Marking Scheme

Chemistry - 2014

Outside Delhi- SET (56 /1)

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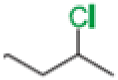
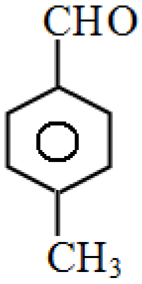
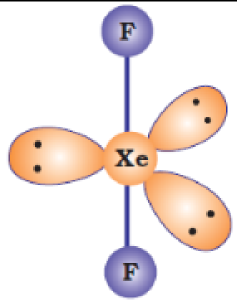
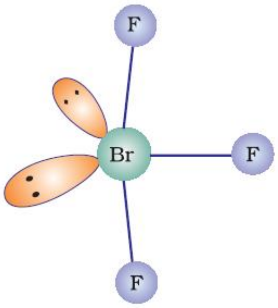
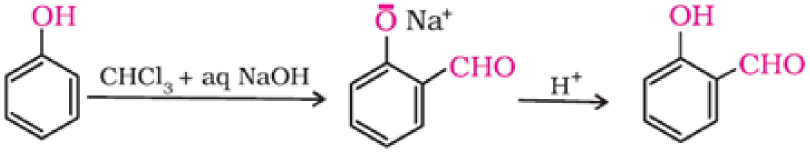
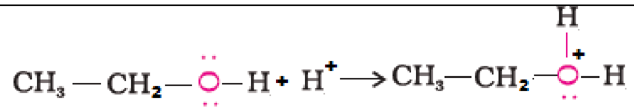
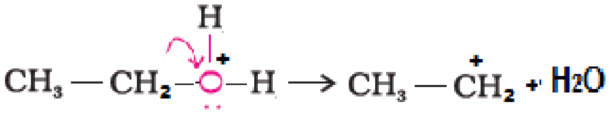
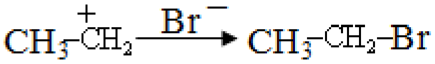
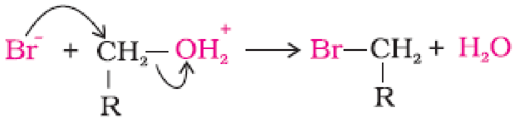
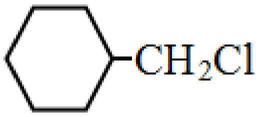
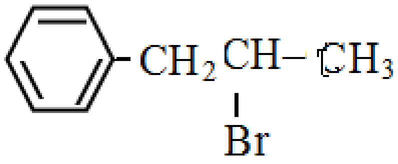
1	It first increases then decreases or graphical representation.	1
2	Zn acts as reducing agent.	1
3	2	1
4	2–Chlorobutane or  or first molecule of the pair.	1
5	Proteins	1
6.	Diazotization	1
7.	Glucose & Fructose	1
8.		1
9.	Given; $d = 2.8 g/cm^3$; $Z = 4$; $a = 4 x 10^{-8}$ cm $N_A = 6.022 x 10^{23}$ per mol $d = \frac{Z x M}{a^3 x N_A}$ or $M = \frac{d x a^3 x N_A}{Z}$ $\Rightarrow M = \frac{2.8 g cm^{-3} \left(4 x 10^{-8} cm\right)^3 x 6.022x10^{23}}{4}$ $M = 2.8 x 16 x 10^{-1} x 6.022 = 26.97$ g/mol	 ½ ½ 1
10	(i) Metal excess defect / Metal excess defect due to anionic vacancies filled by free electrons / Due to F – centers. (ii) Schottky defect.	1 1
	Or	

10	(i) Tetrahedral void is surrounded by 4 constituent particles (atoms / molecules / ions). Octahedral void is surrounded by 6 constituent particles (atoms / molecules / ions). OR radius ratio (r^+/r^-) for Tetrahedral void is 0.225 & radius ratio for octahedral voids is 0.414 (ii) A regular three dimensional arrangement of points in space is called a **crystal lattice**. **Unit cell** is the smallest portion of a crystal lattice which, when repeated in three directions, generates an entire lattice. / unit cell is the miniature of crystal lattice / microscopic edition of the crystal lattice.	1 1
11	**Kohlrausch law of independent migration of ions**. The law states that limiting molar conductivity of an electrolyte can be stated as the sum of the individual contributions of the anion and cation of the electrolyte. On dilution,the conductivity (κ) of the electrolyte decreases as the number of ions per unit volume of solution decreases.	1 1
12	(i) Zero order reaction (ii) slope = -k	1 1
13	In this method, the impure metal is made to act as anode. A strip of the same metal in pure form is used as cathode. They are put in a suitable electrolytic bath containing soluble salt of the same metal. Pure metal is deposited at the cathode and impurities remain in the solution. For example: electro refining of Cu, Ag, Au (any one)	1 1
14	(i) $P_4 + H_2O \longrightarrow$ no reaction or if attempted in any form, award one mark (ii) $XeF_4 + O_2F_2 \longrightarrow XeF_6 + O_2$.	1 1
15	 	1+1
16	**Reimer-Tiemann reaction**  **Williamson synthesis**  $R–X + R'–\ddot{O}Na \longrightarrow R–\ddot{O}–R' + NaX$	1 1
17	**$HBr \rightarrow H^+ + Br^-$**	

	 $CH_3-CH_2-\ddot{O}-H + H^+ \longrightarrow CH_3-CH_2-\overset{H}{\overset{\vert}{O}}{}^{+}-H$	½
	 $CH_3-CH_2-\overset{H}{\overset{\vert}{O}}{}^{+}-H \longrightarrow CH_3-\overset{+}{C}H_2 + H_2O$	½
	 $CH_3-\overset{+}{C}H_2 \xrightarrow{Br^-} CH_3-CH_2-Br$	1
	Or	
	 $Br^- + \underset{R}{\underset{\vert}{CH_2}}-\overset{+}{O}H_2 \longrightarrow Br-\underset{R}{\underset{\vert}{CH_2}} + H_2O$ (where R = $-CH_3$)	
18	(i) Phenol & Formaldehyde	1
	(ii) 2–Chloro–1,3–butadiene (or Chloroprene)	1
19	(a) Given E°Cell = +2.71V & F = 96500C mol^{-1} n = 2 (from the given reaction)	
	$\Delta rG^O = -n \times F \times E^oCell$	½
	$\Delta rG^O = -2 \times 96500\ C\ mol^{-1} \times 2.71V$	½
	= - 523030 J / mol or - 523.030 kJ / mol	1
	(b) Hydrogen – oxygen fuel Cell / Fuel cell.	1
20	$SO_2Cl_2 \rightarrow SO_2 + Cl_2$	
	At t = 0s 0.4 atm 0 atm 0 atm	
	At t = 100s (0.4 – x) atm x atm x atm	
	Pt = 0.4 – x + x + x	
	Pt = 0.4 + x	
	0.7 = 0.4 + x	
	x = 0.3	
	$k = \frac{2.303}{t} \log \frac{p_i}{2p_i-p_t}$	1
	$k = \frac{2.303}{t} \log \frac{0.4}{0.8-0.7}$	1
	$k = \frac{2.303}{100s} \log \frac{0.4}{0.1}$	
	$k = \frac{2.303}{100s} \times 0.6021 = 1.39 \times 10^{-2}\ s^{-1}$	1
21	These are liquid-liquid colloidal systems or the dispersion of one liquid in another liquid.	1
	Types: (i) Oil dispersed in water (O/W type) Example; milk and vanishing cream	½ +½
	(ii) Water dispersed in oil (W/O type) Example; butter and cream.	½ +½

	(Any one example of each type)	
22	(i) As N can't form 5 covalent bonds / its maximum covalency is four. (ii) This is due to very small size of Oxygen atom / repulsion between electrons is large in relatively small 2p sub-shell. (iii) In H_3PO_2 there are 2 P–H bonds, whereas in H_3PO_3 there is 1 P–H bond	1 1 1
23	(i) Tetraamminedichloridochromium (III) chloride. (ii) Optical isomerism (iii) In $[NiCl_4]^{2-}$; Cl^- acts as weak ligand therefore does not cause forced pairing, thus electrons will remain unpaired hence paramagnetic. In $[Ni(CO)_4]$; CO acts as strong ligand therefore causes forced pairing, thus electrons will become paired hence diamagnetic.	1 1 ½ + ½
24	(a) (i)  (ii)  (b) (i) CH_3–I (ii) CH_3–Cl	1 1 ½ +½
25	(i) As primary amines form inter molecular H – bonds, but tertiary amines don't form H – bonds. (ii) Aniline forms salt with Lewis acid $AlCl_3$. (iii) This is because of the combined effect of hydration and inductive effect (+I effect).	1 1 1
	Or	
25	(i) $C_6H_5NO_2 \xrightarrow{Sn+HCl} C_6H_5NH_2 \xrightarrow{NaNO_2+HCl\ ;\ 273K} C_6H_5N_2^+Cl^- \xrightarrow{H_2O} C_6H_5OH$ A B C (ii) $CH_3CN \xrightarrow{H_2O\,/\,H^+} CH_3COOH \xrightarrow[\Delta]{NH_3} CH_3CONH_2 \xrightarrow{Br_2\ +\ KOH} CH_3NH_2$ A B C	½+½+½ ½+½+½
26	(i) Peptide linkage is an amide formed between –COOH group and $–NH_2$ group (-CO-NH-) (ii) Specific sequence of amino acids in a polypeptide chain is said to be the **primary structure** of the protein.	1 1

	(iii) When a protein in its native form, is subjected to change in temperature or change in pH, protein loses its biological activity. This is called **denaturation of protein**	1
27	(i) (a) dedicated towards work/ kind/ compassionate (any two). (b) Dutiful / caring / humane in the large interest of public health in rural area. (any other suitable value) (ii) Narcotic analgesics (iii) Aspartame / Saccharin / Alitame / Sucrolose.(any one)	1 ½ ½ 1
28	(a) (i) Molarity is defined as number of moles of solute dissolved in one litre of solution. (ii) It is equal to elevation in boiling point of 1 molal solution. (b) For isotonic solutions: π urea = π glucose $\frac{W_{urea}}{M_{urea} \text{ x } V_S} = \frac{W_{Glucose}}{M_{Glucose} \text{ x } V_S}$ (As volume of solution is same) $\frac{W_{urea}}{M_{urea}} = \frac{W_{Glucose}}{M_{Glucose}}$ or $\frac{15g}{60\text{g mol}^{-1}} = \frac{W_{Glucose}}{180\text{g mol}^{-1}}$ $W_{Glucose} = \frac{15\text{g x }180\text{g mol}^{-1}}{60\text{g mol}^{-1}} = 45\text{g}$	 1 1 ½ ½ 1 1
	OR	
28	(a) It shows positive deviation. It is due to weaker interaction between acetone and ethanol than ethanol-ethanol interactions. (b) Given: W_B = 10g W_S = 100g, W_A = 90g M_B = 180g/mol & d = 1.2g/m L $M= \frac{\text{Wt \% x density x 10}}{\text{Mol.wt.}}$ $M= \frac{10 \text{ x } 1.2 \text{ x } 10}{180}$ = 0.66 M or 0.66 mol/L $m= \frac{W_B \text{ x } 1000}{M_B \text{ x } W_A \text{ (in g)}}$ $m= \frac{10 \text{ x } 1000}{180 \text{ x } 90}$ = 0.61m or 0.61mol/kg **(or any other suitable method)**	1 1 ½ 1 ½ 1

29

(a) (i) $Cr_2O_7^{2-} + 2\ OH^- \longrightarrow 2CrO_4^{2-} + H_2O$ 1

(ii) $MnO_4^- + 4H^+ + 3e^- \longrightarrow MnO_2 + 2H_2O$ 1

(b) (i) Zn / Zn^{2+} has fully filled d orbitals. 1

(ii) This is due to smaller ionic sizes / higher ionic charge and availability of d orbitals. 1

(iii) because Mn $^{+2}$ is more stable($3d^5$) than Mn^{3+} ($3d^4$). Cr^{+3} is more stable due to t_2g^3 / d^3 configuration. 1

Or

29

(i)

Lanthanoids	Actinoids
Atomic / ionic radii does not show much variation / +3 is the most common oxidation state, in few cases +2 & +4	Atomic / ionic radii show much variation / Besides +3 oxidation state they exibit +4,+5,+6,+7 also.
They are quite reactive	Highly reactive in finely divided state

1

1

(Any two Points)

(ii) Cerium (Ce^{4+}) 1

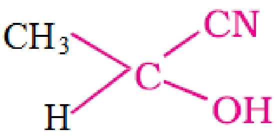
(iii) $MnO_4^- + 8H^+ + 5e^- \longrightarrow Mn^{2+} + 4H_2O$ 1

(iv) Mn^{3+} is more paramgnetic ½

Because Mn^{3+} has 4 unpaired electrons ($3d^4$) therefore more paramagnetic whereas Cr^{3+} has 3 unpaired electrons ($3d^3$). ½

30

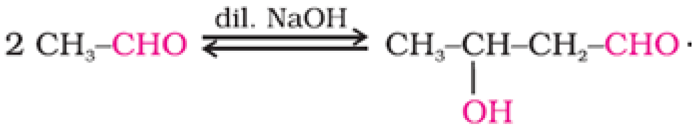
(a) (i)



1

(ii) $CH_3CH{=}N{-}OH$ 1

(iii)



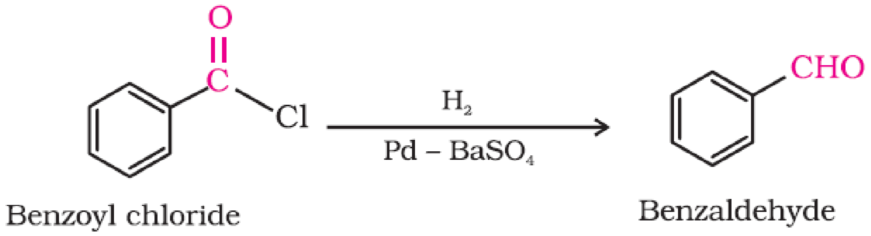
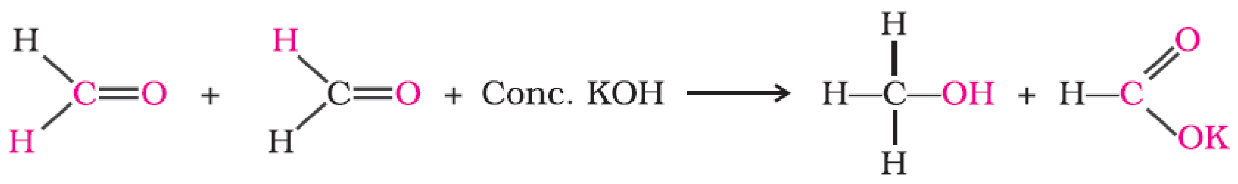
$$2\ CH_3{-}CHO \xrightleftharpoons{\text{dil. NaOH}} \underset{\displaystyle |\atop OH}{CH_3{-}CH}{-}CH_2{-}CHO$$

1

(b) (i) Add neutral $FeCl_3$ in both the solutions, phenol forms violet colour but benzoic acid does not. 1

(ii) **Tollen’s reagent test**: Add ammoniacal solution of silver nitrate (Tollen’s reagent) in both the solutions propanal gives silver mirror whereas propanone does not. 1

(or any other correct test)

	OR	
30	(a) (i) As Cl acts as electron withdrawing group (– I effect) ,CH_3 shows +I effect. (ii) The carbonyl carbon atom in carboxylic acid is resonance stabilised. (b) (i) **Rosenmund reduction:**  Or RCOCl $\xrightarrow{H_2/\,Pd-BaSO_4}$ RCHO +HCl. **(ii) Cannizzaro's Reaction:**  Or With bezaldehyde (c) $CH_3–CH_2–CH_2–CO–CH_3$.	1 1 1 1 1

Sr. No.	Name		Sr. No.	Name	
1	Dr. (Mrs.) Sangeeta Bhatia		9	Sh. Partha Sarathi Sarkar	
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4	Sh. S.K. Munjal		12	Mrs. Maya George	
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