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B.Tech. (Sem. - 1st & 2nd)

ENGINEERING CHEMISTRY

SUBJECT CODE : CH - 101 (2004 - 2010 Batch)Paper ID : [A0110]

Time : 03 Hours

Maximum Marks : 60

Instruction to Candidates:

- 1) Section - A is **Compulsory**.
- 2) Attempt any **Five** questions from Section - B & C.
- 3) Select atleast **Two** questions from Section - B & C.

Section - A

Q1)

(2 Marks each)

- a) Define R_f .
- b) IR spectra is often characterized as molecular finger prints. Explain.
- c) What is the cause of permanent hardness? Can it be removed by either boiling or addition of lime?
- d) Explain degree of hardness of water.
- e) Draw the acid-base conductometric titration curve of HCl vs NaOH.
- f) What is the difference between critical point and triple point?
- g) What is photosensitization?
- h) Rusting of iron is quicker in saline water or in ordinary water. Explain.
- i) State phase rule?
- j) What information is obtained from spin-spin splitting in NMR?

Section - B

(8 Marks each)

- Q2) a) Calculate the quantity of lime and soda needed for softening 50,000 litres of water containing the following salts per litre: $\text{Ca}(\text{HCO}_3)_2 = 8.1 \text{ mg}$; $\text{Mg}(\text{HCO}_3)_2 = 7.5 \text{ mg}$; $\text{CaSO}_4 = 13.6 \text{ mg}$; $\text{MgSO}_4 = 12.0 \text{ mg}$; $\text{MgCl}_2 = 2.0 \text{ mg}$ and $\text{NaCl} = 4.7 \text{ mg}$.
- b) Discuss chemical coagulants used for municipal water.
- Q3) a) Explain cathodic protection.
- b) Discuss the use of corrosion inhibitors.
- Q4) a) Why there is a need to develop the chromatogram? Discuss various methods that can be used for development / visualization.
- b) Give the classification of chromatography.
- c) Draw flow diagram of LC instrument.
- Q5) a) Derive the Nernst equation for zinc rod in contact with a solution of Zn^{2+} ions.
- b) What are concentration cells? Discuss electrode concentration cells.

Section – C

(8 Marks each)

- Q6) a) How photochemical reactions differ from thermal reactions? Discuss Stark- Einstein law of photochemical equivalence.
b) Differentiate fluorescence from phosphorescence.
- Q7) a) Discuss theory of UV-visible spectroscopy.
b) Which will occur at a higher frequency:
i) The C-N stretch of an amine or the C-N stretch of an amide?
ii) The C-O stretch of phenol or the C-O stretch of cyclohexanol?
iii) The C=O stretch of ketone or the C=O stretch of an amide?
iv) The stretch or the bend of the C-O bond in ethanol?
- Q8) a) Sketch the ^1H NMR spectrum, including multiplet patterns for each of the following compounds:
i) CH_3CHBr_2
ii) $\text{CH}_3\text{CH}_2\text{I}$
b) Discuss the information obtained from ^{13}C NMR spectrum.
- Q9) a) What is degree of freedom?
b) Draw and discuss phase diagram of carbon dioxide.

