Roll No. | | | | | | | | | | | | | **Total No. of Pages: 03**

Total No. of Questions: 09

B.Tech (Sem. – 1,2)

CHEMISTRY-I

Subject Code: BTCH- 101-18

M Code: 75343

Date of Examination : 25-01-23

Time: 3 Hrs. **Max. Marks: 60**

INSTRUCTIONS TO CANDIDATES:

1. **SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.**
2. **SECTION - B & C have FOUR questions each, carrying EIGHT marks each.**
3. **Attempt any FIVE questions from SECTION B & C, selecting atleast TWO questions from each of these SECTIONS B & C.**

SECTION-A

1. Write briefly:

a) What is the difference between scattering and reflection?

b) What is the difference between oxidation number and oxidation state?

c) What do you understand by substitution/elimination ratio?

d) Which of the following will show IR spectrum?

O_2, N_2, HI, CO_2

e) What is standard reduction potential?

f) What information can be drawn from Ellingham diagrams?

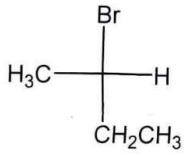
g) Why d and f orbitals show poor shielding effect?

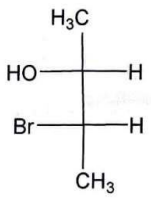
h) List the factors on which Δ_0 depends.

i) The following compounds show only one signal in ^{1}HNMR. Write their structural formula

$$C_2H_4Br_2C_4H_6$$

j) Indicate R or S configuration at stereogenic center(s). Assign priorities to each group.





SECTION-B

2. a) Deduce the time-independent Schrodinger equation. (6)

   b) Give the significance of wave function. (2)

3. a) Under the influence of crystal field, predict the electronic arrangement on the metal ions and nature of ligands in the following complexes:

   i) $[Fe(H_2O)_6]^{2+}$ ii) $[Fe(CN)_6]^{4-}$ iii) $[Fe(CN)_6]^{3-}$

   How many unpaired electrons are there in each complex and what would be their magnetic moments? (6)

   b) What is meant by band theory? What is the difference between conduction band and valence band? (2)

4. a) Explain the theory of NMR spectroscopy. (6)

   b) What is the difference between diffraction and scattering? (2)

5. a) Define excluded volume. Show that excluded volume, designated as b, is four times the actual volume of gas molecules. (5)

   b) Calculate the pressure exerted by one mole of CO_2 gas in $1.36\ dm^3$ vessel at $48°C$ using van der Waals equation. Given: $a = 3.59 dm^6 atm mol^{-2}$ and $b = 0.0427 dm^3 mol^{-1}$. (3)

SECTION-C

6. a) What is corrosion? Discuss mechanism of dry corrosion. (5)

   b) Calculate the standard free energy change $(\Delta G°)$ of the reaction:

   $1/2H_2(g) + 1/2I_2(s) \rightarrow HI(g) \quad \Delta H° = 25.95 kJ$

   The standard entropy of $HI(g), H_2(g)$ and $I_2(s)$ are $206.27,\ 130.60$ and $116.73 JK^{-1}mol^{-1}$, respectively. Is this reaction feasible at standard state? (3)

7. a) Discuss the molecular geometries of the following:

   i) NH_3

   ii) SF_6 (Atomic number: $N = 7, S = 16$) (4)

   b) What is the difference between oxidation number and oxidation state? (2)

   c) What is electron affinity? Which element has highest electron affinity? (2)

8. a) Discuss the following: (4)

   i) Enantiomers ii) Diastereomers

   b) Discuss isomerism in transitional metal complexes. (4)

9. a) Compare and contrast the S_N1 and S_N2 mechanisms of substitution of alkylhalides. (4)

   b) Write short notes on the following organic reactions: (4)

   i) Cyclization reactions

   ii) Reduction reactions

NOTE : Disclosure of Identity by writing Mobile No. or Marking of passing request on any paper of Answer Sheet will lead to UMC against the Student.