 24 Q.NO.22
- 25 Q.NO.23
- 26 Q.NO.26
- 27 Q.NO.24
- 28 Disturbance in genetic equilibrium, or Hardy- Weinberg equilibrium, i.e., change of frequency of alleles in a population would then be interpreted as resulting in evolution. 1
- ii) p=0.5 marks, q 0.5 marks, homozygous dominant=1 marks

$p + q = 1$   
 $p^2 + 2pq + q^2 = 1$   
 $q^2 = 0.16$   
 $q = \sqrt{0.16} = 0.4$  [  $p + 0.4 = 1$  ]  
 $p = 0.6$   
 $p^2 = (0.6)^2$   
 $p^2 = 0.36$   
 $0.36 \times 350 = 126$

#### SECTION-D

- 29 Q.NO.30
- 30 Q.NO.29

#### SECTION-E

- 31 i) (a) Only one pollen tube enters an ovule so 10 pollen tubes will be required for 10 ovules.  
 (b) Out of two male gametes per pollen tube, one is used in syngamy and other gamete in triple fusion. 2
- (b)Role of Stigma:  
 Landing platform for the pollen grain , enables continuous chemical dialogue between pollen and pistil, rejects incompatible pollen grain, promotes the growth of pollen tube of the compatible pollen grain leading to fertilization. 0.5+0.5+0.5=1.5
- iii)Diagram NCERT 1  
 i-coleoptile ii-Scutellum  $\frac{1}{4} + 1/4 = 0.5$   
 OR
- Q.NO.31
- 32 Q.NO.33
- OR
- i) it is called cistron 1
- ii)Point mutation 0.5  
 Frame shift mutation 0.5
- iii)5'GUAGUAUCUACUUAG 3' 1  
 it will code for 4 amino acids 1  
 The last codon UAG is a termination codon that does not got any amino acid. 1
33. Q.NO.32.