

MORNING

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[Total No. of Questions:09]

[Total No. of Pages: 02]

Uni. Roll No. ....

Program: B.Tech. (Batch 2018 onwards)

Semester: 1/2

Name of Subject: Chemistry

Subject Code: BSC-105

Paper ID: 15933

Time Allowed: 3 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) What is the main difference between an open, closed and isolated system?
- b) Differentiate between *n*-type semiconductors and *p*-type semiconductors?
- c) Why gases can be liquefied by cooling?
- d) Define reverse osmosis?
- e) What is meso compound? Give one example.
- f) The molar extinction coefficient of phenanthroline complex of iron (II) is  $12000 \text{ dm}^3 \text{ mol}^{-1} \text{ cm}^{-1}$  and the minimum detectable absorbance is 0.01. Calculate the minimum concentration of complex that can be detected in a Lambert-Beer law cell of path length is 1.00 cm.

**Part – B**

[Marks: 04 each]

- Q2. What is caustic embrittlement? How it can be prevented?
- Q3. Write the conformations of *n*-butane and discuss their relative stabilities.
- Q4. Draw well labelled phase diagram of water system. Discuss its salient features.
- Q5. How *n*-propyl chloride can be distinguished from isopropyl chloride using NMR spectroscopy?



- Q6. With the help of diagram show crystal field splitting in octahedral complexes. Also calculate the CFSE for  $d^5$  and  $d^8$ , tetrahedral complexes.
- Q7. Derive Vander Waal's equation of state for real gas including volume-pressure correction.

## Part – C

[Marks: 12 each]

- Q8(a). (i) Define IR spectroscopy. Discuss various molecular vibrations in this technique.
- (ii) What are ion-exchange resins? Describe in details the ion-exchange process for demineralization of water.
- (iii) Why do transition elements form coloured compounds? Explain.

## OR

- Q8(b). (i) Calculate the amount of lime (84% pure) and soda (92% pure) required for treatment of 20,000 litres of water, whose impurities (in ppm) are:  $Ca(HCO_3)_2 = 40.5$ ,  $Mg(HCO_3)_2 = 36.5$ ,  $MgSO_4 = 30.0$ ,  $CaSO_4 = 34.0$ ,  $CaCl_2 = 27.8$  and  $NaCl = 10.0$ .
- (ii) What is an auxochrome? How its presence influence chromophore?
- (iii) What are zeolites? How do they function in softening of water? What are their merits and demerits?

- Q9(a). (i) What is Markownikoff's rule? Give an example and discuss its mechanism.
- (ii) Write a short note on London forces. What are the factors which affecting strength of these forces?
- (iii) Consider a cell composed of the following half cells at 298 K:
- (a)  $Mg(s) | Mg^{2+}(aq)$ ;      (b)  $Ag(s) | Ag^+(aq)$
- The *e. m. f.* of cell is 2.96 V at  $[Mg^{2+}] = 0.130 M$  and  $[Ag^+] = 1 \times 10^{-4} M$ . Calculate the standard *e. m. f.* of cell.

## OR

- Q9(b). (i) Draw and explain the phase diagram of KI-H<sub>2</sub>O system.
- (ii) The  $K_{sp}$  value of two sparingly soluble salts  $Ni(OH)_2$  and  $AgCl$  are  $2.0 \times 10^{-15}$  and  $6.0 \times 10^{-17}$  respectively. Which salt is more stable?
- (iii) Differentiate between Diastereomers and Enantiomers

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