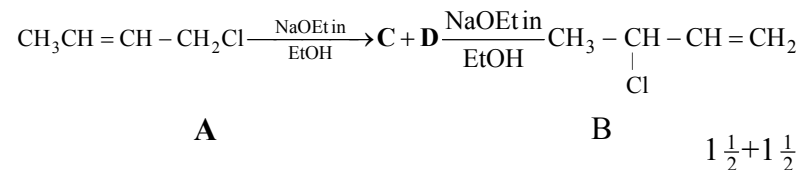
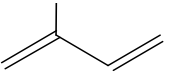


[4]



e) Show the mechanism of sodium metal - induced

polymerisation of isoprene (). 3

GROUP - C

4. a) Calculate the pH of 100 mL 0.1 (N) acetic solution when (i) 00 mL, (ii) 99 ml and (iii) 100 mL and (iv) 101 mL of 0.1 (N) NaOH is added to it. [Given : $K_a = 1.8 \times 10^{-5}$] 6
- b) How can you separate Cu^{2+} and Cd^{2+} from their mixture ? Discuss and give reactions. 2
- c) What do you mean by buffer solution ? Discuss mechanism of buffer action. 3
- d) What is the basis of selection of an indicator in acid-base titration ? 2
- e) Can Fe^{3+} and Mg^{2+} be separated quantitatively as hydroxide from solution that is 0.10 M with respect to each cation ? Consider a precipitation to be quantitative when all but 1 part in 10000 of the ion has been removed from solution. 3

[given : K_{sp} of $\text{Fe}(\text{OH})_3 = 2.0 \times 10^{-39}$ and $\text{Mg}(\text{OH})_2 = 7.1 \times 10^{-12}$]

Ex/B.Sc/CHEM/H/12/IV/A/2019 (Old)

FIRST B.SC. EXAMINATION, 2019

(2nd Semester, Old Syllabus)

CHEMISTRY (HONOURS)

PAPER - IV

Time : Two hours

Full Marks : 50

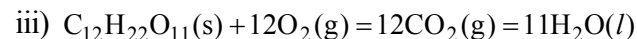
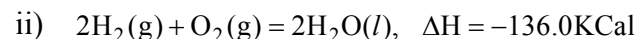
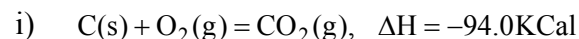
Use a separate answer script for each group.

GROUP - A

1. Answer *any four* questions : 2×4
- a) State and explain the first law of thermo-chemistry or law of Lavoisier and Laplace.
- b) Explain what do you mean by enthalpy of combustion.
- c) The Enthalpy of combustion of ethyl alcohol and acetic acid are -325.1 and $-209.5 \text{ KCal}^{\text{mol}^{-1}}$. Calculate the heat change in the reaction :
- $$\text{C}_2\text{H}_5\text{OH}(l) + \text{O}_2(g) = \text{CH}_3\text{COOH}(l) + \text{H}_2\text{O}(l)$$
- d) The heat of neutralization of HCN by NaOH is $-2.9 \text{ KCal mol}^{-1}$. Calculate the heat of ionization of HCN, given that the heat of neutralization of H^+ by OH^- is $-13.8 \text{ KCal mol}^{-1}$
- e) Calculate the enthalpy of formation of cane sugar from the following data :

[Turn over

[2]



$$\Delta H = -1350.0 \text{KCal}$$

2. Answer **any three** questions : 3×3

a) Compute the limiting ratio of radius of cation and anion in body centred ionic cubic crystal.

b) Calculate the percent void space in a face centred cubic system.

c) Prove that $\frac{1}{d_{hkl}^2} = \left(\frac{h}{a}\right)^2 + \left(\frac{k}{b}\right)^2 + \left(\frac{l}{c}\right)^2$, Where the terms bear usual significance in a crystal system.

d) i) Calculate the Miller indices of the two faces having the intercepts with the three axes as.

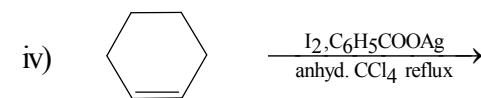
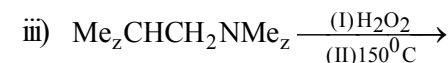
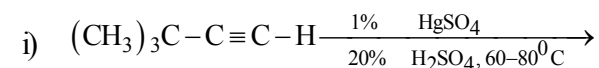
$\left(\frac{1}{2}a, 2b, \infty c\right)$ and $(2a, 3b, 4c)$, where a, b, c are unit length along three axes.

ii) Which is the plane of closest packing in face centred cubic structure ?

[3]

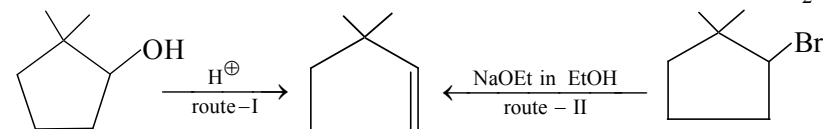
GROUP - B

3. a) Predict the product of the following reactions and give plausible mechanism in each case (any **three**). 2×3



b) Draw Hofmann and Saytzeff transition states of E₂ reaction of Me₂CHCHBrMe in the presence of NaOR. Explain how the ratio of the products changes with the size of the R group. 2½

c) Identify the most successful route for the following reactions and justify your answer. 2½



d) At low NaOEt concentration, both the following chloro compounds **A** and **B** give the same products **C** and **D** in the same ratio. Write the structures of **C** and **D** and account for the result.

[Turn over