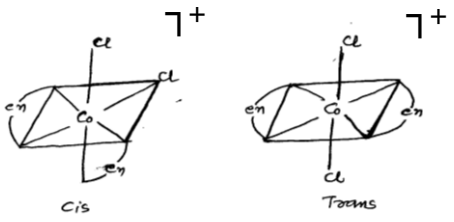
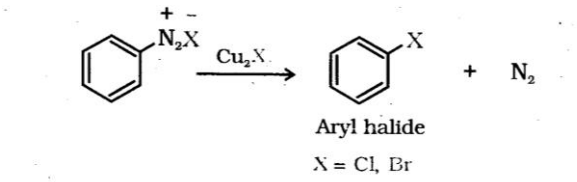
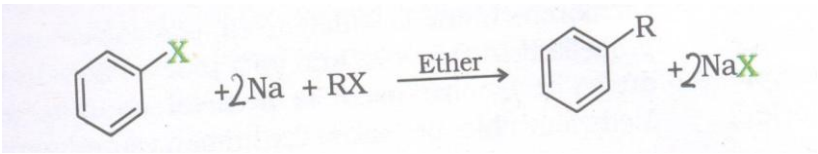
CHEMISTRY MARKING SCHEME
AN - 2013
SET - 56/1(AN)

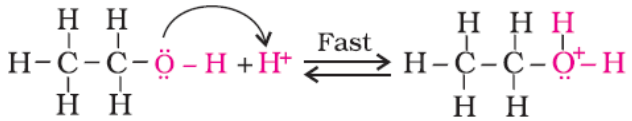
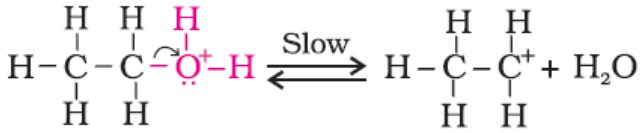
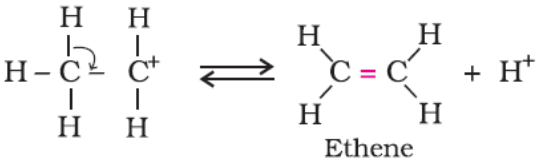
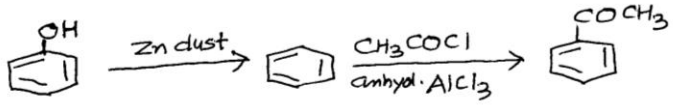
Q no.	Answers	Marks
1	When concentration of each reactant is taken as unity.	1
2	$Na_3PO_4 > K_2SO_4 > NaCl$	1
3	ClF	1
4	$4H_3PO_3 \xrightarrow{\text{heat}} 3H_3PO_4 + PH_3$	1
5	$K_4[Fe(CN)_6]$	1
6	Add Lucas reagent (conc. HCl + Anhyd. $ZnCl_2$) to both the alcohols separately. Turbidity will be produced immediately in case of 2-methylpropan-2-ol	1
7	2-methylcyclopent-3-ene carboxylic acid / for any other attempt give full marks.	1
8	Glycogen	1
9	Volume of unit cell $= a^3 = (288 \times 10^{-10}\ cm)^3$ $= 2.39 \times 10^{-23}\ cm^3$ Volume of 208 g of the element $= \frac{mass}{density} = \frac{208g}{7.2\,g\,cm^{-3}} = 28.88\,cm^3$ Number of unit cells in this volume $= \frac{28.88cm^3}{2.39\times10^{-23}cm^3/unit\ cell} = 12.08\times10^{23}$ unit cells Since each *bcc* cubic unit cell contains 2 atoms, therefore, the total number of atoms in 208 g = 2 (atoms/unit cell) × 12.08×10^{23} unit cells $= 24.16\times10^{23}$ atoms (or any other correct method may be used)	1 1
10	1. Diode is a combination of n-type and p-type semi conductors and is used as rectifier. 2. npn and pnp type of transistors are used to detect or amplify radio or audio signals. 3. The solar cell is an efficient photo diode used for conversion of light energy to electrical energy. (any two)	1+1

11	(i) Because the ions present in saline water enhance the electrochemical process of rusting. (ii) Because the number of ions per unit volume decreases with dilution.	1+1
12	The activated complex has a transient existence and breaks up at a definite rate to form the product. The energy required to form activated complex is called activation energy.	1+1
	OR	
12	The rate of reaction is defined as the change in concentration of reactants or products per unit time. or mathematical expression If the rate is measured in larger time interval (Δt) then it is called average rate whereas if the rate is measured in very small time interval ($\Delta t \to 0$) then it is called instantaneous rate.	1 ½+½
13	$\log \frac{[R]_1}{[R]_2} = \frac{k(t_2 - t_1)}{2.303}$ $k = \frac{2.303}{(t_2 - t_1)} \log \frac{[R]_1}{[R]_2}$ $= \frac{2.303}{(60\,\text{min} - 0\,\text{min})} \log \frac{1.24 \times 10^{-2}\,\text{mol L}^{-1}}{0.20 \times 10^{-2}\,\text{mol L}^{-1}}$ $= \frac{2.303}{60} \log 6.2\,\text{min}^{-1}$ $k = 0.0304\ \text{min}^{-1}$	½ 1 ½
14	(a) 	½ + ½
	(b) sp^3d^2, octahedral / It is an outer orbital octahedral complex with sp^3d^2 hybridisation.	½ + ½

15	(a) Add aq. KOH followed by 2,4-DNP to both the compounds. 1,1-dichloroethane gives yellow ppt. (or any other correct test) (b) $CH_3Br \xrightarrow{KCN} CH_3CN \xrightarrow{CH_3MgBr/\ H_3O^+} CH_3COCH_3$ (or by any other suitable method)	1 1
16	(i)  Aryl halide X = Cl, Br (ii)  	 1+1
17	(a) Because of resonance in CH_3CONH_2, N acquires +ve charge whereas due to +I effect electron density on N increases in $CH_3CH_2NH_2$ (b) Because of strong activation effect or +R effect of NH_2 group in aromatic amines. (or can be explained by diagrammatic representation)	 1+1
18	(i) $CH_3-CH_2-CH_2NH_2$ (ii) $CH_3-\underset{\displaystyle NH_2}{\underset{|}{CH}}-CH_3$ (iii) $CH_3-CH_2-NH-CH_3$	

	(iv)  (At least 3 correct structures should be written) Propanamine and 2-aminopropane	½x3 = 1 ½ ½
19	$Ag^+ + e^- \rightarrow Ag$ 108 g is deposited by 96500 C electric charge 1.45 g of silver is deposited by $\frac{96500\,C \times 1.45\,g}{108\,g} = 1295.6\,C$ Quantity of electricity passed = Current x t $t = \frac{1295.6\,C}{1.5\,amp} = 863.7\,s$ $Cu^{2+} + 2e^- \rightarrow Cu$ 2 x 96500 C deposits 63.5 g of Cu 1295.6 C deposits $\frac{63.5g \times 1295.6\,C}{2 \times 96500\,C}$ of Cu = 0.426 g of Cu $Zn^{2+} + 2e^- \rightarrow Zn$ 2 x 96500 C deposits 65.4 g of Zn 1295.6 C deposits $\frac{65.4g \times 1295.6\,C}{2 \times 96500\,C}$ of Zn = 0.44 g of Zn	1 1 ½ ½
	OR	
19	$E_{cell}^{o} = E_{cathode}^{o} - E_{anode}^{o}$ = 0.34 V - (-0.76) V = +1.10 V $\Delta_r G^{o} = -nFE^{O}_{cell}$ $= -2 \times 96500\,C\,mol^{-1} \times 1.10\,V$ $= -213.3\,kJ\,mol^{-1}$	1 ½ ½ 1

20	(i) Shape selective Catalysis: The reaction in which a catalyst action depends upon its pore structure and molecular sizes of the reactants as well as products is called shape selective catalysis. (ii) Micelles: They are associated colloid which behave as electrolytes at low concentration but behave as colloid at higher concentration. (iii) Lyophobic sols: The sols which are solvent repelling in nature.	1x3=3
21	**(a)** The impure Ni is heated with carbon monoxide(CO) to form volatile compound $Ni(CO)_4$ which on further heating decomposes at higher temperature gives pure Ni. (b) Because of higher entropy in liquid state. (c) NaCN is used for the leaching of silver ore in the presence of air to form a soluble complex.	1x3=3
22	(i) Ram: Kind and helpful Police: Bound to their duty and helpful (ii) -In the manufacture of fertilizers -In petroleum refining -In detergent industry -In storage batteries	½+½ ½x4=2
23	(a) $PbS + 4O_3 \longrightarrow PbSO_4 + 4O_2$ (or any other correct reaction) (b) $6XeF_4 + 12H_2O \longrightarrow 2XeO_3 + 4Xe + 24HF + 3O_2$ (c) Because Bi is more stable in +3 oxidation state.	1x3=3

24	(a)  ½  ½  1 (b)  1	
25	(b) Proteins which consist of linear thread like molecules which lie side by side. ex. Insulin, albumins (any one) (c) Nucleic acids are polymers of nucleotides. Function: They are responsible for transfer of genetic information from one generation to the other./ protein synthesis (any one function)	1 ½ 1 ½
26	(a) <u>Chain Growth Polymerisation</u> — They are used when molecules of the same monomer or different monomers add together on a large scale. **<u>Step Growth Polymerisation</u>** — They are formed by the condensation of bifunctional monomers.	1

	There is no loss of simple molecules.	They result in the loss of some simple molecule.	1
	(b) Sulphur forms cross links during vulcanization and makes the rubber hard.		1
27.	Limited Spectrum Antibiotics: They are effective against a single organism or disease. ex. Penicillin G Antioxidants: Chemical substances which prevent the oxidation in food stuff etc. are called antioxidants. ex. BHA (or any other example) Tranquilizers: Drugs which act on central nervous system and thus help in reducing anxiety are called tranquilizers. ex. Equanil, Seconal, luminal etc (or any other example)		½ + ½ ½ + ½ ½ + ½

28 (a)

$$\text{Molality of sugar solution} = \frac{n_{C_{12}H_{22}O_{11}}}{W_{H_2O}\text{ (in grams)}} \times 1000$$ ½

$$= \frac{5}{342} \times \frac{1000}{100} = 0.146 \text{ m}$$

ΔT_f for sugar solution = 273.15 K – 271 K = 2.15 K

$$\Delta T_f = K_f \times m$$

$$\therefore \quad K_f = \frac{\Delta T_f}{m} = \frac{2.15}{0.146} \text{ K kg mol}^{-1}$$ 1

$$\text{Molality of glucose solution} = \frac{n_{C_6H_{12}O_6}}{w_{H_2O}\text{ (in grams)}} \times 1000$$

$$= \frac{5}{180} \times \frac{1000}{100} = 0.278 \text{ mol kg}^{-1}$$

$$\Delta T_f = K_f \times m$$

$$\therefore \quad \Delta T_f \text{ (Glucose)} = \frac{2.15}{0.146} \text{K kg mol}^{-1} \times 0.278 \text{ mol kg}^{-1}$$

$$= 4.09 \text{ K}$$ 1

∴ Freezing point of glucose solution = 273.15 K – 4.09 K = **269.06 K.** ½

Calculate the mass of

(b)

Henry's law states that at a constant temperature, the solubility of a gas in a liquid is directly proportional to the pressure of the gas over the solution. 1

Applications

(i) To increase the solubility of CO_2 in soft drinks and soda water, the bottle is sealed under high pressure.

(ii) Scuba divers must cope with high concentrations of dissolved Nitrogen with breathing air at high pressure under water. To avoid this air is diluted with He. ½

(iii) At high altitudes the partial pressure of oxygen is less than that at the ground level. ½ + ½

Low blood oxygen causes anoxia.

(any two)

OR

28(a)

no. of moles of benzene $(n_B) = \frac{23.4\,g}{78\,g\,mol^{-1}} = 0.3$

no. of moles of toluene $(n_T) = \frac{64.4\,g}{92\,g\,mol^{-1}}$

$\therefore x_B = \frac{n_B}{n_B + n_T} = \frac{0.3}{0.3+0.7} = 0.3$ ½

$x_T = 0.7$ ½

$p_B = p_B^\circ \cdot x_B = 75\,mm \times 0.3 = 22.5\,mm$ ½

$p_T = p_T^\circ \cdot x_T = 22\,mm \times 0.7 = 15.4\,mm$ ½

Total V.P of solution = 22.5 + 15.4

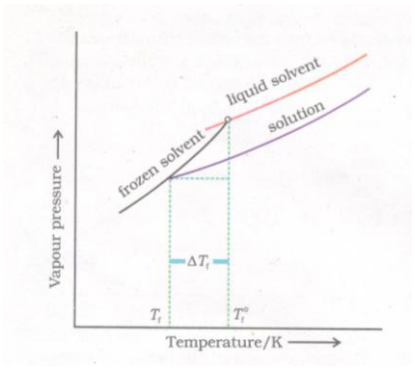
= 37.9 mm

Mole fraction of Benzene in vapour phase

$= \frac{\text{Partial V.P of Benzene}}{\text{Total V.P of solution}}$

$= \frac{22.5}{37.9} = 0.6$ 1

(b)

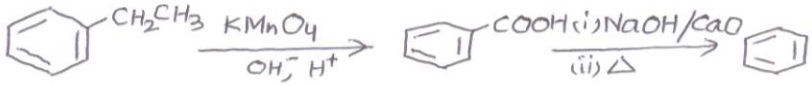
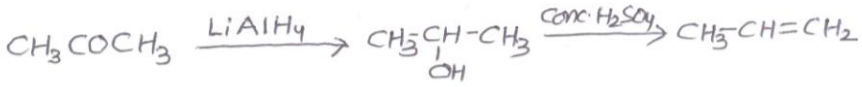
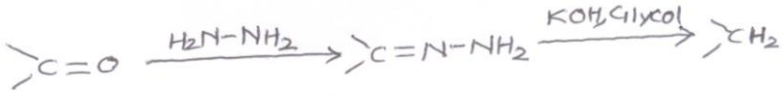


1

1

On adding non volatile solute vapour pressure of solution decreases. Therefore to freeze the solution temperature has to be lowered down causing depression of freezing point.

29.	(a) Because of Lanthanoid contraction. (b) Because of the presence of unpaired electrons there is strong metallic bonding and thus have high enthalpy of atomization. (c) Because Mn^{2+} is more stable due to half filled $3d^5$ whereas Cr^{3+} is stable due to half filled t_{2g}^3 orbital. (d) Because of the absence of unpaired electrons. (e) Because of half filled stable $3d^5$ configuration.	1x5= 5
	OR	
29	(a) $4\,FeCr_2O_4 + 8\,Na_2CO_3 + 7O_2 \rightarrow 8\,Na_2CrO_4 + 2Fe_2O_3 + 8CO_2$ $2Na_2CrO_4 + 2H^+ \rightarrow Na_2Cr_2O_7 + 2Na^+ + H_2O$ $Na_2Cr_2O_7 + 2\,KCl \rightarrow K_2Cr_2O_7 + 2NaCl$ Dichromate ion changes to chromate ion on increase in pH	1 ½ ½
	(b) The steady decrease in atomic radii with increase in atomic number is called lanthanoid contraction. consequences: 5d series elements have nearly same atomic radii as that of 4d series elements.	1 1
	(c) Because of the presence of unpaired electrons.	1
30.	(a) A=$(CH_3CO)_2O$ C=$CH_3COOC_2H_5$ E=CH_3COCH_3 B=CH_3COOH D=C_2H_5OH (b) (i) **Propanol and Propanone** : Propanone gives yellow ppt of Iodoform (CHI_3) on addition of NaOH/ I_2 whereas Propanol does not give this test. ***(or any other suitable test)***	1 ½ 1 ½ 1

	(ii) Because carbon of carboxyl group is less electrophillic.	1
	OR	
30	(a)	
	(i) 	
	(ii) 	1+1
	(or any other correct suitable method)	
	(b) (i) Because -COOH is a deactivating group. (ii) Because one NH_2 is involved in resonance with carbonyl group.	1+1
	(c)	
		1