Marking Scheme

Class. XII Chemistry (Practice Test II) 04.12.17

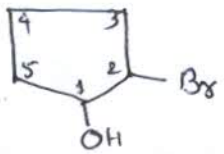
1. These elements do not contain partially filled d-orbital in atomic state or in ionic state.

$Zn - 1s^2, 2s^2 2p^6, 3s^2 3p^6, 3d^{10} 4s^2$

$Zn^{2+} - 1s^2, 2s^2 2p^6, 3s^2 3p^6, 3d^{10}$

1 Mark

2.



1 Mark

3. $CH_3 - CH = CH - CHO \xrightarrow{NaBH_4} CH_3 - CH = CH - CH_2 - OH$ 1 Mark

4. The $-\overset{O}{\overset{\|}{C}}-NH-$ linkage which joins two α-amino acids in peptide. 1 Mark

5. $CHO-(CHOH)_4-CH_2OH \xrightarrow{Br_2/H_2O} COOH-(CHOH)_4-CH_2OH$ 1 Mark

Gluconic acid.

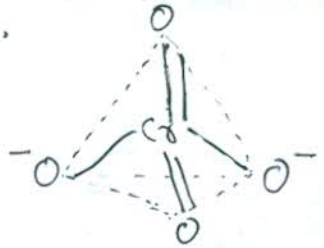
6. (i) A solution which distils without change in composition at a particular temperature is called azeotrope. 1 Mark

(ii) The depression in freezing point when 1 mole of non-volatile solute is dissolved per kilogram of solvent is called molal depression constant. 1 Mark

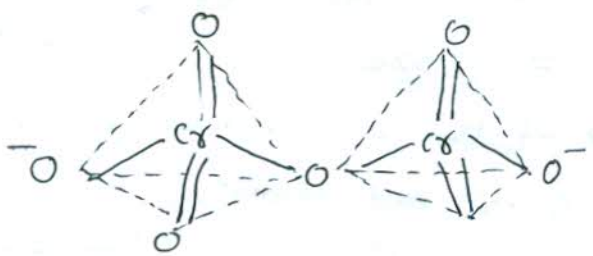
7. (i) The formation of micelle takes place above certain concentration called Critical micellization Concentration (CMC)

(ii) The formation of micelle takes place above a particular temperature called 'Kraft Temperature. 1 Mark

8.



1 Mark



1 Mark

Or

$2CrO_4^{2-}$ + $2H^+$ $\underset{\text{Alkali}}{\overset{\text{Acid}}{\rightleftharpoons}}$ $2HCrO_4^-$ $\underset{\text{Alkali}}{\overset{\text{Acid}}{\rightleftharpoons}}$ $Cr_2O_7^{2-}$ + H_2O 1 Mark

Chromate ion (yellow) — hydrogen chromate — dichromate ion (orange)

9. $MnO_4^- + 8H^+ + 5e \longrightarrow Mn^{2+} + 4H_2O$

$5 \times \{ Fe^{2+} \longrightarrow Fe^{3+} + e$

$MnO_4^- + 5Fe^{2+} + 8H^+ \longrightarrow Mn^{2+} + 5Fe^{3+} + 4H_2O$ 1 mark

$2 \times \{ MnO_4^- + 8H^+ + 5e \longrightarrow Mn^{2+} + 4H_2O$

$5 \{ C_2O_4^{2-} \longrightarrow 2CO_2 + 2e$

$2MnO_4^- + 5C_2O_4^{2-} + 16H^+ \rightarrow 2Mn^{2+} + 10CO_2 + 8H_2O$ 1 mark

10. The alcohol is treated with Lucas Reagent ($HCl + ZnCl_2$) to form chloro alkane. Due to formation of chloroalkane, cloudness appears in solution.

$R-OH + HCl \xrightarrow{ZnCl_2} R-Cl + H_2O$ 1 mark

If cloudness appears immediately, the alcohol is 3°.

If cloudness appears within five minutes the alcohol is 2° 1 mark

If cloudness appears only upon heating, the alcohol is 1°

11. 20% (m/m) solution means 20 g of solute (KI) is dissolved in 100 g of solution. So mass of solvent (water) = 80 g

(i) molality $= \frac{w_B \cdot 1000}{m_B \cdot W_A} = \frac{20 \times 1000}{166 \times 80} = 1.51 \text{ mol kg}^{-1}$ 1 mark

(ii) molarity $= \frac{w_B}{m_B \cdot V}$

But Volume of solution $= \frac{100 \text{ g}}{1.202 \text{ g ml}^{-1}} = \frac{100}{1.202 \times 1000} \text{ L}$

$= \frac{1}{12.02} \text{ L}$

$\therefore$ molarity $= \frac{20 \text{ g}}{166 \text{ g mol}^{-1} \times \frac{1}{12.02} \text{ L}} = 1.45 \text{ mol L}^{-1}$ 1 mark

(iii) mole fraction of KI

$x_{KI} = \frac{n_{KI}}{n_{KI} + n_{H_2O}} = \frac{20/166}{\frac{20}{166} + \frac{1000}{18}}$

$= \frac{1.51}{1.51 + 55.5} = 0.026$ 1 mark

12. 0.195 mol kg^{-1} means, 0.195 mole of H_2S is dissolved in 1000 g of water.

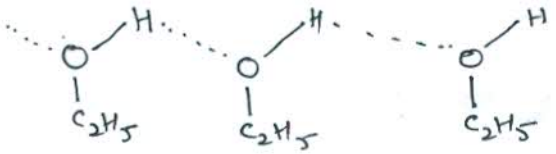
1000 g water $= \frac{1000}{18} = 55.5$ mole water

$\therefore$ mole fraction of $H_2S = \frac{0.195}{0.195 + 55.5} = \frac{0.195}{0.195 + 55.5} = \frac{0.195}{55.695} = 0.0035$ 1 mark

Now, $p = K_H \cdot x$ 1 mark

$\therefore K_H = \frac{p}{x} = \frac{1 \text{ bar}}{0.0035} = 285.6 \text{ bar}$ 1 mark

In ethanol H-bonds exist as intermolecular attraction.

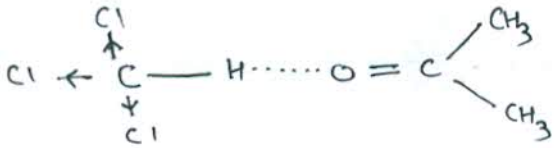


½ mark

When n-hexane is added to ethanol, molecules of n-hexane come between molecules of ~~ethanol~~ and so intermolecular forces become weaker. This results in the increase in vapour pressure. ½ mark

Solution of <u>cyclohexane and ethanol</u> shows <u>positive deviation</u> ½ mark

There is no H-bond when acetone and chloroform are seperate, however on mixing H-bonds are formed as follows:



½ mark

Because of ~~stronger~~ forces of attraction among molecules in solution, vapour pressure decreases. ½ mark

Thus, solution of acetone and chloroform shows negative deviation. ½ mark

14. (i) <u>Autocatalysis</u> :- In certain reaction, one of the product acts as the catalyst. As soon as the products come into existence, one of them catalyses the reaction. This is called autocatalyst and the process is called autocatalysis. ½ mark

e.g In the hydrolysis of ethylacetate, H^+ ions of acetic acid formed in the reaction act as autocatalyst. ½ mark

$$CH_3COOC_2H_5 + H_2O \longrightarrow CH_3COOH + C_2H_5OH$$

(ii) <u>Promotors</u>: The substances which enhance the activity of catalysts when present along with them are called promotors. ½ mark

e.g. In Haber's process Mo is used as promotors which increases the activity of Fe used as catalyst. ½ mark

$$N_2(g) + 3\,H_2(g) \xrightarrow[Mo(s)]{Fe(s)} 2\,NH_3(g)$$

(iii) <u>Poisons</u>:- The substances which decrease the activity of catalyst are called Poisons. ½ mark

e.g. In Rosenmund reduction Sulphur acts as poison and reduces the activity of catalyst Pd. This is done to avoid the further reduction of aldehyde to alcohol ½ mark

$$R-\overset{O}{\overset{\|}{C}}-Cl + H_2 \xrightarrow[S]{Pd/BaSO_4} R-\overset{O}{\overset{\|}{C}}-H + HCl$$

15. $\log \frac{x}{m} = \log k + \frac{1}{n} \log P$ ½ mark

For 1st Condition

$$\log \frac{18.5}{5} = \log k + \frac{1}{n} \log 210 \quad \text{------ I}$$

For 2nd Condition

$$\log \frac{37.1}{5} = \log k + \frac{1}{n} \log 630 \quad \text{------ II}$$

II − I

$$\log \frac{37.1}{5} - \log \frac{18.5}{5} = \frac{1}{n} (\log 630 - \log 210)$$

$$\log 37.1 - \log 18.5 = \frac{1}{n} \log \left(\frac{630}{210}\right)$$

$$\log \frac{\overset{2.005}{37.1}}{18.5} = \frac{1}{n} \log \frac{\overset{3}{630}}{210}$$ ½ mark

$$0.3022 = \frac{1}{n} \times 0.4771$$ ½ mark

$$\therefore n = \frac{0.4771}{0.3022} = 1.58$$

Substituting the value of n in eqn: I

$$\log \frac{18.5}{5} = \log k + \frac{1}{1.58} \log 210$$ ½ mark

$$\log 3.7 = \log k + \frac{1}{1.58} \times 2.3221$$

$$0.5682 = \log k + 1.4697$$

$$\log k = 0.5682 - 1.4697$$ ½ mark

$$\log k = -0.9015$$

$$k = \text{Antilog}(-0.9015)$$

$$= \text{Antilog}(\bar{1}.0985)$$

$$= 1.254 \times 10^{-1}$$ ½ mark

$$= 0.1254 \ cm^3 \ g^{-1}$$

16. (i) Peptization :- It is defined as the process of converting a precipitate into colloid by shaking it with dispersion medium in the presence of small amount of an electrolyte (ie peptizing agent) 1 mark

(ii) Coagulation :- The precipitation of colloid through induced aggregation by the addition of some suitable electrolyte is called coagulation. 1 mark

(iii) Electrophoresis :- The movement of colloidal particles either towards the cathode or anode, under the influence of the electric field is called electrophoresis. 1 mark

18. $K_2Cr_2O_7$ is prepared from chromite ore $FeCr_2O_4$ in the following steps :-

I The powdered ore is heated with NaOH in the presence of air to form sodium chromate.

$$4\,FeCr_2O_4 + 16\,NaOH + 7O_2 \longrightarrow 8Na_2CrO_4 + 2\,Fe_2O_3 + 8H_2O$$ 1 Mark

II Sodium chromate is extracted with water and acidified with sulphuric acid to get sodium dichromate

$$2\,Na_2CrO_4 + H_2SO_4 \longrightarrow Na_2Cr_2O_7 + Na_2SO_4 + H_2O$$ ½ mark

On cooling, sodium sulphate crystallizes out as $Na_2SO_4 \cdot 10H_2O$. Removing solution on crystallization gives crystals of sodium dichromate.

III The solution of sodium dichromate is treated with KCl

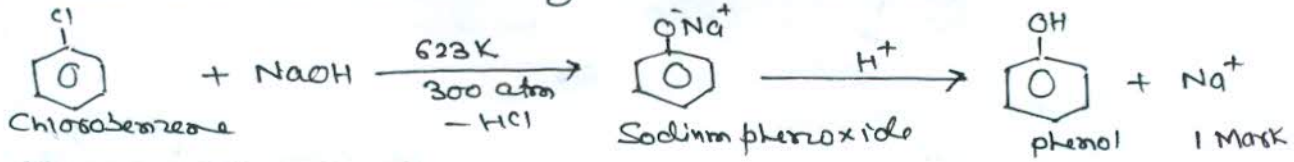
$$Na_2Cr_2O_7 + 2KCl \longrightarrow K_2Cr_2O_7 + 2NaCl$$ ½ mark

As solubility of NaCl is less so it separates out and NaCl is removed by filtration. On cooling $K_2Cr_2O_7$ crystallizes out.

$$Cr_2O_7^{2-} + 14H^+ + 6e^- \longrightarrow 2Cr^{3+} + 7H_2O$$ ½ mark

$$\therefore \text{Eqv. mass of } K_2Cr_2O_7 = \frac{\text{molecular mass}}{6} = \frac{294}{6} = 49$$ ½ mark

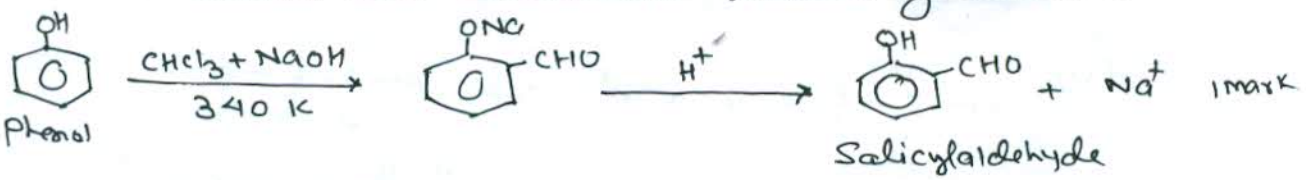
19. (i) **Dow's Process** : When chlorobenzene is heated with NaOH at 623 K and 300 atm. followed by acidification, phenol is formed.



Chlorobenzene — Sodium phenoxide — phenol — 1 Mark

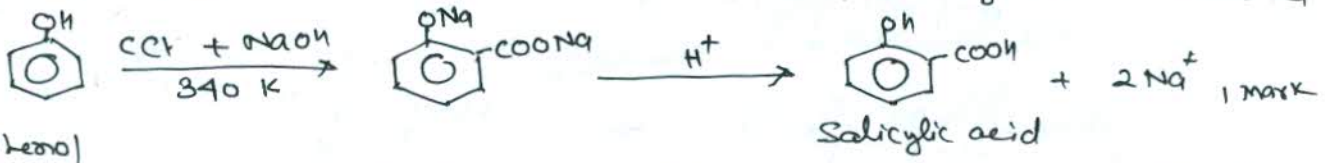
(ii) **Reimer-Tiemann Reaction:**

Salicylaldehyde is formed when phenol is treated with an alkali and chloroform followed by acidification.



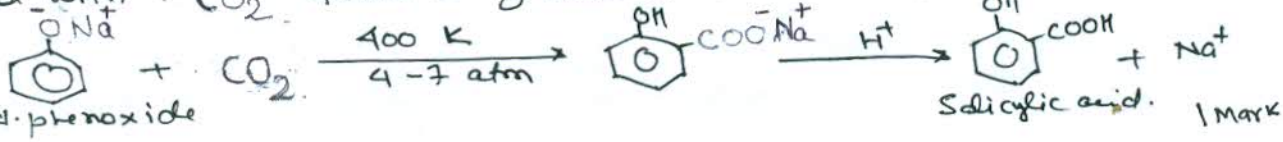
Phenol — Salicylaldehyde — 1 mark

If CCl_4 is used in place of $CHCl_3$, salicylic acid is formed



Phenol — Salicylic acid — 1 mark

(iii) **Kolbe's Reaction:-** Salicylic acid is formed when sodium phenoxide is fused with CO_2 followed by acidification



Sod. phenoxide — Salicylic acid. — 1 Mark

21. The monomeric unit of nucleic acid is called nucleotide. Each nucleotide consists of three parts: a phosphate group, a five carbon sugar and a nitrogen containing heterocyclic base. 1 mark

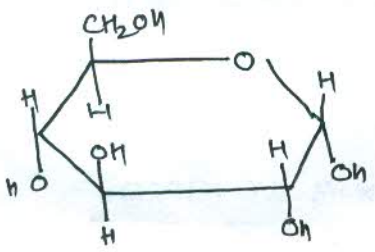
The structural differences between DNA & RNA are:

(i) In RNA β-D-ribose sugar is present but in DNA β-D-2-deoxyribose sugar is present. 1 mark

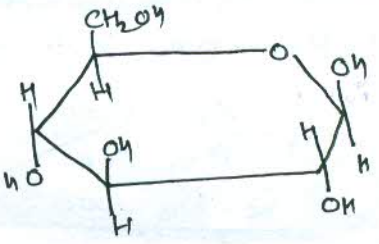
(ii) In DNA uracil is not present in RNA Thymine is not present. 1 mark

(or any other differences)

22 When either of α or β form of glucose is dissolved in water and allowed to stand, the specific rotation changes slowly and attains an equilibrium value of +52.7°C. This gradual spontaneous change of specific rotation of an optically active compound towards an equilibrium value is called mutarotation. 1 mark



α-D(+) Glucose



β-(D) (+) glucose

1+1 marks

23. (i) The doctors are kind hearted and sympathetic towards the poor. 1 mark

(ii) The chemical name of vitamin B_1 is Thiamine. Its important sources are milk, green vegetables and fruits 1 mark (½+½)

(iii) The chemical name of vitamin C is Ascorbic acid. Its important sources are orange, lemones, grapes, tomatoes etc. 1 mark

(iv) It is soluble in water. It is readily excreted in urine. (½+½)

So it cannot be stored in our body 1 mar

24. (i) The excess pressure that must be applied to the solution side to prevent the passage of solvent into it through a semipermeable membrane is called osmotic pressure. 1 mark

Plants absorb water from the soil through their roots due Osmosis. (or otherwise) 1 mark

(ii) $\pi = i \frac{nRT}{V}$ ½

$\therefore i = \frac{\pi \cdot V}{nRT} = \frac{0.75 \text{ atm} \times 2.5 \text{ L}}{0.03 \text{ mol} \times 0.0821 \text{ L atm mol}^{-1}\text{K}^{-1} \times 300 \text{ K}}$ 1

$i = 2.47$ ½

$\alpha = \frac{1-i}{1-n} = \frac{1-2.54}{1-3} = \frac{1.54}{2} = 0.77$ 1