Marking Scheme

Chemistry - 2014

Outside Delhi- SET (56 /2)

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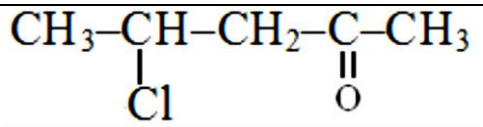
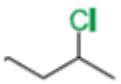
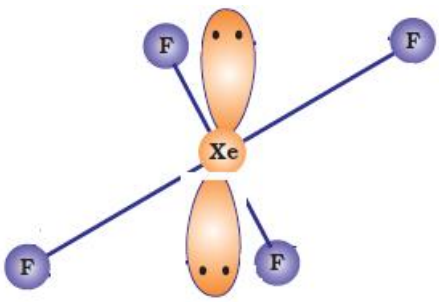
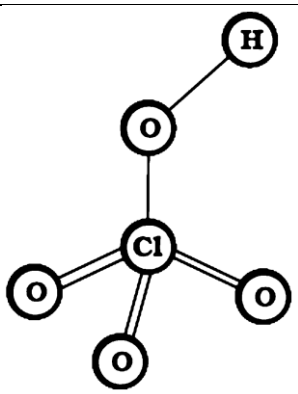
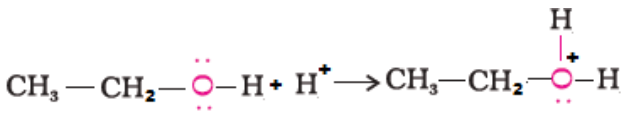
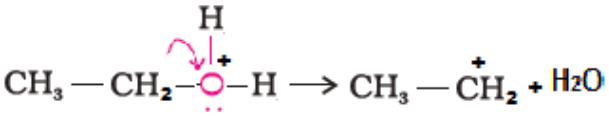
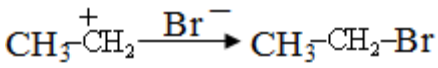
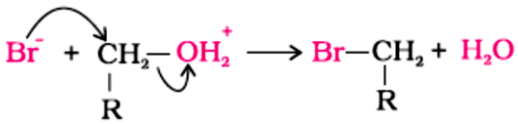
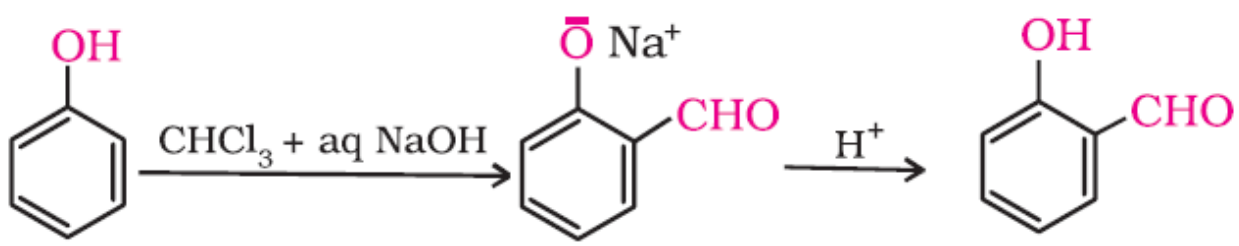
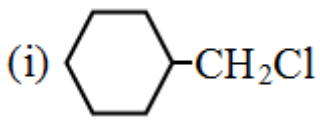
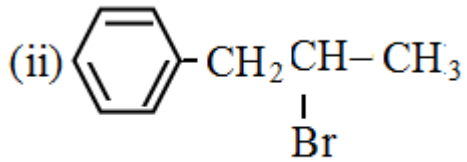
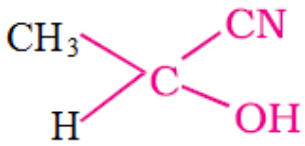
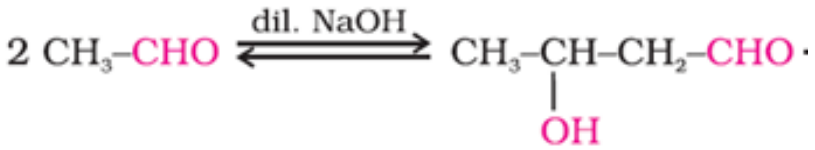
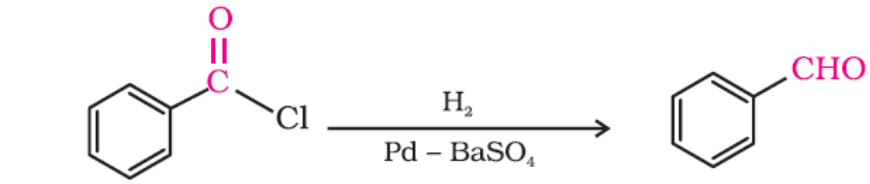
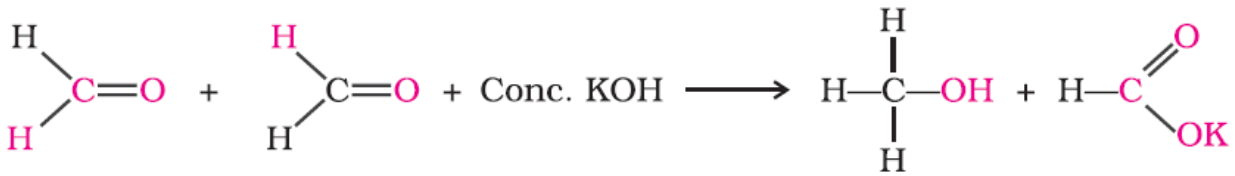
1	In adsorption there is development of inter particle attractions between adsorbate & adsorbent.	1
2	Monds' Process	1
3	NO_2 contains odd number of electron and dimerises to become stable	1
4	Elastomer	1
5	2 molecules of Glucose	1
6.		1
7.	2–Chlorobutane or  or first molecule of the pair.	1
8.	Diazotization	1
9.	(i) Ethylene glycol (Ethane–1,2–diol) and terephthalic acid (Benzene–1,4–dicarboxylic acid) (ii) Hexamethylenediamine & adipic acid	1 1
10	(i) It acts as Flux to remove iron oxide as silicate (slag) / $FeO + SiO_2 \longrightarrow FeSiO_3$ (Slag). (ii) NaCN acts as the depressant. It selectively prevents ZnS from coming to the froth but allows PbS to come with the froth.	1 1
11	(i) $2Ag + PCl_5 \longrightarrow 2AgCl + PCl_3$ (ii) $CaF_2 + H_2SO_4 \longrightarrow CaSO_4 + 2HF$ (or H_2F_2)	1 1
12	 	1+1
13	(i) Antiferromagnetism (ii) Frenkel defect	1 1
14	(i) Galvanic cells that are designed to convert the energy of combustion of fuels (methane, methanol, etc.) directly into electrical energy are called **fuel cells**. (ii) Molar conductivity of electrolyte at infinite dilution or when concentration approaches zero.	1 1

15	**$HBr \rightarrow H^+ + Br^-$**  ½  ½  OR 1  (where R = $-CH_3$)	
16	(i) Zero order reaction (ii) slope= -k	1 1
17	Given; d = 2.8g/cm^3 ; Z = 4 ; a = 4 x 10^{-8} cm N_A = 6.022 x 10^{23} per mol $d = \frac{Z \times M}{a^3 \times N_A}$ or $M = \frac{d \times a^3 \times N_A}{Z}$ ½ $\Rightarrow M = \frac{2.8 g/cm^3 \times (4 \times 10^{-8} cm)^3 \times 6.022 \times 10^{23} \text{ per mol}}{4}$ ½ M = 2.8 x 16 x 10^{-1} x 6.022 = 26.97 g/mol. 1	
18	**Reimer-Tiemann reaction**  **Williamson synthesis** 	1 1
19	(i) A linkage between two monosaccharide units through oxygen atom is called **glycosidic linkage.** (ii) Hydrolysis of sucrose brings about a change in the sign of rotation, from dextro (+) to laevo	1 1

	(–) and the product is named as **invert sugar**. (iii) Carbohydrates that yield two to ten monosaccharide units on hydrolysis, are called **oligosaccharides**.	 1
20	(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
21	(i) As primary amines form inter molecular H – bond, 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	
21	(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
22	(a) (i)  (ii)  (b) (i) CH_3–I (ii) CH_3–Cl	1 1 ½ +½
23	(a) Given E^oCell = +2.71V & F = 96500C mol^{-1} n = 2 (from the given reaction) ΔrG^O = – n x F x E^oCell ΔrG^O = – 2 x 96500 C mol^{-1} x 2.71V = -523030 J / mol or -523.030 kJ / mol (b) Hydrogen – oxygen fuel Cell / fuel cell	 ½ ½ 1 1

24	SO_2Cl_2 → 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 $k = \frac{2.303}{t} \log \frac{p_i}{2p_i - p_t}$ $k = \frac{2.303}{t} \log \frac{0.4}{0.8-0.7}$ $k = \frac{2.303}{100s} \log \frac{0.4}{0.1}$ $k = \frac{2.303}{100s} \times 0.6021 = 1.39 \times 10^{-2}\ s^{-1}$	1 1 1
25	These are liquid-liquid colloidal systems or the dispersion of one liquid in another liquid. **Types:** (i) Oil dispersed in water (O/W type) Example; milk and vanishing cream (ii) Water dispersed in oil (W/O type) Example; butter and cream. **(Any one example of each type)**	1 ½ +½ ½ +½
26	(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
27	(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

28	(a) (i)  (ii) $CH_3CH=N–OH$ (iii)  (b) (i) Add neutral $FeCl_3$ in both the solutions, phenol forms violet colour but benzoic acid does not. (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. (or any other correct test)	1 1 1 1 1
	OR	
28	(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:**  Benzoyl chloride Benzaldehyde 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

29	(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 $\frac{W_{urea}}{M_{urea} \times V_s} = \frac{W_{Glucose}}{M_{Glucose} \times V_s}$ (As volume of solution is same) $\frac{W_{urea}}{M_{urea}} = \frac{W_{Glucose}}{M_{Glucose}}$ or $\frac{15g}{60g\ mol^{-1}} = \frac{W_{Glucose}}{180g\ mol^{-1}}$ $W_{Glucose} = \frac{15g \times 180g\ mol^{-1}}{60g\ mol^{-1}} = 45g$	 1 1 ½ ½ 1 1
	OR	
29	(a) It shows positive deviation. It is due to weaker interaction between acetone and ethanol than ethanol-ethanol interactions. (b) Given: $W_B = 10g$ $W_S = 100g$, $W_A = 90g$ $M_B = 180g/mol$ & $d = 1.2g/mL$ $M = \frac{Wt\ \% \times density \times 10}{Mol.wt.}$ $M = \frac{10 \times 1.2 \times 10}{180} = 0.66\ M$ or $0.66\ mol/L$ $m = \frac{W_B \times 1000}{M_B \times W_A\ (in\ g)}$ $m = \frac{10 \times 1000}{180 \times 90}$ $= 0.61m$ or $0.61mol/kg$ **(or any other suitable method)**	1 1 ½ 1 ½ 1

<table>
<tr><td>30</td><td>(a) (i) $Cr_2O_7^{2-} + 2\ OH^- \longrightarrow 2CrO_4^{2-} + H_2O$
(ii) $MnO_4^- + 4H^+ + 3e^- \longrightarrow MnO_2 + 2H_2O$
(b) (i) Zn / Zn^{2+} has fully filled d orbitals.
(ii) This is due to smaller ionic sizes / higher ionic charge and availability of d orbitals.
(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.</td><td>1
1
1
1
1</td></tr>
<tr><td></td><td>OR</td><td></td></tr>
<tr><td>30</td><td>(i)
<table>
<tr><th>Lanthanoids</th><th>Actinoids</th></tr>
<tr><td>Atomic / ionic radii does not show much variation / +3 is the most common oxidation state, in few cases +2 & +4</td><td>Atomic / ionic radii show much variation / Besides +3 oxidation state they exibit +4,+5,+6,+7 also.</td></tr>
<tr><td>They are quite reactive</td><td>Highly reactive in finely divided state</td></tr>
</table>
(Any two Points)
(ii) Cerium (Ce^{4+})
(iii) $MnO_4^- + 8H^+ + 5e^- \longrightarrow Mn^{2+} + 4H_2O$
(iv) Mn^{3+} is more paramgnetic
because Mn^{3+} has 4 unpaired electrons ($3d^4$) therefore more paramagnetic whereas Cr^{3+} has 3 unpaired electrons ($3d^3$).</td><td>1
1
½
½</td></tr>
</table>

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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