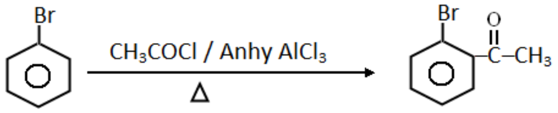
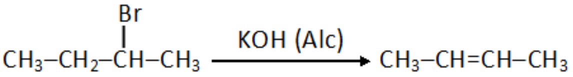
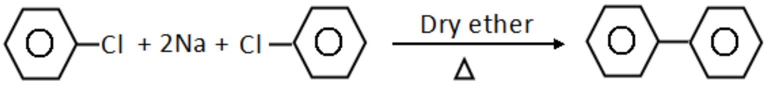
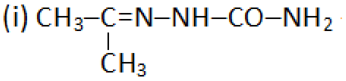
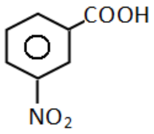
CHEMISTRY MARKING SCHEME

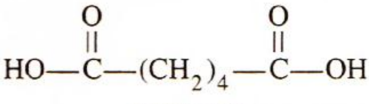
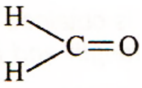
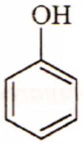
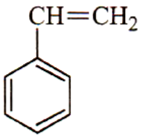
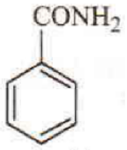
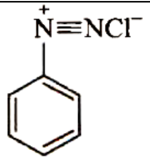
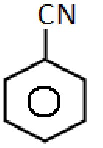
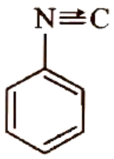
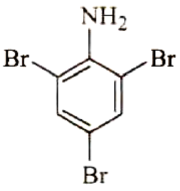
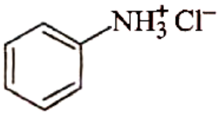
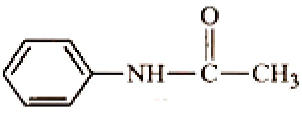
AJMER – 2015

SET - 56/1/A

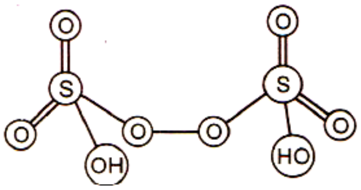
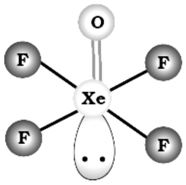
Question	Value points	Marks
01.	$AlCl_3$, due to greater charge on Al^{3+}.	**1**
02.	X_2Y_3	**1**
03.	H_3PO_2 , H_3PO_3 , $H_4P_2O_5$, $H_4P_2O_6$, H_3PO_4 , $H_4P_2O_7$, H_3PO_5 , $H_4P_2O_8$, $(HPO_3)_3$ $(HPO_3)_n$ **(Any two)**	**½ , ½**
04.	2,2–Dimethylpropan–1–ol	**1**
05.	C_6H_5–CH_2CH_2–Br	**1**
06.	(i) As solubility of gases decreases with increase of temperature, less oxygen is available in summer in the lakes / as cold water contains more oxygen dissolved. (ii) They will shrink , due to osmosis.	**1** **1**
07.	Wt. of Ag = 1.5g Current = i = 1.5amp Molecular mass = 108 g/mol F = 96500 C/mol n = number of electron transferred $W = \frac{M\ x\ I\ x\ t}{n\ x\ F}$ $\therefore t = \frac{W\ x\ n\ x\ F}{M\ x\ I} = \frac{1.5\ x\ 1\ x\ 96500}{108\ x\ 1.5}$ = 893.51 s or 14.89 min Or	½ **1** ½
7	At cathode: $Ag^+ + e^- \longrightarrow Ag_{(s)}$ 108g of Ag require 1F $\therefore$ 1.5g of Ag require $\frac{1.5}{108}$ F = $\frac{1.5\ x\ 96500}{108} = 1340.27$ C $t = \frac{Q}{i} = \frac{1340.27}{1.5}$ =893.51s or 14.89 min	½ **1** ½
08.	Due to comparable energies of ns & (n–1)d orbitals / due to presence of unpaired electrons in (n–1)d orbitals. In transition elements, oxidation states differ from each other by unity whereas in case of p- block elements, the oxidation states differ by units of two / In transition elements, the higher oxidation states are more stable for heavier elements in a group. In p – block elements, the lower oxidation states are more stable for heavier members due to inert	**1**

	pair effect. **(Any one difference)**	**1**
09.	(i) Ammineaquadichloridoplatinum(II)	**1**
	(ii) $[Cr(en)_3]Cl_3$	**1**
10.	(i) Zn-Hg, HCl or $H_2N–NH_2$ & KOH/Glycol , Δ	**1**
	(ii) PCl_5 / PCl_3 / $SOCl_2$ (Any one)	**1**
	Or	
10.	(i) $C_6H_5CHO < CH_3CHO < HCHO$	**1**
	(ii) 4 – Methoxybenzoic acid < 4 – Nitrobenzoic acid < 2,4 – Dinitrobenzoic acid	**1**
11.	$P_A^o = 17.5$mm of Hg $W_B = 15$g $M_B = 180$ g/mol	
	$W_A = 150$g Ps = ?	
	$\frac{P_A^o - P_S}{P_A^o} = \frac{W_B \times M_A}{M_B \times W_A}$ ∴ $\frac{P_A^o - P_S}{P_A^o} = \frac{15 \times 18}{180 \times 150} = 0.01$	**1**
	$\frac{P_A^o - P_S}{P_A^o} = \frac{17.5 - Ps}{17.5} = 0.01$	**1**
	∴ $p_s = 17.325$ mm of Hg	**1**
12.	(i) Non – Stoichiometric defect	**1**
	(ii) F – Centre / Farbe Centre	**1**
	(iii) NaCl is heated in an atmosphere of Na vapour / LiCl is heated in an atmosphere of Li vapour / KCl is heated in an atmosphere of K vapour.	**1**
13.	$A^{2+} + B^+ \longrightarrow A^{3+} + B$ (n = 1)	
	$Kc = 10^{10}$ F = 96500C/mol T = 25°C = 298K	
	$\Delta G^o = ?$ $E^o = ?$ R = 8.314J/K/mol	
	$\Delta G^o = -2.303RT \log Kc$	½
	$\Delta G^o = -2.303 \times 8.314$ J/K/mol x 298K X $\log 10^{10}$.	
	∴ $\Delta G^o = -57058.4$ J/mol or -57.0584 kJ/mol	**1**
	$\Delta G^o = -57058.4$ J/mol = $-nFE^o = -1 \times 96500 \times E^o$	½
	∴ $E^o = \frac{-57058.4}{-96500} = 0.591$V (or any other correct method)	**1**
14.	The accumulation of molecular species at the surface rather than in the bulk of a solid or liquid is termed adsorption.	½
	eg: gas like O_2, H_2, CO, Cl_2, NH_3 or SO_2 is taken in a closed vessel containing powdered charcoal	½
	Due to bond formation / interaction between adsorbent and adsorbate	**1**
	Physical (van der Waal's adsorption) & Chemical (Langmuir adsorption)	**1**
15.	(i) Van Arkel Method / vapour phase refining	**1**
	(ii)Zn acts as a reducing agent	**1**

	(iii) As ΔS is positive /ΔG is more negative	**1**
16.	(i) The large positive E^0 value for Mn^{3+} / Mn^{2+} shows that Mn^{2+} ($3d^5$ / half filled d orbital) is much more stable than Mn^{3+} Whereas Cr^{3+} ($t_{2g}{}^3$) is more stable than Cr^{2+} (ii) Due to d – d transition / due to presence of unpaired electrons in d – orbitals which absorb light in visible region (iii) $2MnO_4^- + 16H^+ + 5C_2O_4^{2-} \longrightarrow 2Mn^{2+} + 8H_2O + 10CO_2$	**1** **1** **1**
17.	(i) Linkage isomerism (ii) t_2g^3 eg^1 / Diagrammatic representation (iii) d^2sp^3, Octahedral	**1** **1** **½ , ½**
18.	(i) $CH_3–CH=CH_2 \xrightarrow{H_2O\,/\,H^+} CH_3–CH(OH)–CH_3$ (ii)  (iii)  $CH_3–CH_2–\overset{\overset{\large Br}{\vert}}{C}H–CH_3 \xrightarrow{KOH\ (Alc)} CH_3–CH=CH–CH_3$ (or any other correct method)	**1** **1** **1**
	Or	
18.	(i) $C_2H_5Cl + NaI \xrightarrow{Acetone} C_2H_5I + NaCl$ (ii)  + 2NaCl (iii) $CH_3Cl + KNO_2 \xrightarrow{\Delta} CH_3–ONO + KCl$	**1** **1** **1**
19.	(i) Due to –I / –R effect of $–NO_2$ group & +I / +R effect of $–CH_3$ group or 4-nitrophenoxide ion is more stable than 4-methylphenoxide ion (ii) Due to +R effect of – OH group in phenol / due to sp^2 hybridization of C–atom in C–OH group in phenol whereas sp^3 hybridization of C–atom in C–OH group in methanol. (iii) $(CH_3)_3C–Br$ being a 3° halide prefers to undergo β – elimination on reacting with strong base like $NaOCH_3$.	**1** **1** **1**
20.	(i)  $CH_3–\underset{\underset{\large CH_3}{\vert}}{C}=N–NH–CO–NH_2$ (ii) $C_6H_5–COOH$ (iii) 	**1** **1** **1**

21.	(i)  $HO-\overset{\overset{O}{\Vert}}{C}-(CH_2)_4-\overset{\overset{O}{\Vert}}{C}-OH$ Adipic acid and $H_2N-(CH_2)_6-NH_2$ Hexamethylenediamine (ii)  Formaldehyde and  Phenol (iii)  Styrene (Note: half mark for structure/s and half mark for name/s in each case)	**1** **1** **1**
22.	(i) Maltose (ii) In acidic amino acid more carboxyl groups as compared to amino groups are present & In basic amino acid more number of amino than carboxyl groups are present (iii) Phosphodiester linkage	**1** **1** **1**
23.	(i) Caring nature / Generous / Sensible human approach / empathy/ concern (any two) (ii) By making posters & displaying them in school premises / by doing role play (or any other correct answer) (iii) Drugs which are used for the treatment of /counteract depression. **eg:** Rauwolfia serpentina / Barbituric acid / Equanil / Valium (Diazeparn) / Chlordiazepoxide / meprobamate / iproniazid / phenelzine **(any one example)** (iv) Saccharin / Aspartame / Alitame / Sucrolose / Cyclamate / L-Glucose **(any one)**	**½ , ½** **1** **½ , ½** **1**
24. **24.**	A =  B =  C =  D =  E =  Or (a) (i)  (ii)  (iii)  (b) $(CH_3)_3N < C_2H_5NH_2 < C_2H_5OH$ (c) By Hinsberg test - Add Hinsberg reagent (Benzene sulphonyl chloride) in both compounds $(CH_3)_2$–NH forms ppt insoluble in KOH while $(CH_3)_3$–N does not react	**1 each** **1,1,1** **1**

	(or any other correct test)	**1**
25.	(i) Ao = 0.60 A = 0.30 when t = 30s	
(a)	$k = \frac{2.303}{t} \log \frac{[A_0]}{[A]}$	**1**
	$k = \frac{2.303}{30} \log \frac{0.60}{0.30}$	
	$k = \frac{2.303}{30} \log 2 = \frac{2.303}{30} \times 0.3010$	½
	$k = \frac{0.693}{30} = 0.0231 s^{-1}$	
	When Ao = 0.60 A = 0.15 when t = 60s	
	$k = \frac{2.303}{t} \log \frac{0.60}{0.15}$	
	$k = \frac{2.303}{60} \log \frac{0.60}{0.15}$	½
	$k = \frac{2.303}{60} \log 4 = \frac{2.303}{60} \times 0.6021$	
	$k = \frac{1.3866}{60} = 0.0231 s^{-1}$	
	As for both cases k is approximately same reaction is of pseudo first order	**1**
	(ii) Average rate during the interval 30 - 60 sec = $-\frac{\text{Change in concentration}}{\text{Change in time}}$	
	$= -\frac{0.15 - 0.30}{60 - 30}$	½
	$= -\frac{-0.15}{30} = 0.005 \text{ mol } L^{-1} S^{-1}$.	½
		1
	Or	
25.	(a) (i) Rate increases by 4 times	**1**
	(ii) 2^{nd} order	**1**
	(b) Reaction is 50% completed in 23.1 min i.e. Half-life is 23.1 min	
	$\therefore k = \frac{0.693}{t_{1/2}}$	½
	$= \frac{0.693}{23.1} = 0.03 \text{ min}^{-1}$	½
	$k = \frac{2.303}{t} \log \frac{[A_0]}{[A]}$	½
	$0.03 \text{ min}^{-1} = \frac{2.303}{t} \log \frac{100}{25}$	½
	$0.03 = \frac{2.303}{t} \log 4$	
	$t = \frac{2.303}{0.03} \times 0.6021 = \frac{1.3866}{0.03}$	
	= 46.221 min	

		1
26.	(a) (i) Due to lone pair of electron on nitrogen in NH_3	**1**
	(ii) Due to inert pair effect / Stability of higher oxidation state decreases down the group from S to Te / Stability of lower oxidation state increases down the group	**1**
	(iii) ClO_4^- is more stable than ClO^- / ClO_4^- is weak conjugate base than ClO^-	**1**
(b)	(i)  (ii) 	**1,1**
	Or	
26.	(a) PH_3 $P_4 + 3NaOH + 3H_2O \longrightarrow 3NaH_2PO_2 + PH_3$	½ , ½
	(b) $Xe^+[PtF_6]^-$, Approximately same molecular size of Xe & O_2 / Comparable ionisation energies of Xe & O_2	½ , ½
	(c) It is due to (i) low enthalpy of dissociation of F-F bond (ii) high hydration enthalpy of F^-.	½ , ½
	(d) (i) for bleaching wood pulp (required for manufacture of paper and rayon), cotton and textiles. (ii) In the metallurgy (extraction) of gold and platinum. (iii) In the manufacture of dyes, drugs and organic compounds such as $CHCl_3$, CCl_4, DDT, refrigerants (CCl_2F_2, freon), and bleaching powder. (iv) In the preparation of poisonous gases such as phosgene ($COCl_2$), tear gas (CCl_3NO_2), mustard gas ($ClCH_2CH_2SCH_2CH_2Cl$), etc. Mustard gas was used by Germany in World War I. (v) In sterilizing drinking water. **(Any one use)**	**1**
	(e) $CaF_2 + H_2SO_4 \longrightarrow CaSO_4 + 2HF$	**1**