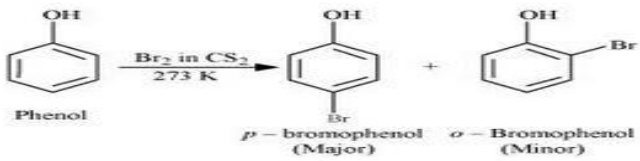
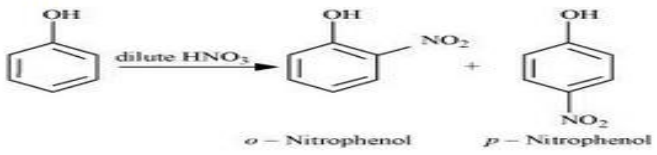
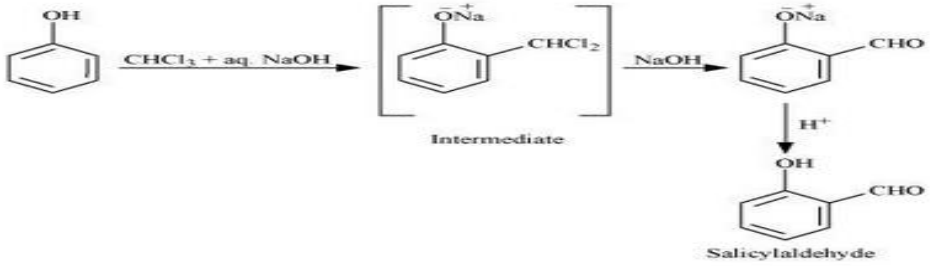
PRE BOARD QUESTION PAPER (2023-24)

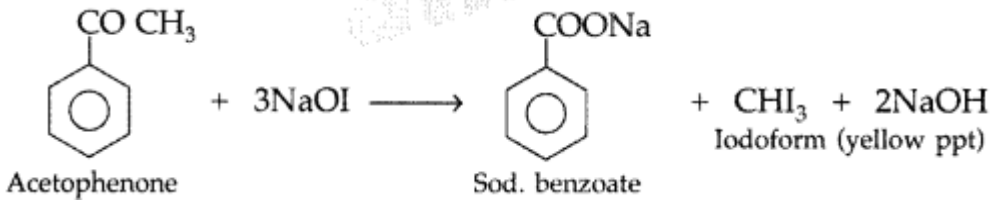
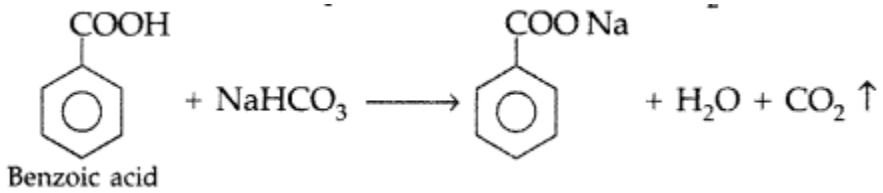
CLASS XII CHEMISTRY

MARKING SCHEME (SET-A)

1	d) Ethyl magnesium bromide	1
2	b) Butan-2-one	1
3.	c) Propanone and 2-Methylpropan-2-ol	1
4.	d) Λ^{o}_{NaCl}	1
5.	d) (n – 1) d^5 ns^2	1
6.	b) C_6H_5OH, NaOH and CH_3I	1
7.	c) Methyl isocyanide	1
8.	a) phospho diester linkage	1
9.	d) Quadruple	1
10.	d) i)=(C), (ii)=(A),(iii)=(D),(iv)=(B)	1
11.	b) $CH_2(CN) - CH_2$(CN)	1
12.	a) $NaHSO_3$	1
13.	(c) A is true but R is false.	1
14.	(a) Both A and R are true and R is the correct explanation of A	1
15.	(b) Both A and R are true but R is not the correct explanation of A.	1
16.	(d) A is false but R is true.	1
17	The elevation in boiling point is given as, $\Delta T_b = K_b\, m = K_b\, w \times 1000/MW$ $\Delta T_b \propto 1/M$ We have given that the molar mass of A > molar mass of B thus, B will show greater elevation in boiling point.	1 1
18	$N_2 + 3H_2 \rightarrow 2NH_3$ $r = -\frac{d[N2]}{dt} = -\frac{d[H2]}{3\,dt} = \frac{1}{2}\frac{d[NH3]}{dt}$ $\frac{d[NH3]}{dt} = 2 \times r = 2.5 \times 10^{-4}$ $r = 2.5 \times 10^{-4}/2 = 1.25 \times 10^{-4}$ $-\frac{d[N2]}{dt} = 1.25 \times 10^{-4}\ Ms^{-1}$	 ½ ½ ½ ½

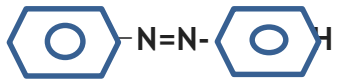
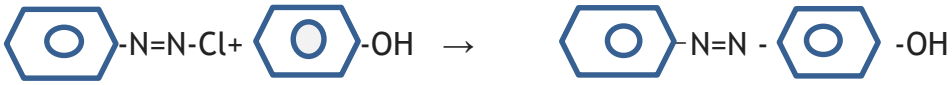
19	A-Sucrose ($C_{12}H_{22}O_{11}$) The mixture of D-(+)- glucose and D-(-)-Fructose is known as invert sugar. The linkage which holds the two monosaccharide units through oxygen atom is called glycosidic linkage.	½ ½ 1
20	a) A= CH_3-CH=CH_2 b) B= CH_3-CH(Br)-CH_3 c) C=CH_3-CH(I)-CH_3 d) D=CH_3-CH(MgI)-CH_3	1/2 1/2 1/2 1/2
21	a) Due to resonance one NH_2 group undergoes or involved in resonance and hence can't participate in the formation of semicarhazone. Long pair of NH_2 group is not involved in resonance and is available for nucleophillic attack. b) This is due to the lone pairs on oxygen atom attached to hydrogen atom in the -COOH group are involved in resonance and hence making the carbon atom less electrophilic. Hence, carboxylic acids do not give the reaction of carbonyl groups. **OR** a) Butanone <Propanone<Propanal <Ethanal b) 4-methoxy benzoic acid < benzoic acid < 4-nitrobenzoic acid < 3, 4-dinitrobenzoic acid	1 1 1 1
22	(a) Δ_rG^0 = – nFE^0 = -2 × 96500 × 2.71 (∵ n = 2) = -523,030 J mol^{-1} = -523.03 KJ mol^{-1} (b) Δ_rG^0 = – 2.303 RT log Kc = -2.303X8.31X298 log Kc log Kc=91.86	½ ½ ½ ½ ½ ½
23	k_1=0.693/20 k_2=0.693/5 log k_2/k_1 = Ea/ 2.303×R (1/T_1−1/T_2) log(4)= Ea /2.303×8.314 (1/300−1/350) Ea=24.2 kJ mol^{-1}	½ ½ ½ ½ 1
24	i) [Fe(en)$_2$$Cl_2$] Cl or x + 0 + 2 (-1) + (-1) = 0 x + (- 3) = 0 or x = + 3 ∴ Oxidation number of iron, x = + 3 ii) The complex has two bidentate ligands and two monodentate ligands. Therefore, the coordination number is 6. iii) In the complex $_{26}Fe^{3+}$ = $3d^5$ $4s^0$ $4p^0$ Due to presence of one unpaired electrons in d orbitals the complex is paramagnetic. iv) The number of geometrical isomers are two. (v) [Fe(en)$_2$$Cl_2$] Cl, only cis-isomer shows optical isomerism.	½ Each

	vi) Dichlorido bis (ethane-1, 2- diamine) Iron (III) chloride.	
25	a) Electron pairs of Cl atom are in conjugation with n electrons of the benzene ring so C-Cl bond in chlorobenzene acquires some double bond character while C-Cl bond in cyclohexyl chloride is a pure single bond.C – Cl bond in chlorobenzene is shorter than in cyclohexyl chloride. Since dipole moment is a product of charge and distance, so chlorobenzene has lower dipole moment than cyclohexyl chloride. (b) Alkyl halides are polar molecules, therefore, their molecules are held together by dipole-dipole attraction. The molecules of H_2O are held together by H-bonds. Since the new forces of attraction between water and alkyl halide molecules are weaker than the forces of attraction already existing between alkyl halide- alkyl halide molecules and water- water molecules, therefore, alkyl halides are immiscible with water. (c) Grignard's reagents are very reactive. They react with alcohol, water, amines etc. to form corresponding hydrocarbon. R-MgX + HOH → RH + Mg(OH)X Therefore, Grignard's reagents must be prepared under anhydrous conditions.	1 1 1
26	I) $CH_3CH_2CH_2OH$ → CH_3CH_2COOH Propan - I - ol Propanoic Acid (ii)  (iii)  (iv)  	1 1 1 1
27.	a) Hell-Volhard-Zelinsky reaction : Carboxylic acid reacts with chlorine or bromine in presence of small quantities of red phosphorous to give exclusively α-chloro or	1

	α-bromo acids. $CH_3COOH \xrightarrow{Cl2, Red\ Phosphorous} Cl\ CH_2COOH$ (b) (i) Acetophenone and Benzophenone: They can be distinguished by iodoform test which is given by only acetophenone with the formation of yellow ppt. while benzophenone does not respond to iodoform test (any other)  (ii) Phenol and Benzoic acid: On addition of $NaHCO_3$ to both solutions carbon dioxide gas is evolved with benzoic acid while phenol does not form CO_2(any other)  	1 1
27.	**OR PART** Molecular formula : C_4H_8O I) A=CH_3-CH_2-CH_2-CHO B= CH_3 - C - CH_2- CH_3 ‖ O C= CH_3-CH-CHO | CH_3 D=CH_3-CH_2-CH_2-CH_3 (with explanation) ii) B= CH_3 - C - CH_2- CH_3 ‖ O (with explanation)	2 1
28	i) On hydrolysis, lactose gives ß-D-galactose and ß-D-glucose. ii) Vitamin C is mainly ascorbic acid which is water soluble and is readily excreted through urine and thus cannot be stored in the body. iii) Nucleoside =a pentose sugar and a nitrogenous base.	1 1 ½

	Nucleotide = a phosphoric acid group , a pentose sugar and nitrogenous base.	½
29	a) $K^+/K > Mg^{2+}/Mg > Cr^{3+}/Cr > Hg^{2+}/Hg > Ag^+/Ag$ b) It is an electrode whose potential is arbitrarily taken as zero or is exactly known. Standard Hydrogen Electrode (SHE). (any other words) c) When an electrode is in contact with the solution of its ions in a half cell,it has a tendancy to loose or gain electrons which are known as electrode potential. pH=10 $Ph=-\log[H^+]$ $[H^+]=10^{-10}$ M $2H^+ + e \rightarrow H_2(g)$ E cell = $E^0 - \frac{0.0591}{n} \log \frac{\{P\}}{\{R\}}$ E cell = $0.0 - \frac{0.0591}{2} \log \frac{\{1\}}{\{10-10\}}$ E cell= - 0.591V **OR** c) Element with higher oxidation potential than Fe will oxidise faster than iron preventing corrosion in iron. Oxidation potential of Fe =0.44 V Oxidation potential of A = 2.37 V Oxidation potential of B = 0.14 V As A has higher oxidation potential than iron, it can be used for coating the surface of iron.	1 1 1/2 1/2 1/2 ½ 1 1
30	a) $[Co(NH_3)_5 Cl]Cl_2$ b) $[Fe(C_2O_4)_3]^{3-}$,bidentate ligand (1/2 +1/2) c) When ligand approaches a transition metal ion, the d– orbitals split into two sets, one with lower energy and the other with higher energy. The difference of energy between the two sets of orbitals is know as crystal field splitting energy. I) $t_{2g}4\ e_g0$ ii) $t_{2g}3\ e_g1$ **OR** c) $[Co(CN)_6]^{3-}$ because wavelength is less energy will be more ,splitting will be more.	1 1 1 1 2
31	A) i) Stronger ii) Negative deviation	3 (1/2 mark

	iii) -ive iv) -ive v) A mixture of acetone and choloroform (or any other) vi) Maximum boiling azeotrope	each)
	B) Δ Tf = i x $\frac{Kf\ xWb\ x1000}{Wa\ xMb}$	1/2
	$CaCl_2$ is an electrolyte which dissociated as $CaCl_2 \rightarrow Ca^{2+} + 2Cl^-$	1/2
	i=3 $\Delta T_f = 3 \times \frac{1.86\ x\ 3\ X1000}{100\ X\ 111}$	1/2
	ΔT_f=1.5 Freezing point =273- 1.5= 271.5 K or -1.5 ^{0}C	1/2
	OR A) W (mass) of cane-sugar = 5% means 5 g Molar mass of cane-sugar (M) = 342 g mol-1	½
	Mass of isotonic substance X = 0.877% means 0.877 g	1
	$C_1RT=C_2RT$ 5/342 =0.866 / M M=59.2≈ 60 gmol^{-1}	1/2
	B) K_H=1.67X10^8 Pa P $_{CO2}$=2.53 x10^5 Pa $Pco_2 = K_H$ X x CO_2	1
	X $_{CO2}$ =2.53 X 10^5 pa /1.67 X 10^8 pa X $_{CO2}$=1.5 x 10^{-3}	1
	$n_{CO2}/n_{H2O} + n_{CO2}$ = 1.5 x 10^{-3} No.of moles of water present in 500 ml 55.5/2=27.7 nCO_2 = 1.5X 27.7= 41.55 millimoles	1
32	a) This is because energy is required to remove one electron from Cu^+ to Cu^{2+}, high hydration energy of Cu^{2+} compensates for it. Therefore, Cu^+ ion in an aqueous solution is unstable.	1m each

	b) Actinides exhibit larger oxidation states than lanthanides, because of the very small energy gap between 5f, 6d and 7s subshells. Thus, the outermost electrons get easily excited to the higher energy levels, giving variable oxidation states. c) Cr^{2+} is reducing agent as its configuration changes from d4 to d3, when it is oxidized to Cr^{3+} . The d3 configuration have a half-filled t2g level which is very stable. d) V^{3+}, Cu^{2+} due to unpaired electrons. e)$3MnO_4^{2-} + 4H^+ \rightarrow 2MnO^-_4 + MnO_2 + 2H_2O$ f) Zr and Hf have almost identical radii due to lanthanoid contraction which is due to weak shielding of d-electrons. g) The ability of O_2 to stabilize higher oxidation states exceeds that of fluorine because oxygen can form multiple bonds with metals.	
33	a) A=Aniline $C_6H_5NH_2$ B= Anilinium chloride $C_6H_5NH_3^+Cl^-$ C= Benzene isonitrile C_6H_5NC D= N-Phenylbenzenesulphonamide $C_6H_5NHSO_2\,C_6H_5NH_2$ E= Benzene Diazonium chloride $C_6H_5N_2\,Cl$ F= p-Hydroxyazobenzene (Orange Dye)  b) $C_6H_5NH_2 + CHCl_3 + KOH \rightarrow C_6H_5NC + 3KCl + 3H_2O$ (A) (C) $C_6H_5NH_2 \xrightarrow{NaNO2+HCl,ice\ cold\ water} C_6H_5N_2Cl$ (A) (E)  (E) (F)	1/2 1/2 1/2 1/2 1/2 1/2 1 1
33	**OR** A) i) $C_6H_5NH_2 < C_6H_5\,N(CH_3)_2 < CH_3NH_2 < (C_2H_5)_2NH$ ii) p-nitroaniline< Aniline< p-toluidine B) i) Ethylamine is soluble in water due to its capability to form H-bonds with water while aniline is insoluble in water due to larger hydrocarbon part which tends to retard the formation of H-bonds. ii) Due to presence of two H-atoms on N-atom of primary amines, they undergo	1 1 1

	extensive intermolecular H-bonding while tertiary amines due to the absence of a H-atom on the N-atom, do not undergo H- bonding. As a result, primary amines have higher boiling points than 3° amines.	1
	C) $CH_3COOH \xrightarrow{NH3,heat} CH_3CONH_2 \xrightarrow{KOH,Br2} CH_3NH_2$	1