BANGALORE SAHODAYA SCHOOLS COMPLEX ASSOCIATION

PRE-BOARD EXAMINATION (2023-2024)

Grade XII – SET 2 - (Answerkey)

Date: **Max. Marks: 70**

Subject: Chemistry **Time: 3 Hrs**

SECTION A

Q1. Ans: c
Q2. Ans: c
Q3. Ans: b
Q4. Ans: a
Q5. Ans. b
Q6. Ans: c
Q7. Ans: d
Q8.Ans: a
Q9. Ans: b
Q10. Ans: d
Q11. Ans: a
Q12. Ans: c
Q13. Ans: c
Q14. Ans: d
Q15. Ans: a
Q16. Ans: b

SECTION B

Q17. Ans: 5% urea solution means 5g urea is present in 100ml of solution.

Molality (m) of urea solution = w X 1000/ M X Mass of solvent

= 5 X 1000/ 60 X 95

= 0.877m

Osmotic pressure = CRT

= 0.877 X 0.0821 X 300

= 21.6atm.

Q18. $m = \frac{n}{\text{mass of solvent(kg)}}$

$= \frac{20}{166 \times 0.08}$

= 1.5 mol /kg

$M = \frac{n}{v(l)}$

$= \frac{20 \times 10 \times 1.2}{166}$

= 1.44 mol /*l*

Q19. (a)Alkyl halides are polar but are insoluble in water because energy required to break the inter molecular H- bond among water molecules in much higher than energy released by water halide interaction.

(b) CCl_4 and SbF_3

Q20. Ans : (a) (i) CrO_2Cl_2/CS_2 and H^+/H_2O

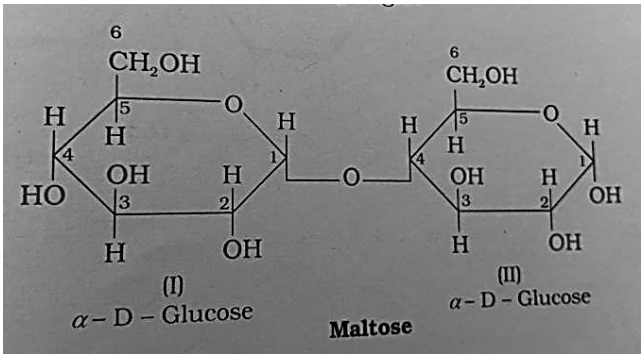
(ii) DIBAL - H

(b)Acetophenone < p-Tolualdehyde < Benzaldehyde < p-nitrobenzaldehyde.

OR

Any suitable method

Q21.

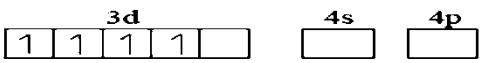


SECTION C

Q22. (a)

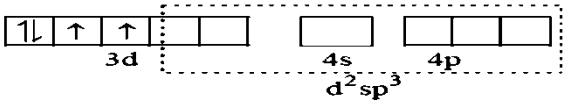
Mn is in +3 oxidation state in the complex.

E.C. of $Mn^{+3} \rightarrow 3d^4$



The presence of a strong field ligand CN^- causes pairing of electrons.

$\Rightarrow$



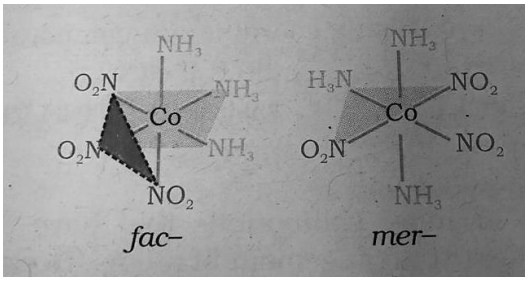
As. coordination number of Mn = 6. so it will form an octahedral complex.

$\therefore$ $[Mn(CN)_6]^{3-}$

It has two unpaired electrons.

$\mu = \sqrt{n(n+2)} = \sqrt{2(2+2)} = \sqrt{8} = 2.87$ B.M.

(b)



Q23. (a) Cathode: $O_2(g) + 4\ H^+(aq) + 4\ e^- \longrightarrow 2\ H_2O\ (l)$

Anode: $2\ Fe\ (s) \longrightarrow 2\ Fe^{2+} + 4\ e^-$

(b) Ans: At cathode:

$$2H^- + 2e^- \rightarrow H_2(g)$$

At anode: Hydroxide ions having lower discharge potential will be discharged in the preference to sulphate ions. Hydroxide ions will decompose to oxygen.

$$4OH^-(aq) \rightarrow 2H_2O(l) + O_2(g) + 4e^-$$

Q24.

Ans: (a) $$i = \frac{\text{Normal molar mass}}{\text{Abnormal molar mass}}$$

$$= \frac{\text{Observed colligative property}}{\text{Calculated colligative property}}$$

'i' greater than 1 for dissociation.

(b) $p = K_H \chi_g$

$$2.5 = 1648 \times \frac{n_{CO_2}}{\frac{500}{18}}$$

n_{CO_2} = 0.042 moles

Q25. (a) $CH_3CH = C(CH_3)_2 + C_2H_5C(CH_3) = CH_2$

major minor

(b) $p - COCH_3C_6H_4Cl$ + $o - COCH_3C_6H_4Cl$

major minor

(c) $p - NO_2C_6H_4CHBrCH_3$ + $p - NO_2C_6H_4CH_2CH_2Br$

major minor

Q26. (a) H_2SO_4 oxidises KI to I_2

(b) Ans: Alkoxy group directs the incoming group to ortho and para positions due to high charge electron density at ortho and para position compare to meta position. Hence incoming substituents to ortho and para position in benzene ring.

(c) Ans: The solubility of alcohols in water is due to their ability to form hydrogen bonds with water molecules. Hydrocarbons cannot form such hydrogen bonds, hence they are insoluble in water.

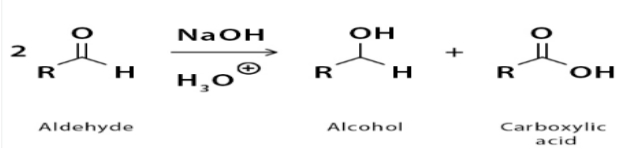
Q27. Ans: (a) (i) Wolff Kishner reduction:

Hydrazine followed by heating with sodium or potassium hydroxide in high boiling solvent such as ethylene glycol.

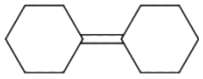
$$R - C(O) - R' \xrightarrow[\text{(ii)KOH/ethylene glycol,}\Delta]{\text{(i)}H_2N-NH_2,H_2O} R - CH_2 - R' + N_2$$

(ii) Cannizzaro reaction.

Ans:Aldehydes which do not have an alpha hydrogen atom undergo self oxidation and reductionreaction on heating with concentrated alkali. In this reaction, one molecule of the aldehyde is reduced to alcohol while another is oxidised to carboxylic acid salt.



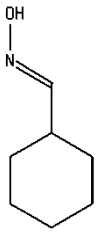
(b)



OR

(a) (i) $CH_3 - \underset{\displaystyle CH_3}{\overset{\displaystyle |}{C}} = NNHCONH_2$

(ii)



(b) Any suitable method.

(c) $R\text{-}COONa \xrightarrow[\text{Heat}]{\text{NaOH \& CaO}} R\text{-}H + Na_2CO_3$

Q28. (a)

Ans:

Globular proteins	Fibrous Proteins
(*i*) They form α-helix structure.	(*i*) They have β-pleated structure.
(*ii*) They are soluble in water.	(*ii*) They are insoluble in water.
(*iii*) They are cross linked condensation polymers of acidic and basic amino accids.	(*iii*) They are linear condensation products.
(*iv*) They are folded to give rise to three dimensional spherical shapes.	(*iv*) The long linear protein chains form tree like structure.
Examples: Albumin, enzymes, hormones.	**Examples:** Fibroin, collagen, myosin etc.

(b)

Ans:

Essential Amino Acids	Nonessential Amino Acids
Essential amino acids are the amino acids which have to be taken in through diet as they "CAN NOT" be produced by the body	Nonessential amino acids need not be taken in through diet as they can be produced by the body
9 amino acids out of 20 are thought to be essential	11 of the 20 amino acids are non-essential
Must be obtained from daily diet.	Can be synthesized by human body.
Example: Histidine, leucine	Example: serine, tyrosine.

(c)

DNA	RNA
Sugar moiety is Deoxy ribose	Sugar moiety is Ribose
The bases present are Adenine, Thymine, Guanine and Cytosine. Uracil is not present.	The bases present are Adenine, Uracil, Guanine and Cytosine. Thymine is rarely present.
Double stranded molecules	Single stranded molecules
Obeys Chargaff's rule	Does not obey Chargaff's rule

SECTION- D

Q29. (a) No, as $Ag^+ + Cl^- \longrightarrow AgCl\downarrow$

(b) Methane and methanol can be used as fuels in fuel cells.

(c) Anode – Lead
Cathode – Lead (IV) oxide
Electrolyte – 38% H_2SO_4

The cell reactions when the battery is in use are given below:

Anode: $Pb(s) + SO_4^{2-}(aq) \rightarrow PbSO_4(s) + 2e^-$

Cathode: $PbO_2(s) + SO_4^{2-}(aq) + 4H^+(aq) + 2e \rightarrow PbSO_4(s) + 2H_2O(l)$

OR

$\Delta G^O = -nFE^0$

$= -6 \times 96500 \times 1.14$

$= -660.0KJ$

$E^0_{cell} = \frac{0.0591}{n} \log Kc$

$K_c = 10^{114}$

Q30. (a) $t_2g^6\ e_g^0$

(b) $[Ni(NO_2)_6]^{4-}, [Ni(NH_3)_6]^{2+}, [Ni(H_2O)_6]^{2+}$

(c) [Ti (H2O)6] $^{3+}$is an octahedral complex. The oxidation state of Ti is +3 with the coordination number 6. Its outer electronic configuration is 3d1, which means that it has one unpaired electron. This unpaired electron is excited from t2g level to eg level by absorbing yellow light and hence appears violet coloured.

OR

(i) Hexaamine chromium (III) ion is paramagnetic.
Cr (III) has electronic configuration [Ar]$3d^3\ 4s^0$ .It contains 3 unpaired electrons. A complex is paramagnetic due to presence of unpaired electrons.

$\mu = \sqrt{15}BM$

(ii) $Co^{3+}\ t_{2g}^6\ eg^0$ diamagnetic

SECTION E

Q31.

(a) Transition elements can use their ns and (n-1) d orbital electrons for bond formation since there is very small energy difference, , they show variable oxidation states.

(b) The transition metals and their compounds, acts as catalyst, because of their ability to adopt multiple oxidation states, ability to adsorb the reactants and ability to form complexes.
They form bonds between reactants and atoms at the surface of the catalyst.

(c) Because small atoms of certain non metallic elements like H, C, N etc get trapped in vacant spaces of lattices of the transition metals. As a result of filling of the interstitial spaces such interstitial compounds are hard and rigid.

(d) This is observed due to lanthanoid contraction. (due to filling of 4f - orbitals which has poor shielding effect.

(e) E∘ value for Cr^{3+}/Cr^{2+} is negative (−0.41V) whereas E∘ value for Mn^{3+}/Mn^{2+} is positive (+1.57V) . Hence, Cr^{2+} ion can easily undergo oxidation to give Cr^{3+} ion and , therefore , acts as strong reducing agent where as Mn^{3+} can easily undergo reduction to giveMn^{2+} and hence acts as oxidizing agent.

Q32.

(a) rate = K x [H_2O_2] [I^-]

Bimolecular

(b) Order with respect to B is 0.

Rate = K $[A]^{\alpha}$

$\alpha = \frac{1}{2}$

(c) $\log\left(\frac{K_2}{K_1}\right) = \frac{Ea}{2.303R}\left[\frac{1}{T_1} - \frac{1}{T_2}\right]$

Ea = 55KJ/mol

OR

(a) $(mol/L)^{-1}s^{-1}$

(b) $K = \frac{2.303}{t}\log\frac{P_0}{2P_0 - P_T}$

$K = \frac{2.303}{100}\log\frac{0.5}{0.4}$

$= 2.2 \times 10^{-3}$ / sec

(c) For a first order reaction, we have,

$t = 2.303/k \log [R0]/[R]$

For 99 % completition of a reaction

$t = t_{0.99}$, $[R_0]=1$, $[R]_{t=}(1-0.99)= 0.01$,

$t_{0.99} = 2.303/k \log 1/10^{-2}$

$= 2.303/ k \log 10^2$

$= 2.303/k \times 2$

For 90 % completion of reaction

$t = t_{0.90}$ $[R_0] =1$, $[R] = (1- 0.9) = 0.1 = 10^{-1}$

$t_{0.90} = 2.303/k \log 1/10^{-1}$

$= 2.303/k \log 10$

$= 2.303/k$

Comparing equation (i) and (ii)

$t_{0.99} = 2 \times t\ 0.90$

Q33

a) Ans: The aromatic compound A is benzoic acid C6H5COOH.
On treatment with aqueous ammonia and heating forms compound B, which is benzamide C6H5CONH2.
Benzamide on heating with bromine and KOH forms a compound C of molecular formula C6H7N, which is aniline C6H5NH2.
The reaction is called Hoffmann bromamide degradation.

b) Any suitable method

OR

(a) $CH_3CH_2CH_2NH_2$ Propanamine

CH_3CHCH_3
|
NH_2 Propan – 2 – amine

$C_2H_5NHCH_3$

$(CH_3)_3N$

(b) (i) $C_6H_5N_2BF_4$, $C_6H_5F + N_2 + BF_3$

(ii) $C_6H_5CN + N_2$

(c) $(C_2H_5)_2 NH$, $C_2H_5NH_2$, $C_6H_5CH_2NH_2$, NH_3 , $C_6H_5NH_2$