

Please check that this question paper contains 09 questions and 02 printed pages within first ten minutes.

[Total No. of Questions: 09]

[Total No. of Pages: 02]

Uni. Roll No.

Program: **B.Tech. (Batch 2018 onward)**

Semester: **1**

Name of Subject: **Chemistry**

Subject Code: **BSC-105**

Paper ID: **15933**

Scientific calculator is Allowed

MORNING

12 MAY 2023

Time Allowed: 03 Hours

Max. Marks: 60

NOTE:

- 1) Parts A and B are compulsory
- 2) Part-C has Two Questions Q8 and Q9. Both are compulsory, but with internal choice
- 3) Any missing data may be assumed appropriately

Part – A

[Marks: 02 each]

Q1.

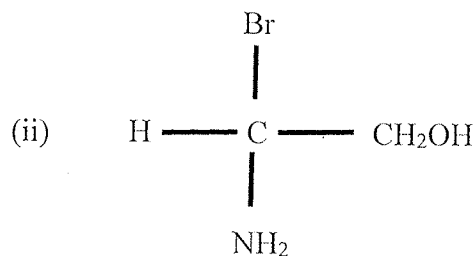
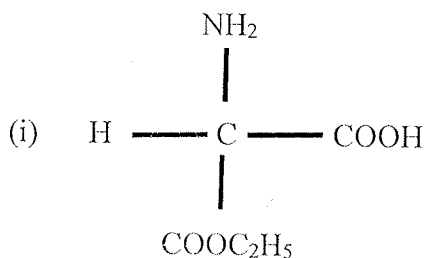
- a) Explain the difference between temporary and permanent hardness.
- b) Define conductor and semiconductor.
- c) What is conjugate acid-base pair?
- d) Differentiate between *Eutectic point* and *Cryohydric point*.
- e) Out of boat and chair form of cyclohexane, which is more stable and why?
- f) 'Benzene is colourless but aniline has colour' Explain?

Part – B

[Marks: 04 each]

- Q2. Write a short note on 'Intermolecular Forces'.
- Q3. What is caustic embrittlement? How it can be prevented?
- Q4. Draw the crystal field energy diagram for d^5 strong field octahedral complex and d^7 weak field octahedral and also discuss their CFSE.
- Q5. Explain the various electronic transitions observed in UV-Visible spectroscopy with suitable examples.
- Q6. Calculate the solubility of silver chloride in water room temperature if solubility product of AgCl is 1.6×10^{-10} .

- Q7. Assign R and S configurations to the following compounds by giving stepwise suitable reasons:



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Part – C

[Marks: 12 each]

- Q8. (a) What are zeolites? How do they function in softening of water? What are their merits and demerits?
- (b) Calculate the amount of lime (91% pure) and soda (97.2% pure) required for treatment of one million litres of water, whose impurities are: $\text{Ca}^{2+} = 30$ ppm, $\text{Mg}^{2+} = 42$ ppm, $\text{HCO}_3^- = 183$ ppm, $\text{FeSO}_4 \cdot 7\text{H}_2\text{O} = 69.5$ ppm and $\text{KCl} = 27.8$ ppm.

OR

- (a) Explain different types of vibrations possible in a molecule on absorption of IR energy.
- (b) $\text{C}_2\text{H}_6\text{O}$ is molecular formula of a sample. It shows three signals in its NMR spectrum. Write down its structure and draw a high-resolution NMR of it.
- Q9. (a) Draw a well labelled phase diagram of water system. Discuss the importance of various curves, areas and triple point.
- (b) Explain peroxide effect by taking any suitable example and discuss its mechanism.

OR

- (a) Discuss the various possible conformations of cyclohexane with order of relative stabilities.
- (b) Calculate the cell *e. m. f.* and the value of free energy change for the cell reaction at 25°C for the cell: $\text{Zn(s)} | \text{Zn}^{2+}(0.0004 \text{ M}) || \text{Cd}^{2+}(0.2 \text{ M}) | \text{Cd(s)}$
 E° values at 25°C : $\text{Zn}^{2+} | \text{Zn} = -0.763 \text{ V}$; $\text{Cd}^{2+} | \text{Cd} = -0.403 \text{ V}$.
