CBSE Board
Class XII Chemistry

Time: 3 Hrs   Total Marks: 70

(a) All questions are compulsory.
(b) Marks for each question are indicated against it. Question 26 is a value based question carrying four marks.
(c) Question nos. 9 to 18 are short answer questions and carry 2 marks each. Use of calculator is not permitted.
(d) Question nos. 19 to 27 are also short answer questions and carry 3 marks each
(e) Question nos. 28 to 30 are long answer questions and carry 5 marks each
(f) Use log tables if necessary, use of calculators is not allowed.

Q1. Alums purify muddy water by which phenomenon: dialysis or coagulation?

Q2. Write the formula of Tetraamminediaquacobalt(III)chloride.

Q3. Alcohols have a higher boiling point as compared to isomeric ethers. Why?

Q4. Give IUPAC name of $OHCCH_2CH_2CH(CH_3)CH_2COOH$.

Q5. Why are aliphatic amines are stronger bases than ammonia?

Q6. Glucose or sucrose are soluble in water but cyclohexane or benzene (simple six membered ring compounds) are insoluble in water. Explain.

Q7. Give the formulae of the monomers of given polymer.
$(\text{-}CO(CH_2)_8\text{-}CONH(CH_2)_4NH\text{-})_n$

Q8. Give one point of difference between antiseptics and disinfectants. Give one example each.

Q9. Calculate the amount of KCl which must be added to 1 kg water so that the freezing point is depressed by 3K. ($K_f = 1.86\ K\ kg\ mol^{-1}$).

Q10. What are the reactions taking place at cathode and anode of a H_2-O_2 fuel cell?

Q11. An orange solid 'A' is prepared by the reaction of conc. H_2SO_4 on a yellow solid 'B'. 'A' on heating gives back 'B' and a green solid 'C' is formed along with liberation of oxygen gas. The acidified solution of 'A' changes to green due to formation of 'D' when SO_2 gas is passed through it. Identify A, B, C and D .Write all equations involved.

Q12. $FeSO_4$ solution mixed with ammonium sulphate solution in 1:1 molar ratio gives positive test for ferrous ions but $CuSO_4$ solution mixed with aqueous ammonia in 1:4 molar ratios does not give test for Cu^{2+} ions. Why?

Q13. A compound is formed by two elements A and B. Atoms of B make a ccp arrangement and those of A occupy half the tetrahedral voids and all the octahedral voids. Derive the formula of the compound.

OR

Potassium crystallizes in bcc lattice. What is the number of unit cells in 3.9g of K? (Atomic mass of K = 39u)

Q14. Calculate the percentage of Fe^{2+} and Fe^{3+} ions in $Fe_{0.93}O_{1.00}$.

Q15. Which polymer is used as a substitute for wool in making commercial fibers? Give the name and structure of its monomer.

Q16. What are antihistamines? Give an example. Discuss their working in the human body.

Q17. Arrange the following in order of increasing reactivity in S_N1 and S_N2 reaction
$C_6H_5CH_2Br$, $C_6H_5CH(C_6H_5)Br$, $C_6H_5CH(CH_3)Br$, $C_6H_5C(CH_3)(C_6H_5)Br$.

Q18. What happens when:

(a) Chloroethane is made to react with KCN

(b) 1-Bromopropane reacts with silver acetate

Give equations involved.

Q19. Why is boiling point of a solution containing non volatile solute more than that of pure solvent? Explain graphically.

Q20. Lalit and his father were going in a boat in the river. Lalit's father threw away the cell used in watches and hearing aids into the water. Lalit prevented him from doing so.

(a) As a student of chemistry, why would you advise Lalit's father not to throw the cell in the water body.

(b) What is the value associated with the above decision?

Q21.

(a) What is meant by peptization? Explain.

(b) Why does a sugar solution containing coloured impurities become colourless when passed over activated charcoal?

(c) What are associated colloids? Give an example.

Q22. (a) Can Al be used to reduce CaO? Explain your answer.

$\Delta G^\theta_{(Ca,CaO)} = -604.2\ kJmol^{-1}$ $\quad \Delta G^\theta_{(Al,Al_2O_3)} = -1582.4\ kJmol^{-1}$

(b) State the principle behind zone refining.

Q23.

i) Give reason for the following

(a) NH_3 is a good complexing agent.

(b) HNO_2 acts as an oxidising as well as reducing agent.

ii) What are the products of complete hydrolysis of XeF_6?

OR

(i) Bond dissociation energy of F_2 is less than that of Cl_2. Why?

(ii) Oxygen is a gas while sulphur is a solid. Why?

(iii) Which compound of Xe is isostructural with IF_5? What is the shape of the molecules?

Q24.

i) Why do transition metals form complex compounds?

ii) What is lanthanoid contraction?

iii) Why does Cr have a high melting point?

Q25.

i) Distinguish between

(a) Aniline and benzyl amine

(b) $CH_3CH_2NH_2$ and $(CH_3)_2NH$

ii) Write a note on Hoffmann Bromamide reaction.

Q26.

(a) Give two reasons to support the cyclic structure of glucose.

(b) Why are amino acids soluble in water?

(c) Name the pyrimidine bases present in DNA and RNA.

Q27.

(a) Give the mechanism of acid catalysed dehydration of ethanol to yield ethyne.

(b) Compound (A) $C_4H_{10}O$ is found to be soluble in sulphuric acid. (A) does not react with sodium metal or potassium permanganate. When is heated with excess of HI, it is converted into single alkyl halide. What is the structural formula of (A)?

Q28. Complete the equations

(a) $NaCl + MnO_2 + H_2SO_4 \rightarrow$

(b) $Al + O_2 \rightarrow$

(c) $2Pb(NO_3)_2 \xrightarrow{673K}$

(d) $C + H_2SO_4$ (conc) $\rightarrow$

(e) $PbS + O_3 \rightarrow$

OR

Complete the equations

(a) $NH_4Cl(aq) + NaNO_2(aq) \rightarrow$

(b) $P_4 + NaOH + H_2O \rightarrow$

(c) $CaF_2 + H_2SO_4 \rightarrow$
(d) NaOH (conc, hot) + $Cl_2 \rightarrow$
(e) $PCl_3 + H_2O \rightarrow$

Q29.

(a) Decomposition of a compound follows first order kinetics. It takes 15min for 20% of the starting compound to react. Calculate

i) Rate constant for the reaction
ii) Time at which 10% of the reactant is left unreacted.
iii) Time taken for the next 20% of the reactant to react after first 15min.

(b) Derive a relationship between rate constant and half life for a zero order reaction.

OR

(a) The rates of a reaction starting with initial concentrations 2.0×10^{-3} M and 1.0×10^{-3} M are equal to 2.40×10^{-4} M s^{-1} and 0.60×10^{-4} M s^{-1} respectively. Calculate the order of the reaction with respect to the reactant and also the rate constant.

(b) For a reaction $A+B \rightarrow C$, it is found that

i. Rate becomes double when concentration of A is doubled.
ii. Rate becomes 16 times when concentration of both A and B are doubled.

Write the rate expression and calculate the overall order of the reaction.

Q30.

(a) Convert

i) Acetic acid to ethylamine
ii) Propionic acid to lactic acid

(b) Identify A, B and C in the following reactions:

$$CH_3COCH_3 \xrightarrow{LiAlH_4} A \xrightarrow{SOCl_2} B \xrightarrow{KOH(alc)} C$$

OR

(a) Convert

i) Acetaldehyde to crotonic acid
ii) Formaldehyde to chloroethane
iii) Acetic acid to propanoic acid

(b) Identify A and B in given equation

$$HCHO \xrightarrow{Conc.NaOH} A + B$$

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Solution

1.

Dispersed phase: Liquid. (1/2)
Dispersion medium: Gas. (1/2)

2. $A = 8 \times \frac{1}{8} = 1$

$B = 6 \times \frac{1}{2} = 3$ (1/2)

Formula = AB_3 (1/2)

3. Froth floatation method (1)

4. $A_3B_2 \rightarrow 3\,A^{2+} + 2B^{3-}$

Initial 1 0 0

After dissociation $1-\alpha$ 3α 2α (1/2)

$$i = \frac{\text{Number of mole of particles after dissociation}}{\text{Number of mole of particles before dissociation}}$$

$$i = \frac{1-\alpha+3\alpha+2\alpha}{1}$$

$i = 1+4\alpha$ (1/2)

$= 1 + 4(0.25)$

$= 1 + 1 = 2$

5. It is a tribasic acid as it contains three O-H bonds. (1)

6.

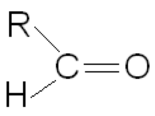
HCl<HBr< HI (1/2)

This is because the bond dissociation energy increases in the order:

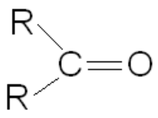
HI < HBr < HCl (1/2)

7. Nitrogen is less reactive than phosphorus because nitrogen molecule contains $N \equiv N$ triple bond which has a high bond dissociation enthalpy than P-P single bond present in phosphorus molecule. (1)

8. Aldehydes are more reactive than ketones towards nucleophilic addition reactions due to inductive effect and steric effect. (1/2)



Aldehyde



Ketone

Sterically, the presence of two relatively large substituents in ketones hinders the approach of nucleophile to carbonyl carbon than in aldehydes having only one such substituent. Electronically, aldehydes are more reactive than ketones because two alkyl groups reduce the electrophilicity of the carbonyl more effectively in ketones. (1/2)

9.

$w_B = 5.67\ g$

$w_A = 25.23\ g$

$M_B = 180\ g\ mol^{-1}$

$M_A = 18\ g\ mol^{-1}$

$n_B = \frac{5.67}{180} = 0.0315\ \ mol$

$n_A = \frac{25.23}{18} = 1.40\ \ mol$

$$\text{Mole fraction of glucose} = x_B = \frac{n_B}{n_A + n_B}$$

$$= \frac{0.0315}{0.0315 + 1.4}$$

$$= 0.022$$ (1/2)

$p^0_A = 23.8\ \ mmHg\ \ at\ \ 25\,°C$

We know that

Relative lowering of vapour pressure

$$\frac{p^0_A - p_A}{p^0_A} = x_B$$ (1/2)

$$\text{Vapour pressure lowering} = p^0_A - p_A = x_B \, . \, p^0_A$$

$$= 0.022\ x\ 23.8$$

$$= 0.524\ \ mm\,Hg$$ (1/2)

Also,

$$\frac{23.8 - p_A}{23.8} = 0.022$$

$$23.8 - p_A = 0.022\ x\ 23.8$$

$$= 0.524$$

$$p_A = 23.8 - 0.524$$

$$= 23.3\ \ mm\,Hg$$ (1/2)

10.

(a) Zirconium is purified using van Arkel method. (1/2)

$$\underset{\text{Impure}}{\mathrm{Zr}} + 2\mathrm{I_2} \longrightarrow \mathrm{ZrI_4} \xrightarrow[1800\,\mathrm{K}]{\text{Heat}} \underset{\text{Pure}}{\mathrm{Zr}} + 2\mathrm{I_2}$$ (1/2)

(b) Al_2O_3 can be used as a stationary phase in chromatography. (1)

11.

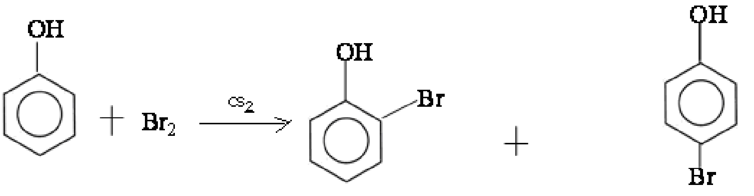
a. Amino acids which cannot be synthesized by the body and must be obtained from other sources are called essential amino acids. (1)

b. A process that changes the physical and biological properties of proteins without affecting its chemical composition is called denaturation. This can be done by change in pH, change in temperature, using chemical agents etc. (1)

12. p-Nitrophenol is more acidic than p-methoxyphenol. (1)
This is because p-nitrophenoxide ion is stabilized due to electron withdrawing inductive effect of $–NO_2$ group present on the para position. On the other hand, $-OCH_3$ group has electron releasing inductive effect which destabilizes p-methoxyphenoxide ion. (1)

OR

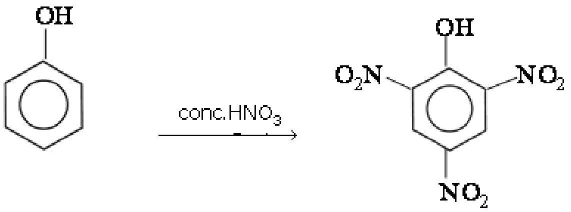
(i)When phenol reacts with Br_2 in CS_2 at 273K, a mixture of o- and p- bromo phenol is formed in which p- bromo phenol is the major product.



o - Bromophenol p - Bromophenol

(1)

(ii) When phenol reacts with conc. HNO_3, 2, 4, 6-trinitrophenol is formed.



(1)

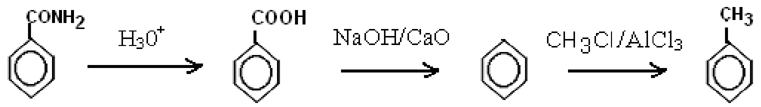
13.

(i) Hex-4-en-2-ol

(ii) 2, 4-Dimethoxypentane (1)

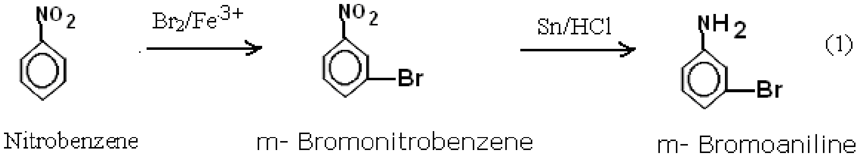
14.

(i)



(1)

(ii)



(1)

15. (2)

$$\begin{tikzcd} \underset{(A)}{C_2H_5CN} \arrow[r, "H_2O/NaOH"] \arrow[d, "Na(Hg)/C_2H_5OH\ (Reduction)"] & \underset{(B)}{C_2H_5COONa} + NH_3 \\ \underset{(C)}{C_2H_5CH_2NH_2} \arrow[r, "HNO_2"] & \underset{(D)}{C_2H_5CH_2OH} + N_2 + H_2O \end{tikzcd}$$

(1 mark for correct identification of A, B, C, D)
(1 mark for correct reactions)

16.

DNA	RNA	Marks
1) It has a double stranded structure	1) It has single stranded structure	1
2) Sugar moiety is β-D-2-deoxyribose	2) Sugar moiety is β-D-ribose	1

17. A one molar (1M) solution contains 1mole of solute in 1 L of solution while a one molal (1m) solution contains 1 mole of solute in 1000g of solvent. (1/2)
Density of water is almost 1 g mL^{-1}.So, for 1 molal solution, 1mole of solute is present in 1000mL of waterAnd for 1 molar solution, 1mole of solute is present in 1000 mL of solution i.e less than 1000mL of water (Since 1000mL solution=volume of solute + volume of solvent). (1)
Thus, 1M solution is more concentrated than 1m solution. (1/2)

18.

$$\log\frac{k_2}{k_1}=\frac{E_a}{R\times 2.303}[\frac{1}{T_1}-\frac{1}{T_2}]$$ (1/2)

$E_a = 110\,kJmol^{-1}$

$T_1 = 400\,°C = 673K$

$k_1 = 7.8mol^{-1}L\,s^{-1}$

$T_2 = 430\,°C = 703K$

$k_2 = ?$

Substituting the values,

$$\log\frac{k_2}{7.8}=\frac{110\times 1000}{2.303\times 8.314}[\frac{1}{673}-\frac{1}{703}]$$ (1/2)

$k_2 = 18.0\,mol^{-1}\,L\,s^{-1}$ (1/2)

19.

- **(i)** Schottky defect
- **(ii)** Si doped with Al produces p-type semiconductor, positively charged holes are created. Thus, holes appear to be responsible for semi conducting properties. When Si is doped with P, n-type semiconductor is formed in which semi conducting properties is due to flow of electrons. (1)
- **(iii)** Antiferromagetic substances possess zero net magnetic moment while ferromagnetic substances are strongly attracted by magnetic field. This is because in presence of magnetic field, antiferromagetic substances contain equal number of electrons with opposite spin whereas in ferromagnetic substances electrons are placed in such a way that dipoles are oriented in one direction. (1)

20.

(i) For a first order reaction,

$$k=\frac{2.303}{t}\log\frac{a}{a-x} \quad ....(1)$$ (1/2)

Here, $a = 0.062\,atm$

$a - x = 0.044\,atm$

$t = 55\,s$

$$k = \frac{2.303}{55}\log\frac{0.062}{0.044}$$

$= 6.24x10^{-3}s^{-1}$ (1)

(ii) To calculate $a - x$ when $t = 100\,s$, $a = 0.062\,atm$ (1)

we use equation

$$\therefore 6.24x10^{-3} = \frac{2.303}{100}\log\frac{0.062}{a-x}$$ (1/2)

$\therefore a - x = 0.033\,atm$ (1)

21.

(i)River water is muddy and contains charged colloidal particles of clay, sand and many other materials. Sea water contains in it a number of dissolved electrolytes. When sea water and river water come in contact with each other, the electrolytes present in the sea water coagulate the suspended colloidal particles which ultimately settle down at the point of contact. Thus, there is a formation of delta at the point where river enters the sea.(1)

(ii)
1. Catalysts are highly selective. A catalyst is able to direct a reaction to give a particular product. (1/2)
2. Catalysts are highly active. A catalyst is able to increase the rate of a chemical reaction. (1/2)

(iii) A colloid in which the particles of dispersed phase are sufficiently big in size to be of colloidal dimensions is called a macromolecular colloid. Example: Starch (1)

OR

(i) The movement of colloidal particles under an applied electric potential is called electrophoresis. (1)
(ii) The process of settling of colloidal particles is called coagulation or precipitation of sol. (1)
(iii) Emulsions are liquid – liquid colloidal systems in which the dispersed phase and dispersion medium both are liquids. Example: milk. (1)

22.
(i) $I_2 + 6H2O + 5Cl_2 \rightarrow 2\ HIO_3 + 10\ HCl$ (1)

(ii) $P_4 + 8\ SOCl_2 \rightarrow 4\ PCl_3 + 4\ SO_2 + 2S_2Cl_2$ (1)

(iii) $(NH_4)_2Cr_2O_7 \xrightarrow{\text{Heat}} N_2 + 4\ H_2O + Cr_2O_3$ (1)

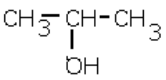
23:

When a nitrate salt is made to react with conc. H_2SO_4, following reaction occurs.
$XNO_3 + H_2SO_4 \rightarrow XHSO_4 + HNO_3$ (1)
When Cu turnings are added, it reacts with HNO_3 formed during the reaction giving intense brown fumes of NO_2.
$Cu + 4HNO_3 \rightarrow Cu(NO_3)_2 + 2\ H_2O + 2NO_2$ (1)
When allowed to cool, NO_2 gets converted to colourless N_2O_4
$2\ NO_2 \rightarrow N_2O_4$
(A) (B) (1)

24.
(i) Add small amount of aqueous KOH to both compounds. Acidify with dil HNO_3 and add $AgNO_3$. Benzyl chloride gives white precipitate while chlorobenzene does not. (1)

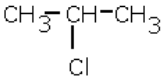
(ii)

A



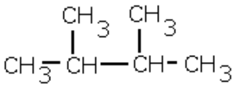
$CH_3-\underset{\underset{OH}{|}}{CH}-CH_3$

B



$CH_3-\underset{\underset{Cl}{|}}{CH}-CH_3$

C



$CH_3-\overset{\overset{CH_3}{|}}{CH}-\overset{\overset{CH_3}{|}}{CH}-CH_3$

D

aq. KOH

(1/2 mark each for correct identification of A, B, C, D)

25. The electrical switches are made of Bakelite should be used because Bakelite has electrical non - conductivity and heat-resistant properties in electrical insulators and is hence safe. (1)

Values associated: Scientific attitude since knowledge is useful only when put to practice, care for others, awareness and social responsibility. (2)

26.

(i) The forces are ionic bonding, hydrogen bonding, van der Waals' forces of attraction or dipole-dipole attraction. (1)

(ii) Chloramphenicol. It is broad-spectrum antibiotic. (1)

(iii) Non-biodegradable detergents will lead to pollution. These detergents have branched alkyl chains and are thus not easily decomposed by micro-organisms.

27.

(i) Potassium trioxalatochromate (III)

(1)

(ii) $[CoF_6]^{3-}$

Co (Z=27): [Ar] $3d^7 4s^2$

Co^{3+}: [Ar] $3d^6\ 4s^0$

F^- is weak field ligand therefore does not cause pairing of electrons.

There are four unpaired electrons. (1/2)

$[Co\ (NH_3)_6]^{3+}$

Co (Z=27): [Ar] $3d^7 4s^2$

Co^{3+}: [Ar] $3d^6 4s^0$

NH_3 is a strong field ligand and causes pairing of electrons .Hence there are no unpaired electrons. (1/2)

(iii) Hydrate isomerism (1)

28.

(i) Au and Hg can show +1 oxidation state. (1)

(ii) Scandium (1)

(iii) Transition elements exhibit variable oxidation state and can form complexes.

(1)

Due to low charge density, Cu^+ has low enthalpy of hydration. Cu^+ in aqueous solution undergoes disproportionation. (1)

$2Cu^{+}(aq) \rightarrow Cu^{2+}(aq) + Cu(s)$ (1)

The E^{θ} value for this is positive and reaction is favourable.

OR

(i)

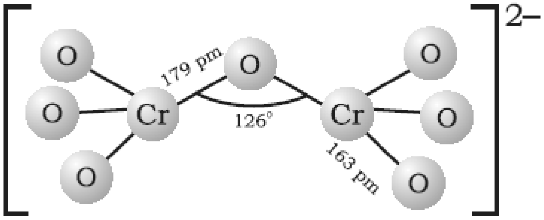
a) $4\,FeCr_2O_4 + 8Na_2CO_3 + 7O_2 \rightarrow 8Na_2CrO_4 + 2Fe_2O_3 + 8CO_2$ (1)

b) $2MnO_2 + 4KOH + O_2 \rightarrow 2K_2MnO_4 + 2H_2O$ (1)

(ii) On increasing pH, the solution turns yellow due to the formation of chromate ion.

$Cr_2O_7^{2-} + 2\,OH^{-} \rightarrow 2CrO_4^{2-} + H_2O$ (1)

(iii)



Dichromate ion (2)

29.

(a) The cell reaction is

$3Sn^{4+} + 2Cr \rightarrow 3Sn^{2+} + 2Cr^{3+}$

$\Delta G^{\theta} = -\,n\,F\,E^{\theta}_{cell}$ (1/2)

$E^{\theta}_{cell} = 0.89$ V,

n = 6

F = 96500 C mol^{-1}

$\Delta G^{\theta} = -\,(6) \times (96500) \times (0.89)$ (1/2)

$= -5.15 \times 10^{5}$

$= -5.15 \times 10^{5}$ J (1)

(b) Calculation of K

(i) $\Delta G^{\theta} = -2.303\,RT \log K$ (1/2)

$\Delta G^{\theta} = -5.15 \times 10^{5}$ J, R = 8.314 J mol^{-1} K^{-1}, T = 298 K

$\log K = -\,\Delta G^{\theta} / 2.303\,RT$

$= -\,(-5.15 \times 10^{5}\ \text{J}) / (2.303 \times 8.314\ \text{J mol}^{-1}\text{K}^{-1} \times 298\ \text{K})$

$\log K = 90.259$ (1/2)

$K = 1.8 \times 10^{90}$ (1/2)

(ii) $\log K = n\,F\,E^{\theta}_{cell} / 2.303\,RT$ (1/2)

$$= \frac{(6) \times (96500\ \text{C mol}^{-1}) \times (0.89\ \text{V})}{2.303 \times (8.314\ \text{J mol}^{-1}\text{K}^{-1}) \times (298\ \text{K})}$$

$= 90.313$ (1/2)

$K = 2.05 \times 10^{90}$ (1/2)

OR

29.

(a) Since the reduction potential of Ag^+/Ag is more than that of Cu^{2+}/Cu, therefore, Ag^+ gets reduced to Ag at the cathode and Cu gets oxidized to Cu^{2+} at the anode. (1)

At cathode:

$2\,Ag^+ + 2\,e^- \rightarrow 2\,Ag$

At anode:

$Cu \rightarrow Cu^{2+} + 2\,e^-$

Therefore, the net reaction is:

$2Ag^+ + Cu \rightarrow 2Ag + Cu^{2+}$ (1)

(b) The cell is:

$Cu(s)\,|\,Cu^{2+}(aq)\,||\,Ag^+(aq)\,|\,Ag\,(s)$ (1)

(c)

$E^\theta_{cell} = E^\theta_{Ag^+/Ag} - E^\theta_{Cu^{2+}/Cu}$ (1/2)

$= 0.80 - 0.34$

$= 0.46\ V$ (1/2)

$E_{cell} = E^\theta_{cell} - \frac{0.059}{n}\log\frac{[Cu^{2+}]}{[Ag^+]^2}$ (1/2)

$E_{cell} = E^\theta_{cell} - \frac{0.059}{n}\log\frac{[Cu^{2+}]}{[Ag^+]^2}$

$0 = 0.46 - \frac{0.059}{2}\log\frac{0.01}{[Ag^+]^2}$

$[Ag^+] = 1.59 \times 10^{-9}\ M$ (1/2)

30.

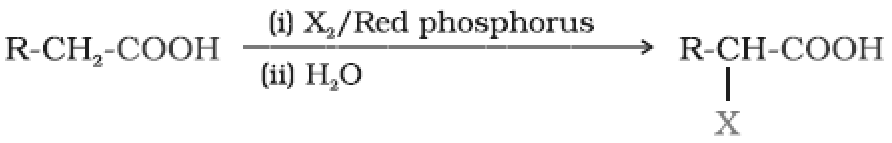
(a) $CH_3CH_2OH + CH_3COOH \xrightarrow{\text{conc. } H_2SO_4} CH_3COOCH_2CH_3 + H_2O$ (1)

(b)

(i) In Rosenmund's reaction, acid chlorides are subjected to catalytic hydrogenation in the presence of Pd supported over $BaSO_4$ to yield corresponding aldehyde. The catalyst is poisoned by S or quinoline. (1)

$RCOCl + H_2 \xrightarrow{Pd,\ BaSO_4} RCHO + HCl$ (1)

(i) In Hell Volhard Zelinsky reaction, carboxylic acids react with chlorine or brominein the presence of small amount of P, to give α-halogenated carboxylic acids. The reaction requires presence of α - hydrogen in the acid. (1)



$$R\text{-}CH_2\text{-}COOH \xrightarrow[\text{(ii) } H_2O]{\text{(i) } X_2/\text{Red phosphorus}} R\text{-}\underset{\displaystyle X}{\underset{|}{C}}H\text{-}COOH$$

X = Cl, Br

α – Halocarboxylic acid

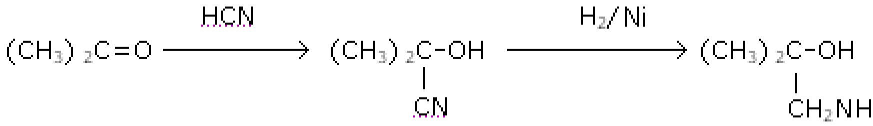
(1)

OR

(i)

$$CH_3CH_2COOH \xrightarrow{NH_3} CH_3CH_2CONH_2 \xrightarrow{Br_2/KOH} CH_3CH_2NH_2 \quad (1)$$

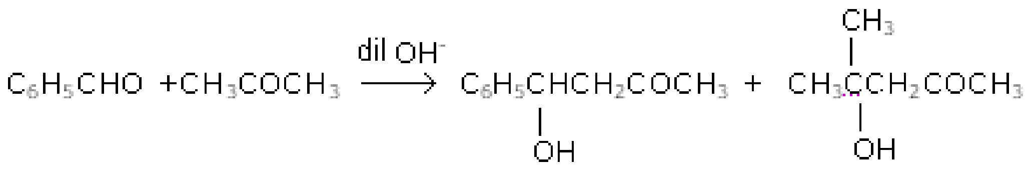
(ii)



$$(CH_3)_2C{=}O \xrightarrow{HCN} (CH_3)_2\underset{\displaystyle CN}{\underset{|}{C}}\text{-}OH \xrightarrow{H_2/Ni} (CH_3)_2\underset{\displaystyle CH_2NH_2}{\underset{|}{C}}\text{-}OH$$

(1)

(iii)

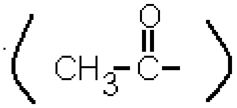


$$C_6H_5CHO + CH_3COCH_3 \xrightarrow{\text{dil } OH^-} C_6H_5\underset{\displaystyle OH}{\underset{|}{C}}HCH_2COCH_3 + CH_3\overset{\displaystyle CH_3}{\overset{|}{\underset{\displaystyle OH}{\underset{|}{C}}}}CH_2COCH_3$$

(1)

(b) $NH_2CONHNH_2$, semicarbazide contains two NH_2 groups but the one next to CO group is involved in resonance with C=O and, thus is not available. (1)

(c) Pentan-2-one will give a yellow precipitate with iodine and sodium hydroxide since it contains the group



$$\left(CH_3\text{-}\overset{\displaystyle O}{\overset{\|}{C}}\text{-} \right)$$

. (1)