CHEMISTRY – 2017

Time: 3 Hour 15 Minutes   **Total Marks: 70**

Instruction to the Candidates: See Previous year

1. Candidates are required to give their answers in their own words as far as practicable.
2. Figures in the right margin indicate full marks.
3. 15 Minutes of extra time has been allotted for the candidates to read the questions carefully.
4. This question paper is divided into section- **Section-A and Section – B.**
5. In **Section –A,** there are **28 Objective type questions** which are compulsory, each carrying **1 mark.** Darken the circle with blue/black ball pen against the correct option OMR Answer Sheet provided to you. **Do you use Whitener/Liquid/Blade/Nail etc. on OMR Sheet; otherwise the result will be invalid.**
6. IN **Section – B,** there are **11 Short answer type questions** (each carrying **2 marks),** out of which any 10 questions are to be answered. Apart from this, there are **4 Long Answer Type question** (Each Carrying 5 marks), out of which all questions are be answered.
7. Use of any electronic appliances is strictly prohibited.

Section – I (Objective Type)

The following Question Nos. 1to 28 there is only one correct answer against each question. For each question, mark the correct option on the answer sheet:
$28 \times 1 = 28$

1. **Which of the following oxides shows electrical properties like metals?** 1

   (a) SiO_2 **(b)** MgO **(c)** $SO_2(S)$ **(d)** CrO_2

   Ans: Option (d)

2. **Which of the following is an amorphous solid?**   1

   (a) Graphite (C)   **(b)** Quartz Glass SiO_2

   (b) Chrome Alum   **(d)** Silicon Carbide (SiC)

   Ans: Option (b)

3. **Which of the following aqueous solution should have the highest boiling point?** 1

   (a) 1.0 M NaOH   **(b)** 1.0 M Na_2SO_4 **(C)** 1.O M NH_4NO_3 **(d)** 1.0 M KNO_3

   Ans: Option (b)

4. **A Solution has an osmotic pressure of 0.0821 atm. At 300 k. Its concentration would be-** 1

(a) 0.66 M   (b) 0.32   (c) 0.066 M   (d) 0.033 M

Ans: Option (d)

5. **Azeotropic misture of HCL and H_2O has-**

(a) **48%** HCL   (b) **22.2%** HCL   (c) **36%** HCL   (d) **20.2%** HCL

Ans: Option (d)

6. **When one faraday of electric current is passed, the mass deposited, is equal to-** 1

(a) One gram equivalent   (b) One gram mole

(c) Molecular Mass   (d) Active Mass

Ans: Option (a)

7. **The rate at which a substance reacts, depends upon its-** 1

(a) Atomic Mass   (b) One gram equivalent

(C) Electrochemical equivalent   (d) Half gram equivalent

Ans: Option (d)

8. **For a zero order reaction –**

(a) $t1/2 \propto \alpha$ (b) $t1/2 \propto 1/\alpha$

(c) $t1/2 \propto \alpha^2$ (d) $t1/2 \propto 1/\alpha^2$

Ans: Option (a)

9. **A catalyst is a substance which -** 1

(a) **I**ncrease the equilibrium concentration of the product

(b) Changes the equilibrium constant of the reaction

(c) Shortens the time to reach equilibrium

(d) Supplies energy to the reaction

Ans: Option (c)

10. **Sulphide ores are generally concentrated by –** 1

(a) Froth Floatation method   (b) Roasting

(c) Gravity   (d) Reduction by Carbon

Ans: Option (a)

11. Which of the following is Tribasic ?

(a) H_3PO_2 (b) H_3PO_3 (c) $H_4P_2O_7$ (d) H_3PO_4

Ans: Option (d)

12. In white phosphorous $\left(P_4\right)$ molecule, which one is not correct –   1

(a) 6 P – P single bond are present   (b) 4P – P single bond are present

(c) 4 Lone pair of electrons are present

(d) bond angle is 60^0

Ans: Option (b)

13. The general electronic configuration shown by the transition metal is -   1

(a) $(n-1)d^5$ (b) $(n-1)d^{(1-10)ns^{0.1 \text{ or } 2}}$

(c) $(n-1)d^{(1-10)}ns^1$ (d) none of these

Ans: Option (b)

14. The highest magnetic moment shown by transition metal ion with the outermost electronic configuration is-
1

(a) 3^5 (b) $3d^2$ (c) $3d^7$ (d) $3d^9$

Ans: Option (a)

15. What is the coordination number of Cr in $K_3[Cr(OX)_3]$?   1

(a) 6   (b) 5   (c) 4   (d) 3

Ans: Option (d)

16. The EAN of cobalt in the complex ion $[Co\left(en\right)_2Cl_2]$ is -   1

(a) 27   (b) 36   (c) 33   (d) 35

Ans: Option (c)

17. A Grignard reagent is prepared by the action of magnesium in dry ether on –

(a) C_2H_5OH (b) C_2H_6 (c) C_2H_5Cl (d) C_2H_5CN

Ans: Option (c)

18. Primary, Secondary and Tertiary alcohole are distinguished by-   1

    (a) Oxidation method   **(b)** Lucas regard method

    (c) Victor Meyer's method   **(d)** All of these

  Ans: Option (d)

19. Ethyl acetate reacts with CH_3MgBr to form –   1

    (a) Secondary Alcohol   **(b)** Tertiary Alcohol

    (c) Primary Alcohol and Acid   **(d)** Carboxylic Acid

  Ans: Option (b)

20. Carbon atom in the carbonyl group is –   1

(a) $Sp-hybridised$ **(b)** $Sp^2-hybridised$

(c) $Sp^3-hybridised$ **(d)** $dSp^2-hybridised$

  Ans: Option (b)

21. The reaction is called   1

$$RCOCl + H_2 \xrightarrow{pd/Baso_4} RCHO + HCl$$

    (a) Cannizzaro Reaction   **(b)** Rosenmund's Reaction

    (c) Haloform Reaction   **(d)** Clemensen's Reaction

  Ans: Option (b)

22. Which of the following undergoes Cannizaro's reaction ?   1

  (a) CH_3CHO **(b)** CH_3CH_2CHO **(c)** $(CH_3)_2CHCHO$ **(d)** $HCHO$

  Ans: Option (d)

23. What is the decreasing order of basicity?   1

(a) $NH_3 > C_2H_5NH_2 > (C_2H_5)NH > (C_2H_5)N$

(b) $(C_2H_5)_3N > (C_2H_5)_2NH > C_2H_5NH_2 > NH_3$

(c) $(C_2H_5)_2NH > C_2H_5NH_2 > (C_2H_5)N > NH_3$

(d) $(C_2H_5)_2NH > C_2H_5NH_2 > NH_3 > (C_2H_5)N$

Ans: Option (b)

24. Aniline reacts with Acetaldehyde to form   **1**

  (a) Carbylamines   **(b)** Nitrobenzene   **(c)** Imine   **(d)** Schiff's base

  Ans: Option (d)

25. Sweetest of all sugar is –

  (a) Glucose   **(b)** Lactose   **(c)** Sucrose   **(d)** Fructose

  Ans: Option (d)

26. Enzyme is –   **1**

(a) Carbohydrate   **(b)** Lipid   **(c)** Proteins   **(d)** None of these

  Ans: Option (c)

27. Natural Rubber is polymer of –
1

(a) Styrene   **(b)** Isoprene   (c) Chloroprene   (d) Butadiene

  Ans: Option (b)

28. Antibiotic used for the treatment of typhoid is -   **1**

  (a) Penicillin   **(b)** Chloramphenicol

  (c) Terramycin   **(d)** Sulphadiazine

Section – II (Non- Objective Type)

Questions Nos. 1 to 11 are of short answer type. Each question carries marks.
$11 \times 2 = 22$

Short Answer Type Questions

1. **Lithium forms bcc crystals. Calculate the atomic radius of lithium if the length of the side of unit cell of lithium is 351 pm.**
   2

  Ans:

    Side of unit cell (a) = 351 PM.

  We know that $r = \dfrac{\sqrt{3}a}{4} = \dfrac{\sqrt{3} \times 351}{4} = \dfrac{1.732 \times 351}{4} = \dfrac{607.9}{4}$

    $= 151.97$ pm

2. State and explain faraday's 2ⁿᵈ law of electrolysis.
    2

Ans:

When same amount of electricity passed though diff. electrolyte connected is series

Amount of substance deposit or liberated is directly proposional to their equivalence.

3. What is specific conductance and molar conductance?
    2

Ans: Specific conductance – specific conductance of a solution is conductance 1 cm cube of the solution of the electrolytes.

The period of specific resistance is called specific conductance.

$$k = \frac{1}{P} = \frac{1}{R}\frac{1}{A}$$

Molar conductance: The conductance of the solution containing on gram able of electrolyte such that the entire solution is placed between two parallel electrode one centimetre apar. It is denoted by^ m molar conductance $\wedge m = K \times V$

$$\wedge m = \frac{K \times 100}{C} = k \times \frac{1000}{M}$$

4. Distinguish between Lyophilic and Lyophobic colloids.
    2

Ans:

Lyophilic: (i) water = Hydrophilic

   (ii) Lyophilic solute is liquid attracting

   (iii) Disperson medium +gum, starch, – lyophilic

   Lyophobic: (i) water = hydrophobic

   (ii) Lyphobic solute is liquid Repelling.

   (iii) Some method is used like chemical, physical, dispersion.

5. Give the name and chemical composition of important ores of aluminium and Copper.   **2**

Ans: The main ore of Al is Bauxite $\left(Al_2O_3 \cdot 2H_2O \right)$. The main ore of Cu is copper pyrite $\left(CuFeS_2 \right)$

6. Fill in the blanks – $1+1=2$

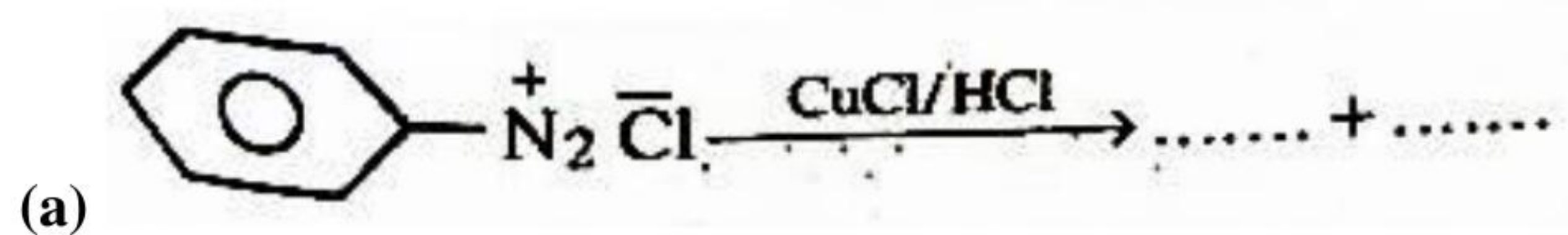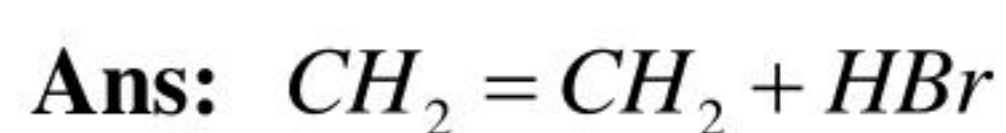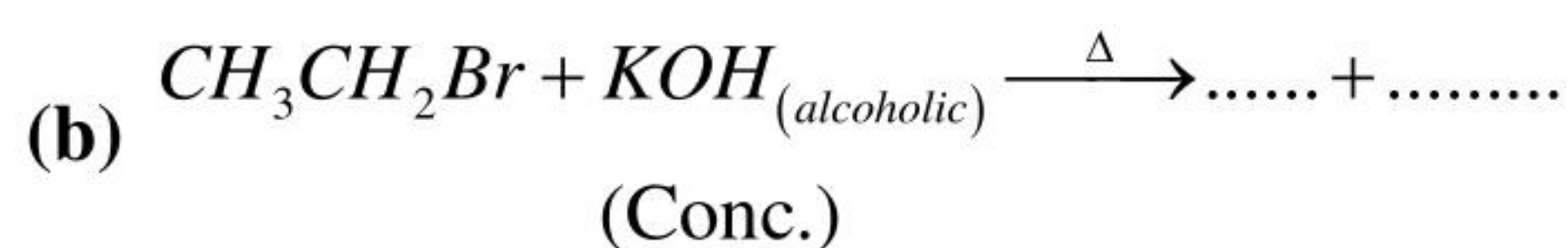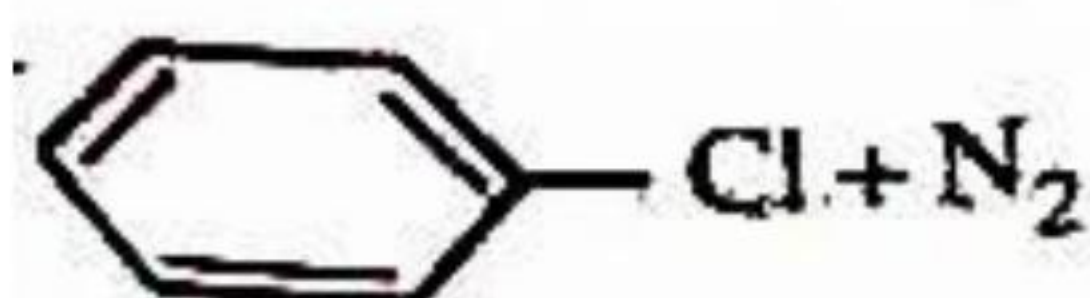**(a)** $CH_3CH_2COOAg + Br_2 \xrightarrow[\text{Re}\,flux]{ccl4} ....+ CO_2 +.......$

Ans:

$CH_3Br, AgBr$
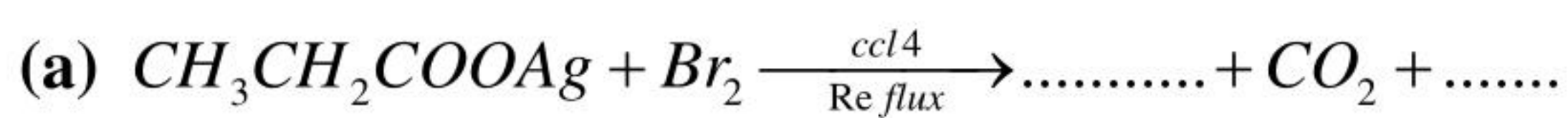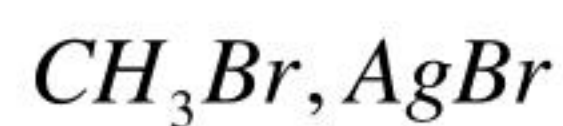
(b)
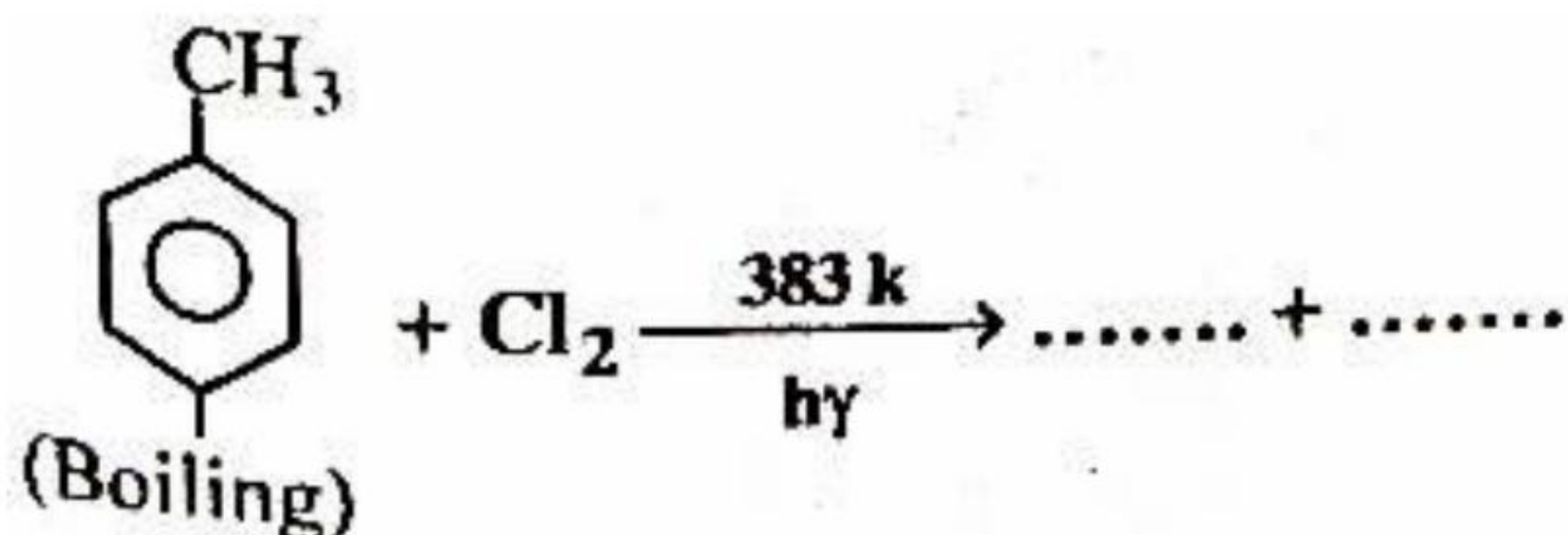
Ans:
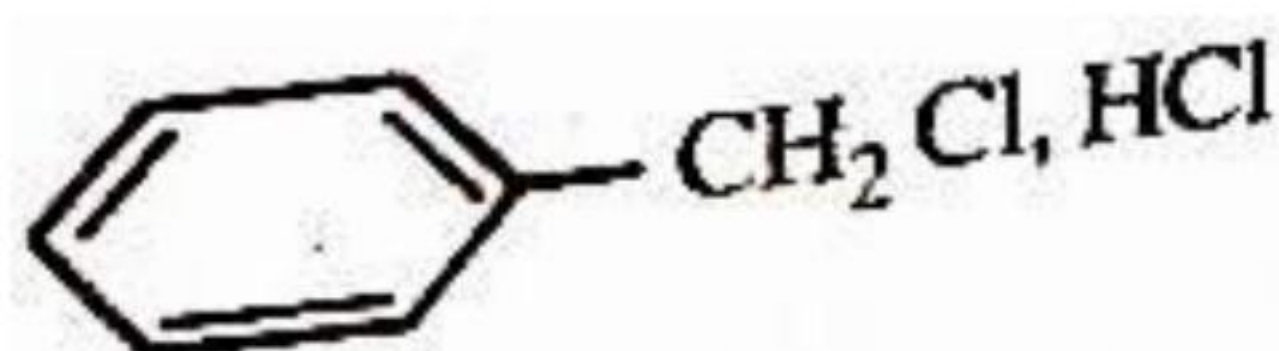
7. **Complete the reaction –** $1+1=2$

(a)

Ans: (a)

(b) $CH_3CH_2Br + KOH_{(alcoholic)} \xrightarrow{\Delta} ......+.........$
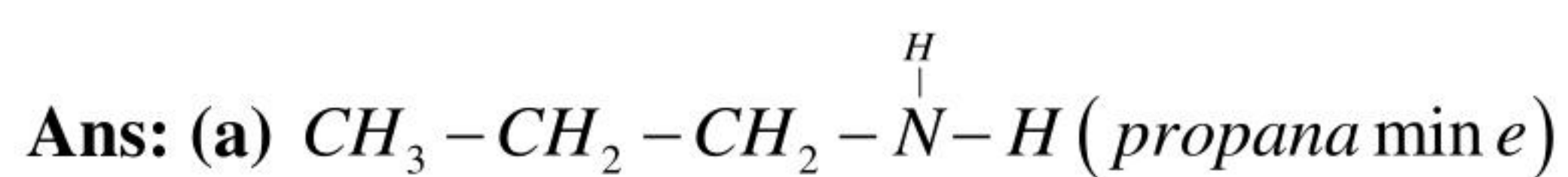$\quad\quad$ (Conc.)

Ans: $CH_2 = CH_2 + HBr$

8. **Write the names and structure of four isomeric amines having the molecular formula C_3H_9N**

Ans: (a) $CH_3 - CH_2 - CH_2 - \overset{H}{\underset{|}{N}} - H \left(propana\min e \right)$

(b) $CH_3 - N - CH_2 - CH_3 \, (N - Methyl \text{ ethanamine})$
$\overset{\displaystyle |}{\underset{\displaystyle H}{}}$

(c) $CH_3 - N - CH_3 \quad (N, N - dim ethyl \text{ methanamine})$
$\underset{\displaystyle CH_3}{|}$

(d) $CH_3 - \overset{\displaystyle NH_2}{\underset{\displaystyle |}{CH}} - CH_3 \, (propan \text{ 2-amine})$
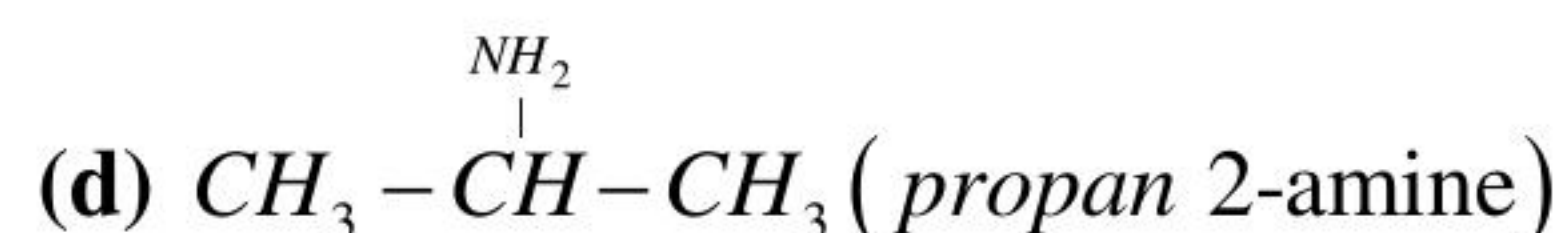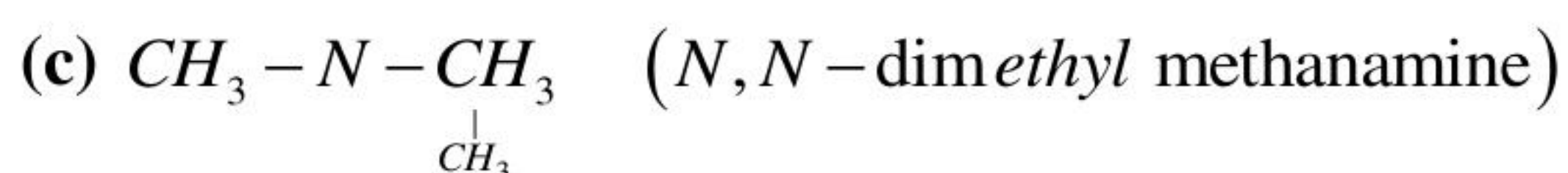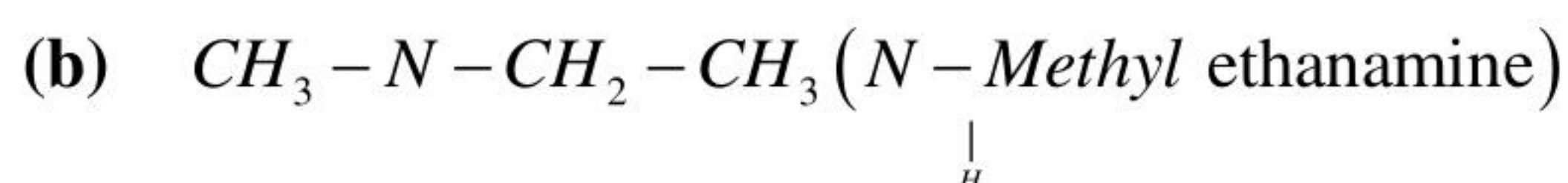
9. Name two vitamins and their deficiency diseases.   **2**

Ans:

Vitamin A- Night blindness, drying of skin

Vitamin B- Cheilosin, Beri-beri

10. Name the Monomer and write the structure of any two of the following polymers. 2
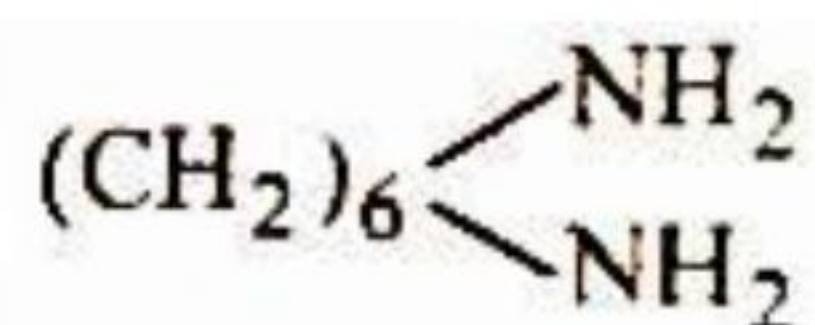
  (a) PVC   **(b)** Nylon-6,6   **(c)** Polythene   **(d)** Polyester

Ans:

  (a) Vinyl chloride

$$\left(\overset{\displaystyle H}{\underset{\displaystyle H}{}} C = C \overset{\displaystyle Cl}{\underset{\displaystyle H}{}} \right)$$
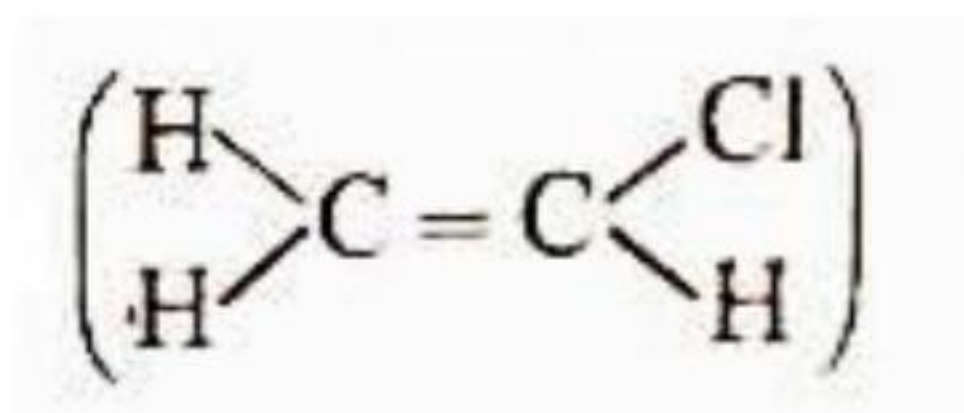
  (b) Hexamethylene diamine

$$(CH_2)_6 \overset{\displaystyle NH_2}{\underset{\displaystyle NH_2}{}}$$

  (c)

Ethene $CH_2 = CH_2$

(d)

Ethane – 1, 2 – diol $\left(HOCH_2 - CH_2 \right)$

11. Write the name of any two of the following medicines. $1 + 1 = 2$

(a) Analgesics   **(b) Antiseptic**   **(c) Antibiotic**   **(d) Antihistamine**

Ans:

  (a) Ibrufen, Novalgin   (b) Bithional, Chloroxylenol   (c) penicillin
      Tetracycline

(d) Brompheniramine, terfenadine

Long Answer Type Question

12. (a) what do you mean by the term 'Depression of freezing point?

Ans: Depression of freezing point: when a non-volatile solution dissolved in the solvent the freezing point of the solvent decrease. This called depression in freezing point.

Depression of freezing point $(\Delta Tf) = T_o - T$

Where T_o = The freezing point of the pure solvent

T= That of solution

(b) State Rault's Law of depression of freezing point. How is it used in determining the molecular weight of non-volatile and non-electrolyte solute?

Ans: Rault's law of the depression in freezing point: The depression of freezing point is directly proportional to the molar concentration of dissolved solution.

$\Delta Tf \propto m$ or $\Delta Tf = kf \cdot m$ where kf is called moral depression constant.

Determination of molar mass from depression of freezing points: The w gm of solute is dissolved in w_g of solvent to make a dilute solution. If the molar mass of solute and M be that of the solvent.

Thus molality (m) = $\dfrac{w \times 1000}{m \times w}$

From Raoult's law

OR

(a) What do you mean by Relative lowering of vapour pressure.?

Ans: (a) Relative lowering of vapour pressure: The relative lowering vapour pressure of dilute solution containing the non-volatile solute to the mole-fraction of the solute at a given temp.

Relative lowering of vapour press $\dfrac{P_0 - P_s}{P_0}$

(b) The relative lowering of vapour pressure of 1% Solution of Aniline in Ether was 0.007. Calculate the molecular weight of Aniline.

Ans: Given relative lowering of v.p=0.0007

1% Solution of aniline

Wt Solution =1 g

Wt of solute =1g

Wt. of solution =100g   wt. of solvent =99g

Mol. Wt. of aniline =?   Mol. Wt. of ether =74
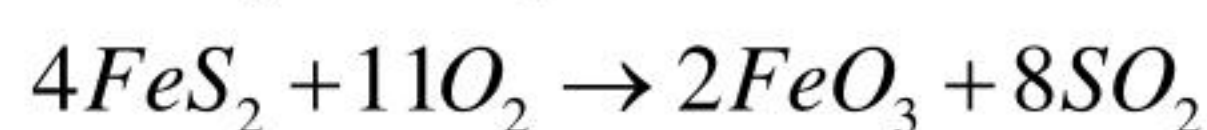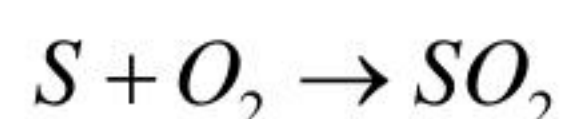
We know that

$$\frac{P_0 - P_s}{P_0} = \frac{w \times M}{m \times W};$$

$$0.007 = \frac{W \times M}{m \times W}$$

$$m = \frac{W \times M}{0.007 \times W} = \frac{1 \times 74}{0.007 \times 99} = 106.78$$

13.(a) Write only the principle for the manufacturing of sulphuric acid by contact process.

(i) SO_2 gas is produced by burning sulphur of FeS_2 in excess of air-

$$S + O_2 \rightarrow SO_2$$
$$4FeS_2 + 11O_2 \rightarrow 2FeO_3 + 8SO_2$$

(ii) SO_2 is oxidised into SO_3 in presence of catalyst

$$2SO_2 + O_2 \rightarrow 2SO_3$$

(iii) SO_3 on treatment with conc. H_2SO_4 oleum $\left(H_2S_2O_7 \right)$ is obtained.

(iv) From oleum sulphuric acid is obtained of desired concentration by diluting water.

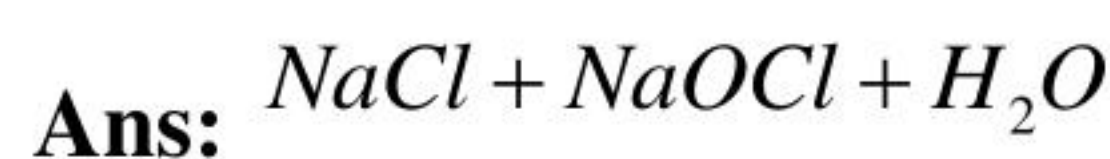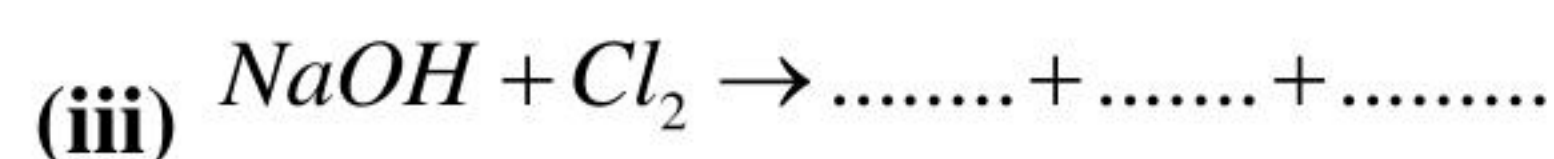$$H_2S_2O_7 + H_2O \rightarrow 2H_2OSO_4$$
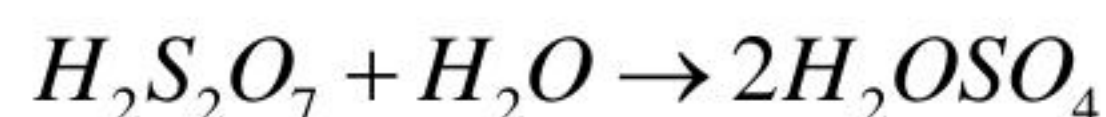
(b) Complete the following reactions 1×3

(i) $KBr + Cl_2 \rightarrow \dots\dots + \dots\dots$

Ans. $2KCl + Br_2$

(ii) $I_2 + H_2O + Cl_2 \rightarrow \dots\dots + \dots\dots$

Ans:

$$2H_2O_3 + 10HCl$$

(iii) $NaOH + Cl_2 \rightarrow \ldots\ldots + \ldots\ldots + \ldots\ldots$

Ans: $NaCl + NaOCl + H_2O$
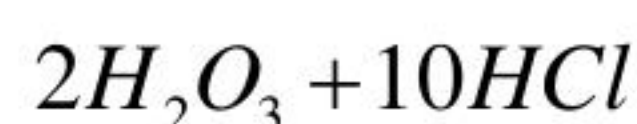
14. Write the IUPAC name of the following coordination compounds-
1×5

(a) $K_4[Fe(CN)_6]$

(b) (b) $Ni(CO)_4$

(c) (c) $K_2[Pt(Cl)_6]$

(d) (d) $CO(NH_3)_3$

(e) $Fe_4[Fe(CN)_6]_3$
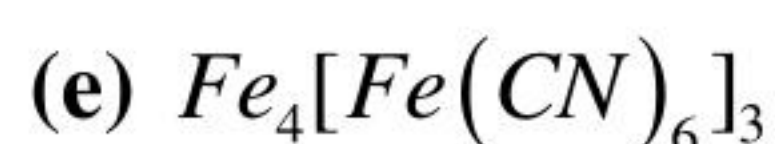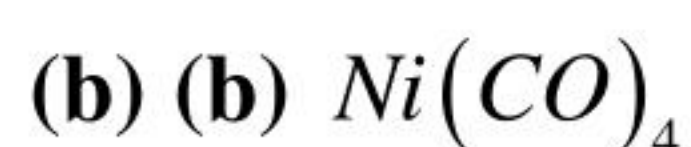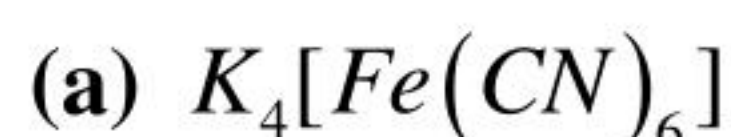
(a) Potassium hexacyanoferrate II

(b) Tetra carbonyl Nickel (o)

(c) Potassium hexa chloride palatinate iv

(d) Triammine Cobalt (o)

(e) Ferric hexacyano ferrate ii

Or,

(a) State Werner'' coordination theory.

Ans: Werner's co-ordination theory: This theory may be stated as follows-

1. The central metal atom of the coordination coupd show two types of valencies.

(a) Primary valency. It is also the oxidation state of the metal ion,

(b) Secondary valency which is also called as coordination number.

2. Every metal atom or ion has a fixed number of secondary valencies (C.M).

3. The metal atom or ion tend to satisfy both its primary as well as secondary valencies.

4. The secondary valencies are always directed towards the fixed positions in space and thereby giving a definite geometry to the complex.
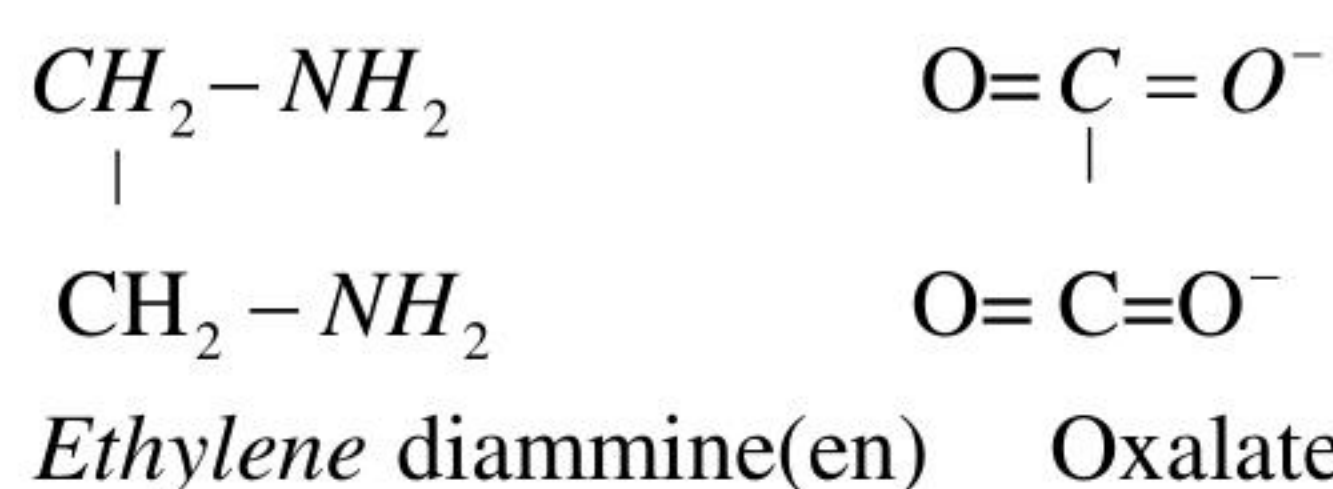
(b) What are ligands? Classify them with example.

Ligands: The neutral molecules, anions or cations which are directly linked with the central metal atom or ion in a complex ion are called ligands.

Types of ligands:

(i)   Mono or unidentate ligands: One donor atom F^-, Cl^-, CM^-, OH^-

(ii)   Bidentate ligands: Two donor atoms

$$CH_2-NH_2 \qquad\qquad O=C=O^-$$
$$\quad | \qquad\qquad\qquad\qquad |$$
$$CH_2-NH_2 \qquad\qquad O=C=O^-$$

Ethylene diammine(en)   Oxalate

(iii)   Polydentate ligands: Two or more donor atom. EDTA

15. What happens when- $\qquad\qquad\qquad\qquad 1\times 5$

(a) Ethene is passed into concentrated H_2SO_4 and the product boiler with water.

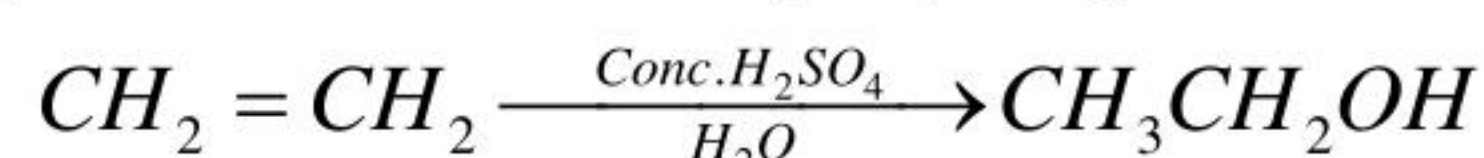**(b) Ethylethanoate is boiled with KOH aq.**

(c) Methyl magnesium iodide is heated with methanol.

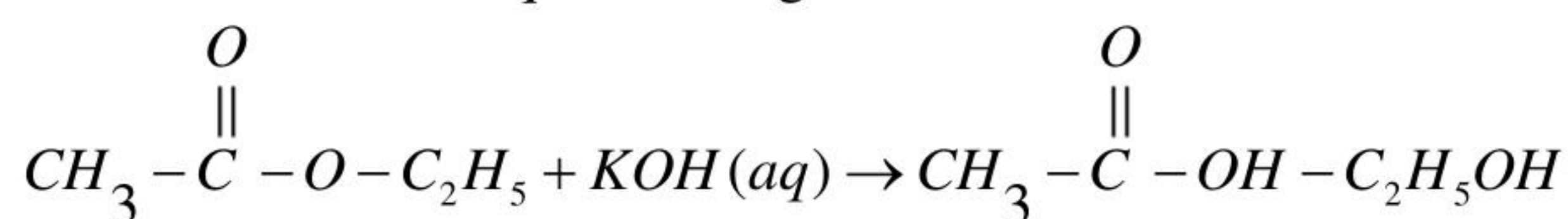**(d) Acetadehyde is heated with Tollen's reagent.**

(e) Alkaline solution of phenol is heated with CO_2 under high pressure and then the product is acid hydrolysed.

Ans:

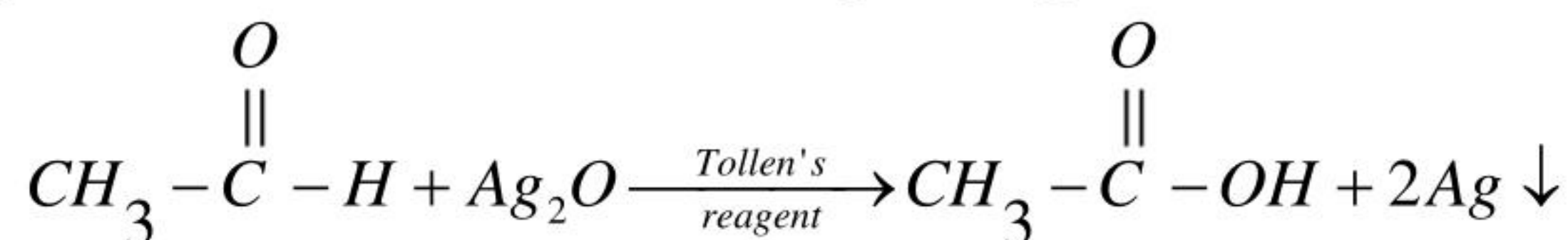**(a)** When ethene is passed into conc. H_2SO_4 are product boiled with water to give ethanol.

$$CH_2=CH_2 \xrightarrow[H_2O]{Conc.H_2SO_4} CH_3CH_2OH$$

(b) When ethylethanoate is boiled with aq. KOH to give ethanlol.

$$\underset{CH_3}{} \overset{O}{\underset{\|}{C}} -O-C_2H_5 + KOH(aq) \rightarrow \overset{O}{\underset{\|}{C}}\underset{CH_3}{} -OH-C_2H_5OH$$

(c) When methyl magnesium iodide is heated with methanol to give ethane.

$$CH_3-Mg-I+CH_3+Mg(OH)I$$

(d) When acetaldehyde is heated with Tollen's reagent to give ethanoic acid.

$$\overset{O}{\underset{\|}{C}}\underset{CH_3}{}-H+Ag_2O \xrightarrow[reagent]{Tollen's} \overset{O}{\underset{\|}{C}}\underset{CH_3}{}-OH+2Ag\downarrow$$

(e) When alkaline solution of phenol is heated with CO_2 under high pressure and then the product is acid hydrolysed to give salicylic acid.

Salicyclic acid
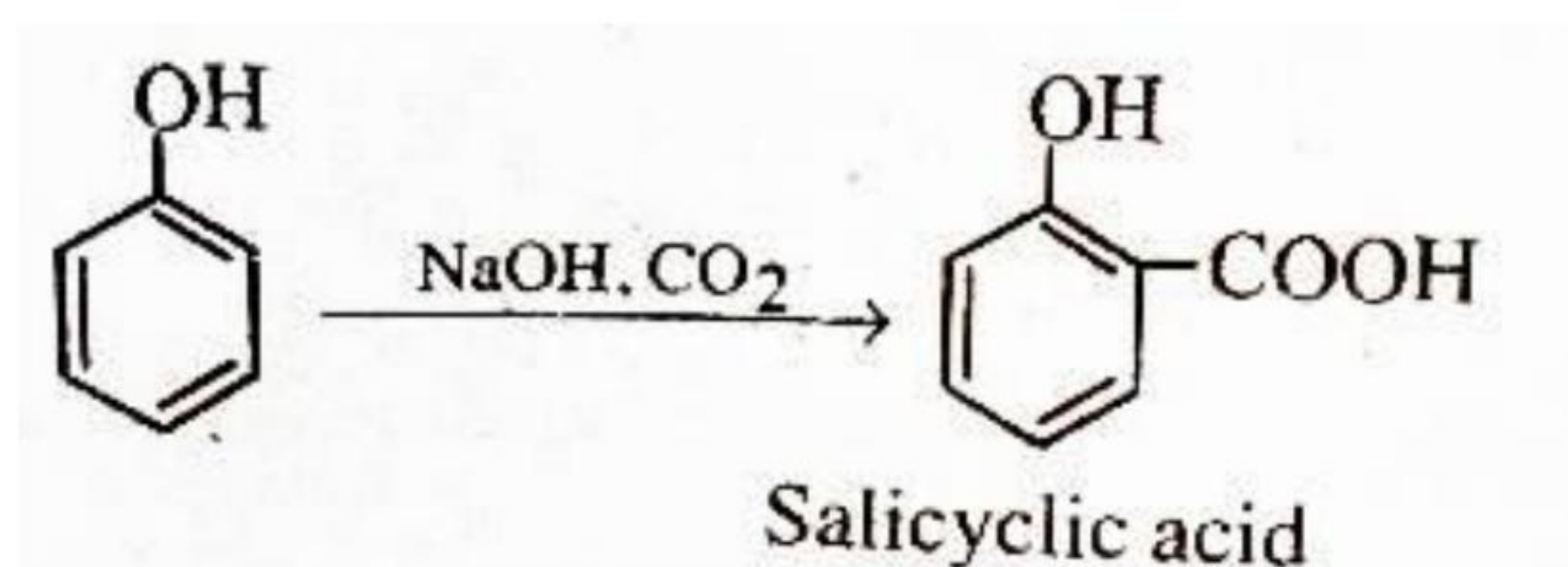
(f)

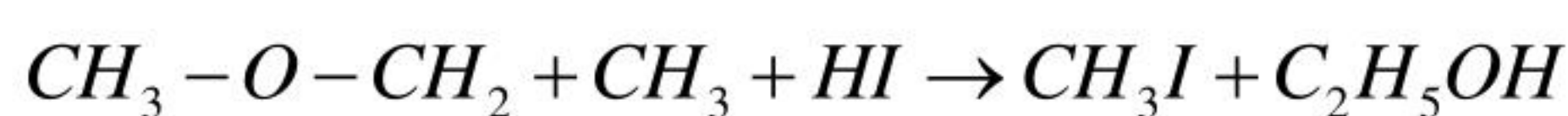**Or, What happens when-** $\qquad$ 1×5

(a) Propene is passed into concentrated H_2SO_4 and the product is boiler with water.

Ans: when propene is passed into conc. H_2SO_4 and the product is boiled with water to give propan-2-0-1.

(b) Methoxy ethane is heated with HI.

Ans: When methaxy ethane is heated with HI to give ethyl alcohol.

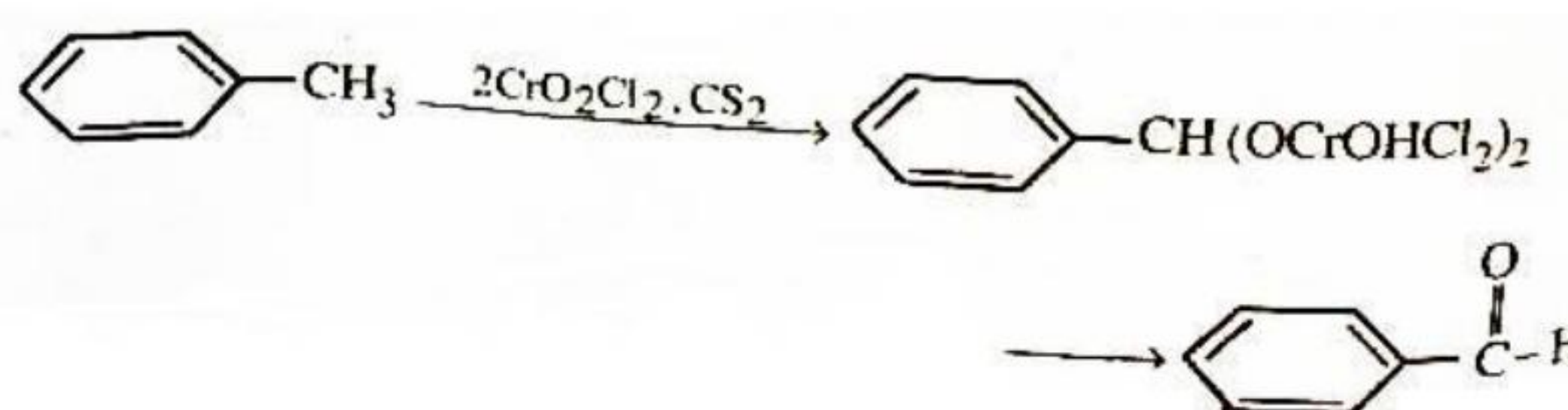$$CH_3 - O - CH_2 + CH_3 + HI \rightarrow CH_3I + C_2H_5OH$$

(c) Ethanol is heated with Fenton's reagent.

Ans: When ethanol is heated with fenton's reagent to give – No reaction

(d) Toluene is heated with Chrom 1 Chloride is CS_2 and product is hydrolysed.

(e) Ans: When toluene is heated with chromyl chloride in CS_2 and the product is hydrolysed to give benzaldehyde.

(f) Crotonaldehyde is treated with Li Al H₄ / dry ether and the product is acid hydrolysed.

When crotonaldehyde is treated with LiAlH₄/dry ether and the product is acid hydrolysed to give but -2-en-1-O]