

Total No. of Questions : 5]

SEAT No. :

[Total No. of Pages : 3

**P711**

**[5117]-1**

**F.Y.B.Sc.**

**BIOTECHNOLOGY**

**Bb - 101 : Fundamentals of Chemistry  
(2013 Pattern)**

*Time : 3 Hours]*

*[Max. Marks : 80*

*Instructions to the candidates:*

- 1) Neat diagrams must be drawn whenever necessary.*
- 2) Figures to the right indicate full marks.*
- 3) All questions carry equal marks.*
- 4) Use of logarithmic table and calculator is allowed.*
- 5) All questions are compulsory.*

**Q1)** Answer the following:

**[8 × 2 = 16]**

- a) Define :
  - i) Mean free path
  - ii) Vapour pressure.
- b) State and explain the pseudomolecular reactions.
- c) Explain the colligative properties of NaCl are higher than urea at the equimolar solutions.
- d) Determine the number of phases, components and degree of freedom for the following system in closed vessel.
  - i)  $\text{CaCO}_{3(s)} \rightleftharpoons \text{CaO}_{(s)} + \text{CO}_{2(g)}$
  - ii) An aqueous solution of NaCl.
- e) Calculate the pH of  $10^{-8}$  M HCl solution.
- f) What are the advantages of potentiometric titrations.

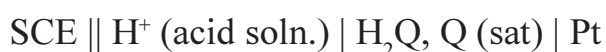
**P.T.O.**

- g) Draw the E & Z isomers of 1 bromo 2 butene.
- h) Draw the resonating structures of  $\text{HNO}_3$  and  $\text{NO}_3^-$  and identify more stable species.

**Q2)** Answer the following: (Any four)

**[4 × 4 = 16]**

- a) Explain the different types of molecular velocities and obtain the relation between them.
- b) The half life period of first order reaction was found to be 277.2 min when the initial concentration of reactant is 0.12 mole/lit, how long will it take for concentration of reactant to drop to 0.02 mole/lit.
- c) What is meant by cryoscopic constant? Explain how elevation of boiling point of solvent may be used to determine the molecular weight of dissolved substance.
- d) Find the pH of acidic solution at 298K for the following cell.



$$\text{Given : } E_{\text{ox(cal)}} = -0.2415\text{V} \quad E_{\text{red(QH)}} = 0.6997\text{V}$$

and the observed e.m.f. of cell = 0.283 V.

- e) What is optical activity? Give the necessary conditions for a molecule to be optically active. Illustrate with suitable example.
- f) Define paramagnetism and explain the diamagnetic nature of fluorine molecule with the help of molecular orbital energy level diagram.

**Q3)** Answer the following (Any Four)

**[4 × 4 = 16]**

- a) State Charles Law. Show that K.E. of an ideal gas depends only upon the temperature.
- b) Find the molecular weight of sucrose, if a 2% sucrose has an osmotic pressure 986 mm at 12°C.

- c) Draw and discuss the phase diagram for the lead-silver system.
- d) What is single electrode potential? Derive Nernst equation for the following cell reaction  
$$aA + bB \rightleftharpoons cC + dD$$
- e) What is conformational isomerism? Explain the conformational isomerism in n-propane using energy profile diagram.
- f) Explain the formation of  $H_2$  & HF molecules on the basis of atomic orbital overlap.

**Q4)** Attempt the following (Any two)

**[2 × 8 = 16]**

- a) Derive the integrated form of Arrhenius equation and explain how determine the energy of activation of a reaction by graphical method.
- b) Draw a neat diagram of water system and explain the areas, curves and triple point with reference to phase rule.
- c) What are concentration cells? Explain the electrode concentration cell and electrolyte concentration cell without transference.

**Q5)** Attempt the following (Any One)

**[1 × 16 = 16]**

- a) Define an equivalent conductance and cell constant. State and explain Kohlrausch's law of independent migration of ions. What is Debye-Huckel-Onsager equation? Give it and explain the meaning of terms involved in it.
- b) Explain the following types of organic reactions.
  - i) Oxidation and reduction reactions.
  - ii) Elimination reactions.
  - iii) Addition reactions.
  - iv) Substitution reaction.

