COMMON PRE-BOARD EXAMINATION

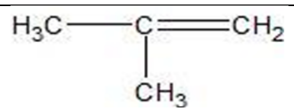
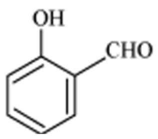
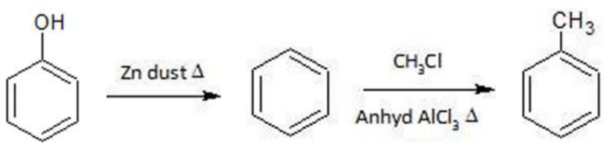
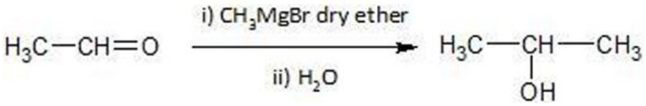
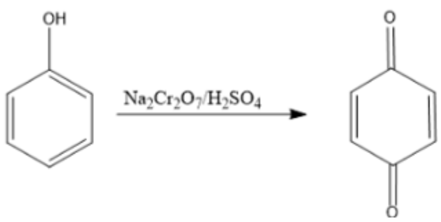
CHEMISTRY-Code No. 043

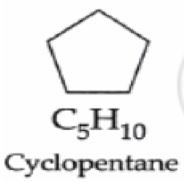
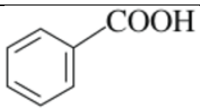
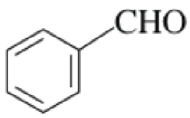
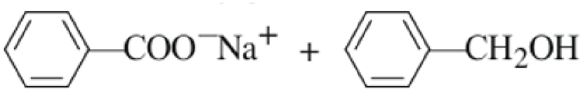
Class-XII-(2025-26)

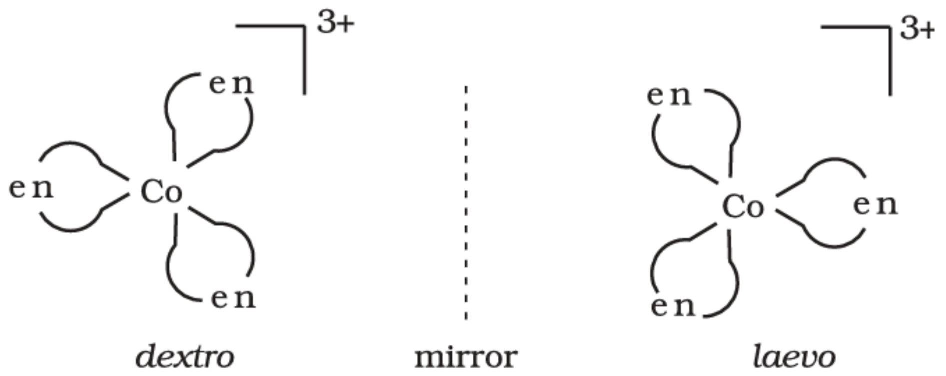
SET: 2

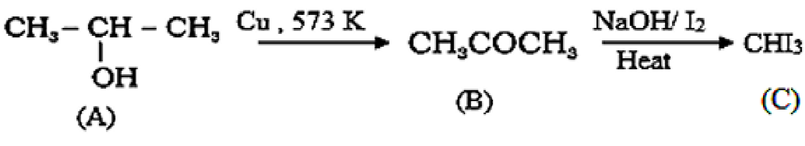
MARKING SCHEME

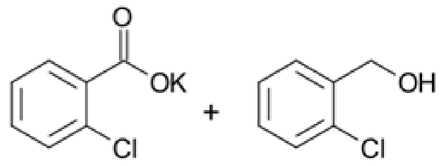
1.	B. $K_2[Zn(C_2O_4)_2]$	**1**
2.	A. Benzyl iodide and phenol	**1**
3.	A. C_3H_7COOH	**1**
4.	C. Hydrogen bond	**1**
5.	A. Osmotic pressure	**1**
6.	D. 4-Bromobut-1-ene	**1**
7.	C. a substitution reaction	**1**
8.	B. C_2H_5NC	**1**
9.	D. Variable oxidation states	**1**
10.	D. conductivity decreases whereas molar conductivity increases on dilution.	**1**
11.	D. carbonyl chloride	**1**
12.	C. CH_3COCl	**1**
13.	A. Both A and R are true, and R is the correct explanation of A.	**1**
14.	C. A is true, but R is false.	**1**
15.	B. Both A and R are true, but R is not the correct explanation of A.	**1**
16.	C. A is true, but R is false.	**1**
17.	Henry's law states that the partial vapour pressure of a gas is directly proportional to the mole fraction of the gas in the solution / $p = K_H x$ where p = partial pressure of gas, x = mole fraction in solution, and K_H is Henry's constant. **Application**: To increase the solubility of CO_2 in soft drinks and soda water, the bottle is sealed under high pressure / to minimize the painful effects accompanying the decompression of deep-sea divers (bends). Oxygen diluted with less soluble helium gas is used for breathing / At higher altitudes, low blood oxygen causes climbers to become weak and unable to think clearly (anoxia). (Any one) **OR**	**1** **1** **1**

	Same composition in liquid and in vapour phase and boil at a constant temperature. Maximum Boiling Azeotrope 68% HNO_3 + 32% H_2O (Or any other correct example) (Percentage can be ignored)	½ ½
18.	I. First order reaction II. Slope = k /2.303 III. s^{-1}	**1** ½ ½
19.	I.  II. 	**1** **1**
20.	The energy required to split the degenerate d-orbitals into two sets of orbitals is called crystal field splitting energy. (i) $t_{2g}^4\ eg^2$ (ii) $t_{2g}^6\ eg^0$	**1** ½ ½
21.	I A- $CH_3CH_2CH_2NH_2$ B- $CH_3CH_2CH_2OH$ II A- $C_6H_5N_2^+Cl^-$ B- C_6H_6	**1** **1**
22.	I. $CH_3CH{=}CH_2 \xrightarrow[H^+]{H_20} CH_3CH(OH)CH_3 \xrightarrow[CrO3]{[O]} CH_3COCH_3$ II.  III.  IV. 	**1** **1** **1**
23.	I. Mercury cell delivers a constant potential of approx 1.35V during its life-time because the overall cell reaction does not involve any ion in solution whose concentration can change during its life-time. $Zn_{(s)} + HgO_{(s)} \rightarrow ZnO_{(s)} + Hg_{(1)}$ II. In the experimental determination of electrolytic conductance, direct current (DC) is not used because it changes the composition of the solution.	**1** **1**

	III. Galvanic cells that are designed to convert the energy of combustion of fuels like hydrogen, methane, methanol, etc., directly into electrical energy are called fuel cells. For example, $H_2 - O_2$ fuel cell (i.e., hydrogen-oxygen fuel cell)	**1**
24.	I. Iodination of arenes is reversible due to the formation of HI. To move the reaction forward, an oxidising agent like HNO_3 or HIO_4 oxidises HI, thus stabilising the product. II. $\underset{\text{But-1-ene}}{CH_3-CH_2-CH=CH_2} + HBr \xrightarrow{\text{Peroxide}} \underset{\text{1-Bromobutane}}{CH_3-CH_2-CH_2-CH_2Br}$ $\underset{\text{1-Bromobutane}}{CH_3-CH_2-CH_2-CH_2Br} + NaI \xrightarrow{\text{Acetone}} \underset{\text{n-Butyl iodide (1-Iodobutane)}}{CH_3-CH_2-CH_2-CH_2I} + NaBr\downarrow$ III. 	**1** **1** **1**
25.	I. Co^{2+}: $[Ar]3d^7$, Sc^{3+}: $[Ar]3d^0$, Cr^{3+}: $[Ar]3d^3$ Co^{2+} and Cr^{3+} have unpaired electrons. Thus, they are colored in aqueous solution. Sc^{3+} has no unpaired electron. Thus, it is colorless. II. Metal copper has high enthalpy of atomisation and enthalpy of ionisation. Therefore, the high energy required to convert Cu(s) to Cu^{2+}(aq) is not balanced by its hydration enthalpy. III. Due to lanthanoid contraction the size of lanthanoid ion decreases regularly with increase in atomic size. Thus, covalent character between lanthanoid ion and OH^- increases from La^{3+} to Lu^{3+}. Thus the basic character of hydroxides decreases from $La(OH)_3$ to $Lu(OH)_3$.	**1** **1** **1**
26.	I.  II.  III. 	**1** **1** **1**
27.	$\Delta T_f = K_f\, m$ $1.5 = \frac{3.9\times w_B}{176} \times \frac{1000}{75}$ Mass of ascorbic acid = 5.08 g	**1** **1** **1**

28.	I. In the case of the Scandium atom ($3d^1$), which has one electron in its ground state, it is regarded as a transition element. On the other hand, zinc atom having completely filled d-orbitals ($3d^{10}$) in its ground state as well as in its oxidised state, it is not considered as a transition element. II. Physical and chemical properties of 4d and 5d series elements are similar because they have the same atomic and ionic radii due to the lanthanide contraction. III. Transition metals and most of their compounds show paramagnetic behaviour because they possess a number of unpaired electrons in d-orbital.	**1** **1** **1**
29.	I. The silver plate acts as a cathode. The reduction reaction happens at the silver plate. II. $\mathrm{Zn(s)}\|\mathrm{Zn^{2+}}(aq)\|\|\mathrm{Ag^{+}}(aq)\|\mathrm{Ag(s)}$ **OR** If the salt bridge is removed, no current will flow. III. $2Al(s) + 3Cd^{2+}(0.1M) \rightarrow 3Cd(s) + 2Al^{3+}(0.01M)$ $E_{cell} = E^{\circ}_{cell} - \frac{0.059}{n}\log\frac{[Al^{3+}]^2}{[Cd^{2+}]^3}$ $E_{cell} = 1.26 - \frac{0.059}{6}\log\frac{[0.01]^2}{[0.1]^3}$ $= 1.26 - \frac{0.059}{6}(-1)$ $=1.26 + 0.009 = 1.269V$	**1** **1** **2**
30.	I. sp^3d^2, paramagnetic II. Coordination isomerism III. 	**1** **1** **2**

31.	A. I. α -D-Glucose II. Globular proteins: The chains of polypeptides coil around to give a spherical shape. Fibrous proteins: When the polypeptide chains run parallel and are held together by hydrogen and disulphide bonds, then a fibre–like structure is formed. III. Vitamin K IV. Despite having the aldehyde group, glucose does not give Schiff's test, and it does not form the hydrogensulphite addition product with NaHSO3 / The pentaacetate of glucose does not react with hydroxylamine , indicating the absence of free —CHO group. (Or, any relevant reaction) V. Adenine, Guanine, Cytosine, Uracil	**1 x 5 = 5**
	OR I. Anomers are isomers which differ in the spatial arrangement of hydroxyl group on one (anomeric) carbon atom. Example-α -D-Glucose and β-D-Glucose II. When a protein in its native form is subjected to a physical change, like a change in temperature or a chemical change like a change in pH, the hydrogen bonds are disturbed. Due to this, globules unfold and helix gets uncoiled and the protein loses its biological activity. This is called denaturation of proteins. III. α-glycosidic linkage -starch β-glycosidic linkage- Cellulose IV. All other vitamins of group B are water-soluble and are excreted in urine. They cannot be stored in the body. V. Nucleotide- Sugar + N containing base + Phosphate group Nucleoside- Sugar + N-containing base	**1 x 5 = 5**
32.	I. (i) Because it is an electron-withdrawing group / deactivating group / -R effect, electrophilic substitution takes place at the m-position.	**1**
	(ii) Because aldehydes & ketones form addition compound with $NaHSO_3$ which on hydrolysis forms pure aldehydes & ketones.	**1**
	(iii) Due to resonance, carboxylic carbon becomes less electrophilic.	**1**
	II.  (All 3 correct – 2M, Any 2 correct – 1M, Any 1 correct – ½ M)	**2**

	OR I. The structures of expected products of Cannizzaro reaction of 2 chlorobenzaldehyde  II. $-SO_3H$ is electron withdrawing in nature, hence it decreases the availability of lone pair for donation, hence basic nature of aniline decrease due to the presence of sulphonic group. III. Following are the steps to convert acetic acid to ethanamine. excess of $CH_3COOH \xrightarrow{LiAlH_4} CH_3CH_2OH \xrightarrow{SOCl_2} CH_3CH_2Cl \xrightarrow[NH_3]{\text{excess of}} CH_3CH_2NH_2$ IV. Benzoic acid from Benzoyl chloride: $C_6H_5COCl \xrightarrow{H_2\text{-}Pd/BaSO_4} C_6H_5CHO \xrightarrow{\text{acidified } KMnO_4} C_6H_5COOH$ V. The chemical test to distinguish between propanal and propanone is Tollen's test (Silver Mirror). Propanal on heating in a water bath with ammonical silver nitrate (Tollen's reagent) forms a silver mirror on the sides of the test tube. Propanone on heating in a water bath with Tollen's reagent does not show any reaction.	**1 x 5 = 5**
33.	A (i) Order w.r.t P is 1 Order w.r.t Q is 2 (ii) Rate = k [P] $[Q]^2$ (iii) Rate constant, k = 27.78 $mol^{-2}L^2s^{-1}$ (iv) Rate of formation of R = 0.625 $molL^{-1}s^{-1}$ **OR** B I. $t_{99\%} = \frac{2.303}{k} \log \frac{100}{1}$ $t_{90} = \frac{2.303}{k} \log \frac{100}{10}$ $\frac{t_{99\%}}{t_{90}} = 2$	 **1** **1** **1** **1** **1** **2**

	II. $$\log\frac{k_2}{k_1}=\frac{E_a}{2.303R}\left[\frac{T_2-T_1}{T_1T_2}\right]$$	½
	$k_2 / k_1 = 3$, $T_2 = 320$ K, $T_1 = 300$ K	½
	$E_a = 43839.3$ J mol^{-1}	**2**