INDIAN SCHOOL MUSCAT
FIRST PRELIMINARY EXAMINATION
SUBJECT : CHEMISTRY MARKING SCHEME

CLASS: XII | Sub. Code: 043 | Time Allotted: 3 Hrs

12.12.2017 | Max. Marks: 70

1. Ca^{2+} +2 e- →Ca 1
   1 F is required for 20 g

2. The rate will become one fourth. 1

3. Lanthanoids resemble each other due to similar ionic sizeand 4d and 5d series elements also show similarities in properties. 1

4. $CH_3CH_2N(CH_3)CH_2CH_2CH_3$ 1

5. 1-(4-Bromophenyl)-3-bromo-1-methylbut-2-ene 1

6. In the first step MnO_2 is fused with KOH to form potassium manganate (K_2MnO_4). Then K_2MnO_4 is electrolytically oxidised to potassium permanganate. 2
   $2MnO_2 + 4KOH + O_2 \rightarrow 2K_2MnO_4 + 2H_2O$
   $3MnO_4^{2-} + 4H^+ \rightarrow 2MnO_4^- + MnO_2 + 2H_2O$

7. a) Entropy is higher and ΔS become more positive so ΔG becomes more negative and reduction becomes easier. 2

   b) Sulphide minerals become wet by oils and gangue particles by water.

8. 2

   a) The process of conversion of a freshly prepared precipitate into a colloidal sol by shaking it with suitable dispersion medium in the presence of small amount of electrolyte is called peptization.
   b) The potential difference between the fixed layer and the diffused layer of opposite charges is called the electrokinetic potential or zeta potential

OR

   a) $2AuCl_3 + 3HCHO + 3H_2O \rightarrow 2Au(sol) + 3HCOOH + 6HCl$

   b) $FeCl_3 + 3H_2O$ Hydrolysis $\rightarrow Fe(OH)_3$ (sol) + 3HCl

9. a) CH_3CH_2 I -lower bond dissociation enthalpy of C-I bond 2

   b) The intermediate carbocation is sp^2 hybridised and has less steric hindrance so equal

probability of attacking nucleophile from either side and form equal amount of dextro and laevo products.

10. a) With Hinsberg reagent dimethylamine forms salt but trimethyl amine will not react. 2

b) 4-Chloro cyclohexanamine

11. a) Due stable half filled orbitals in Mn^{2+} but in Cr^{3+} half filled t_2g in Cr^{3+} 3

b) In actinoids 5 f,6d and 7s orbitals ae of comparable energies

c) Due to higher oxidation state of Mn in Mn_2O_7 / Due to high polarizing power of Mn(VII)

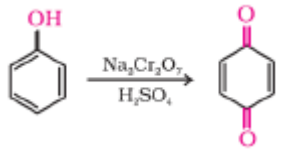
12. 3

a) The greater the valency of the coagulating ion, the greater will be the coagulating power. This is known as Hardy – Schulze rule

b) It is the ability of a catalyst to direct a chemical reaction to a particular product. e.g.: CO reacts with H_2 to form different products based on the nature of the catalyst

c) ions carrying opposite charge to that of the sol neutralize the charge and causes precipitation.

13. a) $CH_3 – C (CH_3)_2 – OCH_3 + HI \rightarrow CH_3OH + CH_3 – C (CH_3)_2I$ 3

(i) 

(ii) $CH_3CHO + CH_3MgBr \rightarrow CH_3CHCH_3OMgBr + H_2O \rightarrow CH_3CH_2CH_2OH$

14. a) Gold is leached with a dilute solution of NaCN in the presence of air 3

b) Cryolite lowers the high melting point of alumina and makes it a good conductor of electricity.

c) CO forms a volatile complex with metal Nickel which is further decomposed to give pure Ni metal.

15. 3

a) t_2g^3 eg ^{1}

b) Hydrate isomerism

c) Sp^3d^2 ,Paramagnetic

16. The metal-carbon bonds in metal carbonyls have both σ and π characters. A sigma bond is formed when the carbonyl carbon donates a lone pair of electrons to the vacant orbital of the metal. A pi 3

bond is formed by the donation of a pair of electrons from the filled metal d orbital into the vacant anti-bonding orbital (also known as back bonding of the carbonyl group). Thus, a synergic effect is created due to this metal-ligand bonding. This synergic effect strengthens the bond between CO and the metal. (with diagram)

OR

a) Potassiumtrioxalatoferrate (III)

b)

(i) The number of donor atoms of a particular ligand that are directly bonded to the central atom is called denticity. For unidentate ligands, the denticity is 1,

(ii) It is a series in which the ligands are arranged in the increasing order of their field strength

17. 3

a) Alkyl groups are electron donating,which increase electron density on nitrogen

b) Due to resonance stabilization in aromatic diazonium salts

c) Aniline is basic and form salt with $AlCl_3$

18. a) 3

(i) $KMnO_4$/dil H_2SO_4

(ii) Con H_2SO_4 at 443 K

b) Due to lp/lp repulsion on oxygen

c) Ethers are not associated with hydrogen bonding

19. a) 3

(i) The pentose sugar combines with the base to form nucleoside, which combines with the phosphoric acid group to form nucleotide.

(ii) During the formation of a disaccharide or polysaccharide a linkage (C-O-C) formed between monosaccharide units through oxygen atom is called glycosidic linkage. When two molecules of amino acids combine, the amino group of one molecule reacts with –COOH group of another molecule by losing one water molecule to form a CO-NH linkage, commonly called peptide linkage

b) H-bonding is present between specific pairs of bases present in stands

20. a) The secondary structure of protein refers to the shape in which a long polypeptide chain can exist. There are two different types of secondary structures - α-helix and βpleated sheet structure. These structures arise due to the regular folding of the backbone of the polypeptide chain due to hydrogen bonding between >CO and –NH– groups of the peptide bond 3

b) Sucrose is dextrorotatory but after hydrolysis gives dextrorotatory glucose and laevorotatory fructose. Since the laevorotation of fructose (–92.4°) is more than dextrorotation of glucose (+ 52.5°), the mixture is laevorotatory. Thus, hydrolysis of sucrose brings about a change in the sign of rotation, from dextro (+) to laevo (–) and the product is named as invert sugar.

c) They are stereo isomers which differ only in the configuration at the first carbon.

21. (i) Electron density is more at o and p positions due to +R effect 3

(ii) Linkage takes place through nitrogen atom as nitrite ion is an ambident nucleophile

(iii) N-butyl bromide has more surface area of contact ,so more Vander waals force of attraction and higher boiling point.

22. a) CH_3-O-CH_3 < CH_3CHO < CH_3-CH_2-OH < CH3-COOH 3

b)

i. Due to steric and + I effect of two methyl groups in propanone.

ii. Due to resonance, electrophilicity of carbonyl carbon is reduced.

23. 4

a) Equanil, Iproniazid, phenelzine(any two)

b) empathetic, caring, sensitive or any two values can be given.

c) They should talk to him, be a patient listener, can discuss the matter with the psychologist.

If the level of noradrenaline is low, then the signal sending activity becomes low and the person suffers from depression.

24. 5

a)

(i) Add NaOH and I_2 to both the compounds and heat, acetophenone forms yellow ppt of iodoform.

(ii) Add $NaHCO_3$ solution to both the compounds, benzoic acid will give effervescence and liberate CO_2.

b) $HCHO \xrightarrow{NaOH} HCOONa + CH_3OH$

A C B

$CH_3OH \xrightarrow{Cu, 573\ K} HCHO$

$HCOOK + H^+ \longrightarrow HCOOH$

OR

a)

(i) $CH_3\text{-}CH_2\text{-}COOH$ (Propanoic acid) $\xrightarrow{i)\ Cl_2/\ Red\ P\ ii)\ H_2O}$ $CH_3\text{-}CHCl\text{-}COOH + HCl$ (2-chloropropanoic acid)

(ii) $R\text{-}COCl + H_2 \xrightarrow{Pd/BaSO_4} R\text{-}CHO + HCl$

(iii) $2CH_3\text{-}CHO$ (Ethanal) $\xrightarrow{dil.\ NaOH}$ $CH_3\text{-}CH(OH)\text{-}CH_2\text{-}CHO$ (3-Hydroxybutanal (aldol)) $\longrightarrow$ $CH_3\text{-}CH{=}CH\text{-}CHO$ (But-2-enal (Crotanaldehyde))

b)

(i) $\rightarrow C_6H_5COCl + SO_2 + HCl$

(ii) $CH_3\text{-}CO\text{-}CH_3 + [H]\ Zn/Hg \rightarrow CH_3\text{-}CH_2\text{-}CH_3$

25. 5

a) At anode Fe is oxidized to Fe^{2+}. Fe^{2+} ions pass into the solution and the electrons move to cathodic area.

$Fe \rightarrow Fe^{2+} + 2e^-$

At cathode the electrons reduce H^+ ions produced from H_2CO_3

$CO_2 + H_2O \rightarrow H_2CO_3$

$H_2CO_3 \rightarrow H^+ + HCO_3^-$

$2H^+ + 2e^- \rightarrow 2H$

The H atoms formed reduce the dissolved oxygen

$2H + ½\ O_2 \rightarrow H_2O$

The overall reaction at cathode is

$2H^+ + ½\ O_2 + 2e^- \rightarrow H_2O$

The overall reaction $Fe + H^+ + ½\ O_2 \rightarrow Fe^{2+} + H_2O$

$2Fe^{2+} + 2H_2O + ½\ O_2 \rightarrow Fe_2O_3 + 4H^+$

$Fe_2O_3 + xH_2O \rightarrow Fe_2O_3.xH_2O$

b) $$Ecell = E^o cell - \frac{0.059}{2} \log \frac{[Zn^{2+}][Cu]}{[Zn][Cu^{2+}]}$$

$Cu^{2+} + Mg\ (s) \rightarrow Cu + Mg^{2+}$

$E^o cell = 2.71\ V$

$$Ecell = 2.71 - \frac{0.059}{2} \log \frac{0.1}{10^{-3}}$$

$= 2.71 - 0.059 =$ **2.65 V**

OR

a) At infinite dilution when the dissociation of the electrolyte is complete, each ion makes a definite contribution towards the molar conductivity of the electrolyte ,irrespective of the nature of the other ion with which it is associated

b) $Cd + 2Ni(OH)_3 \rightarrow CdO + 2Ni(OH)_2 + H_2O$

c) $\lambda = \frac{1000 \times K}{C}$

$= \frac{1000 \times 7.896 \times 10^{-5}}{0.00241} = 32.76\ SCm^2mol^{-1}$

$\alpha = \frac{\lambda^o_m}{\lambda_m} = 32.76/390.5 = 0.084$

$Ka = \frac{C\alpha^2}{(1-\alpha)} = \frac{0.00241 \times (0.084)^2}{1 - 0.084} = 1.86 \times 10^{-5}$

26. 5

a) .

Order	**Molecularity**
• It is the sum of the powers to which the conc: terms are raised in the rate law expression.	• It is the no: of reacting species involved in simultaneous collision during a reaction.
• Determined experimentally	• Theoretical concept
• Order can be zero	• Molecularity cannot be zero.
• Determined from the slow step in a complex reaction .	• Determined for all steps

.

b) No of collisions per sec per unit volume,

c)

$$\log\frac{k_2}{k_1} = \frac{E_a}{2.303R}\left[\frac{1}{T_1} - \frac{1}{T_2}\right]$$

$\frac{\log k2}{7.87\times10^{-7}} = \frac{103 \times 1000}{2.303 \times 8.314}$ [1/273 -1/293]

=1.345

$\frac{K_2}{7.87\times10^{-7}}$ = antilog 1.345

$K_2 = 22.13 \times 7.87\times10^{-7} = \mathbf{1.74 \times 10^{-5}\ s^{-1}}$

OR

a) Reactions which appears to be of higher order but becomes reactions of 1st order under certain conditions are called pseudo order reactions.

b) Rate constant of a reaction at a given temp is defined as the rate of a reaction when the conc: of each of the reacting species is unity in the rate law

For a first order reaction,

$$t = \frac{2.303}{k} \log \frac{[R]_0}{[R]}$$

$$k = \frac{2.303}{40 \text{ min}} \log \frac{100}{100-30}$$

$$= \frac{2.303}{40 \text{ min}} \log \frac{10}{7}$$

$$= 8.918 \times 10^{-3} \text{ min}^{-1}$$

Therefore, $t_{1/2}$ of the decomposition reaction is

$$t_{1/2} = \frac{0.693}{k}$$

$$= \frac{0.693}{8.918 \times 10^{-3}} \text{ min}$$

= 77.7 min (approximately)

End of the MS