



# CHEMISTRY

## BOOKS - KALYANI CHEMISTRY (ENGLISH)

### ISC QUESTION PAPER

#### Part I

1. Calcium acetate on heating gives \_\_\_ which gives\_\_  
on heating with iodine and sodium hydroxide  
solution.



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2. On dilution of a solution, its specific conductance - while its equivalent conductance \_\_\_\_

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3. Sucrose is a \_\_\_\_\_ and yield upon hydrolysis, a mixture of \_\_\_ and fructose,

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4. The more ..... the standard reduction potential of a metal, the ..... is its ability to displace hydrogen

from acids.



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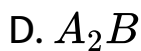
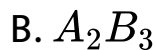
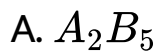
5. An aqueous solution of  $CH_3COONa$  is \_\_\_ due to

\_\_\_\_\_



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6. In a face centered cubic lattice, atom (A) occupies the corner positions and atom (B) occupies the face centre positions. If one atom of (B) is missing from one of the face centered points, the formula of the compound is :



**Answer:**



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7. The half-life period of a first order reaction is 20 minutes. The time required for the concentration of the reactant to change from 0.16 M to 0.02 M is :

A. 80 minutes

B. 60 minutes

C. 40 minutes

D. 20 minutes

**Answer:**

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8. For a spontaneous reaction  $\Delta G^\circ$  and  $E^\circ$  cell will

be respectively :

A.  $-ve$  and  $+ve$

B.  $+ve$  and  $-ve$

C.  $+ve$  and  $+ve$

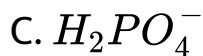
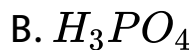
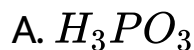
D.  $-ve$  and  $-ve$

**Answer:**



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9. The conjugate acid of  $HPO_4^{2-}$  is:



**Answer:**

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10. The polymer formed by the condensation of hexamethylenediamine and adipic acid is :

- A. Teflon
- B. Bakelite
- C. Dacron
- D. Nylon-66

**Answer:**

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11. Answer the following questions :

Why the freezing point depression ( $\Delta T_f$ ) of 0.4M NaCl solution is nearly twice than that of 0.4M glucose solution ?



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12. Identify the order of reaction from each of the following units of rate constant (k) :

(a)  $\text{mole L}^{-1} \text{sec}^{-1}$  (b)  $\text{Mol}^{-1} \text{sec}^{-1}$



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13. Specific conductivity of 0.20 M solution of KCl at 298 K is  $0.025 \text{ Scm}^{-1}$ . Calculate its molar conductivity.

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14. Name the order of reaction which proceeds with a uniform rate throughout.

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15. What are the products formed when phenol and nitrobenzene are treated separately with a mixture of

concentrated sulphuric acid and concentrated nitric acid ?

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16. Calculate the molecular mass of ammonia ?

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17. Calcium acetate on heating gives \_\_\_ which gives \_\_ on heating with iodine and sodium hydroxide solution.

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18. On dilution of a solution, its specific conductance - while its equivalent conductance \_\_\_\_

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19. Sucrose is a \_\_\_\_\_ and yield upon hydrolysis, a mixture of \_\_\_ and fructose,

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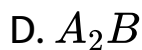
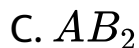
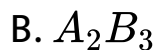
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22. In a face centred cubic lattice, atom A occupies the corner positions and atom B occupies the face centre positions. If one atom of B is missing from one of the face centred points, the formula of the compound is:

A.  $A_2B_5$



**Answer:**

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**23.** The half-life period of a first order reaction is 20 minutes. The time required for the concentration of the reactant to change from 0.16 M to 0.02 M is :

A. 80 minutes

B. 60 minutes

C. 40 minutes

D. 20 minutes

**Answer:**

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**24.** For a spontaneous reaction  $\Delta G^\circ$  and  $E^\circ$  cell will be respectively :

A.  $-ve$  and  $+ve$

B.  $+ve$  and  $-ve$

C.  $+ve$  and  $+ve$

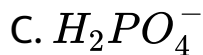
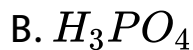
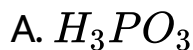
D.  $-ve$  and  $-ve$

**Answer:**



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**25.** The conjugate acid of  $HPO_4^{2-}$  is:



**Answer:**



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26. The polymer formed by the condensation of hexamethylenediamine and adipic acid is :

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31. What are the products formed when phenol and nitrobenzene are treated separately with a mixture of

concentrated sulphuric acid and concentrated nitric acid ?

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## Part II Section A

1. Determine the freezing point of a solution containing 0.625 g of glucose ( $C_6H_{12}O_6$ ) dissolved in 102.8 g of water.

(Freezing point of water = 273 K,  $K_f$  for water = 1.87 K kg mol<sup>-1</sup> at. wt. C = 12, H = 1, O = 16)

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2. A 0.15 M aqueous solution of KCl exerts an osmotic pressure of 6.8 atm at 310 K. Calculate the degree of dissociation of KCl. ( $R = 0.0821 \text{ Lit. atm } K^{-1} \text{ mol}^{-1}$ ).

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3. A solution containing 8.44 g of sucrose in 100 g of water has a vapour pressure 4.56 mm of Hg at 273K. If the vapour pressure of pure water is 4.58 mm of Hg at the same temperature, calculate the molecular weight of sucrose.

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4. When ammonium chloride and ammonium hydroxide are added to a solution containing both  $Al^{3+}$  and  $Ca^{2+}$  ions, which ion is precipitated first and why?

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5. A solution of potassium chloride has no effect on litmus whereas, a solution of zinc chloride turns the blue litmus red. Give a reason.

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6. How many sodium ions and chloride ions are present in a unit cell of sodium chloride ?



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7. Lead sulphide has face centred cubic crystal structure. If the edge length of the unit cell of lead sulphide is 495 pm, calculate the density of the crystal.  
(at. Wt. Pb =207, S=32)



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8. Calculate the molecular mass of water.



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9. The following electrochemical cell is set up at 298 K:



Given:

$$E^\circ \text{Zn}^{2+} / \text{Zn} = -0.761\text{V}, E^\circ \text{Cu}^{2+} / \text{Cu} = +0.339\text{V}$$

(1) Write the cell reaction.

(2) Calculate the emf and free energy change at 298 K



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10. (ii) Answer the following:

(1) What is the effect of temperature on ionic product

of water ( $K_w$ ) ?

(2) What happens to the ionic product of water ( $K_w$ ) if some acid is added to it ?



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**11.** Frenkel defect does not change the density of the ionic crystal whereas, Schottky defect lowers the density of ionic crystal. Give a reason.



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**12.** Name the law or principle to which the following observations conform :



(1) When water is added to a 1.0 M aqueous solution of acetic acid, the number of hydrogen ion ( $H^+$ ) increases.

(2) When 9650 coulombs of electricity is passed through a solution of copper sulphate, 3.175 g of copper is deposited on the cathode.(at. wt. of Cu = 63.5).

(3) When ammonium chloride is added to a solution of ammonium hydroxide, the concentration of hydroxyl ions decreases.



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13. What is the difference between the order of a reaction and its molecularity ?

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14. Explain why high pressure is required in the manufacture of sulphur trioxide by contact process.

State the law or principle used.

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15. Calculate the equilibrium constant (K) for the formation of  $\text{NH}_3$  in the following reaction:  $\text{N}_2(\text{g}) +$

$3\text{H}_2(\text{g})$  At equilibrium, the concentration of  $\text{NH}_3$ ,  $\text{H}_2$  and  $\text{N}_2$  are  $1.2 \times 10^{-2}$ ,  $3.0 \times 10^{-2}$  and  $1.5 \times 10^{-2}$  M respectively.

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**16.** Explain the following: Hydrolysis of ester (ethyl acetate) begins slowly but becomes fast after sometime.

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**17.** Assertion : The pH of an aqueous solution of acetic acid remains unchanged on addition of sodium

acetate.

Reason : The ionization of acetic acid is increased by addition of sodium acetate.

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**18.** Determine the freezing point of a solution containing 0.625 g of glucose ( $C_6H_{12}O_6$ ) dissolved in 102.8 g of water.

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26. (ii) Answer the following:

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**33.** Assertion : The pH of an aqueous solution of acetic acid remains unchanged on addition of sodium acetate.

Reason : The ionization of acetic acid is increased by addition of sodium acetate.



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## Part II Section B

1. Write the formula of the following compounds :

Potassium trioxalatoaluminate (III).

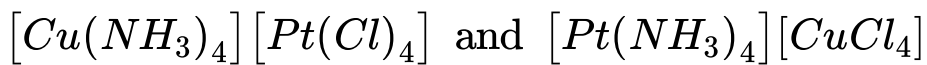
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2. Write the formula of the following compounds :

Hexaaquairon (II) sulphate.

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3. Name the types of isomerism shown by the following pairs of compounds :



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4. The anhydride of nitric acid is:

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5. For the coordination complex ion  $[Co(NH_3)_6]^{3+}$

Give the IUPAC name of the complex ion.

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6. For the coordination complex ion  $[Co(NH_3)_6]^{3+}$ .

What is the oxidation number of cobalt in the complex ion?



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7. For the complex ion of  $[Co(NH_3)_6]^{3+}$

State the hybridization of the complex.



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8. For the complex ion of  $[Co(NH_3)_6]^{3+}$  :

State the magnetic nature of the complex.



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9. Give balanced equations for the following reactions

:

Potassium permanganate is heated with concentrated hydrochloric acid.



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10. Give balanced equations for the following reactions :

Lead sulphide is heated with hydrogen peroxide.



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**11.** Give balanced equations for the following reactions

:

Ozone is treated with potassium iodide solution.



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**12.** Write all the chemical reactions involved in the manufacture of sulphuric acid by contact process.



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13. (i) What are the types of hybridization of iodine in interhalogen compounds  $IF_3$ ,  $IF_3$  and  $IF_7$ , respectively?

(ii) Draw the structure of xenon hexafluoride ( $XeF_6$ ) molecule and state the hybridization of the central atom.

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14. Draw the structure of xenon hexafluoride ( $XeF_6$ ) molecule and state the hybridisation of the central atom.

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15. Give the equations for the conversion of argentite ( $Ag_2S$ ) to metallic silver.

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16. How can the following conversions be brought about :

Acetaldehyde to propan-2-ol.

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**17.** How can the following conversions be brought about :

Nitrobenzene to p-aminoazobenzene

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**18.** How can the following conversions be brought about :

Acetic acid to methylamine.

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**19.** How can the following conversions be brought about :

Aniline to benzene.

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**20.** How will you distinguish between primary, secondary and tertiary amines ?

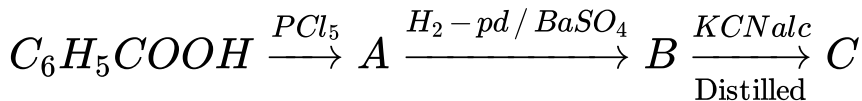
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**21.** Why do alcohols pass higher boiling points as compared to those of corresponding alkanes ?



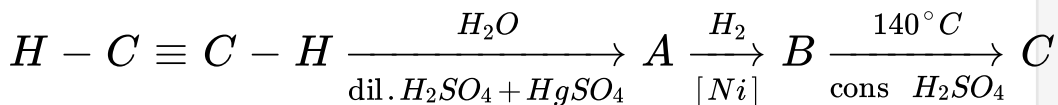
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22. Identify the compounds A, B and C:



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23. Identify the compounds A, B and C:



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**24.** Give balanced equations for the following name reactions :

Friedel-Crafts reaction (alkylation)



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**25.** Write chemical equations to illustrate the following name reactions :

Williamson's synthesis



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**26.** Give balanced equations for the following name reactions :

Aldol condensation.



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**27.** Give chemical test to distinguish : ethyl alcohol and sec - propyl alcohol.



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**28.** Give chemical test to distinguish :

Acetaldehyde and acetic acid.





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**29.** Deficiency of which vitamin causes the following diseases :

(1) Scurvy

(2) Night blindness.



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**30.** State two main differences between globular and fibrous proteins.



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31. An aliphatic unsaturated hydrocarbon (A) when treated with  $HgSO_4 / H_2SO_4$  yields a compound (B) having molecular formula  $C_3H_6O$ . (B) on oxidation with concentrated  $HNO_3$  gives two compounds (C) and (D). Compound (C) when treated with  $PCl_5$  gives compound (E). (E) when reacts with ethanol gives a sweet smelling liquid (F). Compound (F) is also formed when (C) reacts with ethanol in the presence of concentrated  $H_2SO_4$ .

(i) Identify the compound A, B, C, D, E and F.

(ii) Give the chemical equation for the reaction of (C) with chlorine in the presence of red phosphorus and name the reaction.



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(i) Identify the compound A, B, C, D, E and F.

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33. What is the common name of the polymer obtained by the polymerisation of caprolactam? Is it addition polymer or condensation polymer?



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34. Name the two organic compounds which have the same molecular formula  $C_2H_6O$ . Will they react with  $PCl_5$ ? If they react, what are the products formed ?



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**35.** Give balanced equations for the following reactions :

Methyl magnesium bromide with ethyl alcohol.

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**36.** Give balanced equations for the following reactions :

Acetic anhydride with phosphorous pentachloride.

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**37.** Give balanced equations for the following reactions :

Acetaldehyde with hydroxylamine.

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**38.** Write the formula of the following compounds :

Potassium trioxalatoaluminate (III).

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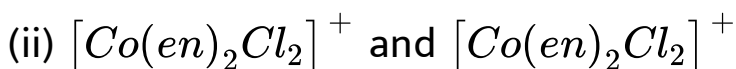
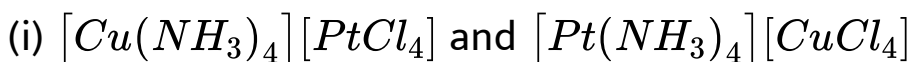
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40. Name the types of isomerism shown by the following pairs of compounds :



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41. Name the types of isomerism shown by the following pairs of compounds :



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Give the IUPAC name of the complex ion.

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What is the oxidation number of cobalt in the complex ion?

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44. For the complex ion of  $[Co(NH_3)_6]^{3+}$

State the hybridization of the complex.



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State the magnetic nature of the complex.



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**48.** Give balanced equations for the following reactions :

Ozone is treated with potassium iodide solution.



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49. Give names of water soluble vitamins



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50. (i) What are the types of hybridization of iodine in interhalogen compounds  $IF_3$ ,  $IF_3$  and  $IF_7$ , respectively ?

(ii) Draw the structure of xenon hexafluoride ( $XeF_6$ ) molecule and state the hybridization of the central atom.



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**53.** How can the following conversions be brought about :

Acetaldehyde to propan-2-ol.



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55. How can the following conversions be brought about :

Acetic acid to methylamine,

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56. Which is other name for cobalamin.

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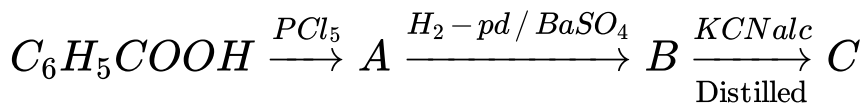
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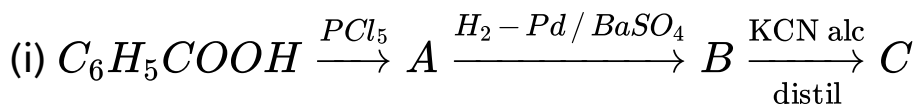
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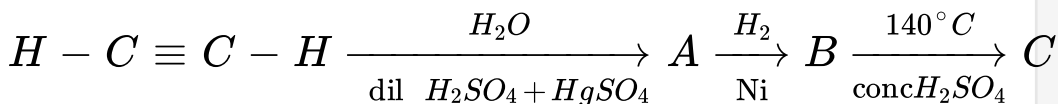


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60. Identify the compounds A, B and C :



(ii)



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61. Gives names of water and fat soluble vitamins.



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62. Write chemical equations to illustrate the following name reactions :

Williamson's synthesis



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**63.** Give balanced equations for the following name reactions :

Aldol condensation.

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(i) Identify the compound A, B, C, D, E and F.

(ii) Give the chemical equation for the reaction of (C) with chlorine in the presence of red phosphorus and name the reaction.



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**69.** An aliphatic unsaturated hydrocarbon (A) when treated with  $HgSO_4 / H_2SO_4$  yields a compound (B) having molecular formula  $C_3H_6O$ . (B) on oxidation with concentrated  $HNO_3$  gives two compounds (C) and (D). Compound (C) when treated with  $PCl_5$  gives compound (E). (E) when reacts with ethanol gives a sweet smelling liquid (F). Compound (F) is also formed when (C) reacts with ethanol in the presence of concentrated  $H_2SO_4$ .

(i) Identify the compound A, B, C, D, E and F.

(ii) Give the chemical equation for the reaction of (C)

with chlorine in the presence of red phosphorus and name the reaction.

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70. What is the common name of the polymer obtained by the polymerisation of caprolactam? Is it addition polymer or condensation polymer?

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71. Name the two organic compounds which have the same molecular formula  $C_2H_6O$ . Will they react with  $PCl_5$ ? If they react, what are the products formed ?



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**72.** Give balanced equations for the following reactions :

Methyl magnesium bromide with ethyl alcohol.



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**73.** Give balanced equations for the following reactions :

Acetic acid reacts with phosphorus pentachloride.



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74. Give balanced equations for the following reactions :

Acetaldehyde with hydroxylamine.



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