Total No. of Questions : 5]

SEAT No. : ____

P711

[Total No. of Pages : 3

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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) $CaCO_{3(s)} \rightleftharpoons CaO_{(s)} + CO_{2(g)}$

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 HNO_3 and 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.

SCE || H^+ (acid soln.) | H_2Q, Q (sat) | Pt

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

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-Onsagar 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.