UG (CBCS) EVEN SEMESTER EXAMINATION, 2024

EDUCATION
(B.Sc. B.Ed.)

8th Semester

Course No. : BSCH – 802
(Physical Chemistry)

Full Marks : 50
Pass Marks : 20

Time : 2 hours

The figures in the margin indicate full marks for the questions

(*Answer five questions*)

1. (a) Calculate the energies of the Hückel molecular orbitals for the allyL cation. 8

   (b) Distinguish between delocalization energy and π-bond formation energy. 2

Or

2. (a) Write down the basic assumptions of Huckel's molecular orbital theory. 4

   (b) Write down the defintions of coulomb integral and overlap integral (include necessary equations) 3+3=6

3. (a) Deduce Nernst equation. 4

   (b) Define concentration cell. 2

   (c) Write a brief account on standard weston cadmium cell. 4

Or

4. (a) Define asymmetric potential. 2

(b) Define activity and mean ionic activity coefficient. 1+2=3

(c) Write a brief account on potentiometric titration. 5

5. (a) Define heat capacity. Write a brief note on Einstein's modification of heat capacity. 1+5=6

(b) What are the most likely locations of a particle in a box of length L in the state n=3? 4

Or

6. (a) Wave function of a given particle in a three dimensional potential energy well is

$$\psi(x,y,z) = A\sin\left(\frac{n_x \pi x}{a}\right)\sin\left(\frac{n_y \pi y}{b}\right)\sin\left(\frac{n_z \pi z}{c}\right)$$

where n_x, n_y and n_z are quantum numbers and a, b, c are the dimensions of the well. Evaluate the normalization constant A. 5

(b) Show that the probability of finding the electron in 1-s orbital of hydrogen is maximum at Bohr radius. 5

$$\psi_{1s} = \left(\frac{1}{\pi {a_0}^3}\right)^{1/2} \exp\left(\frac{-r}{a_0}\right)$$

7. (a) It is found that half-life of a given reaction becomes double when the initial concentration was doubled, find out the order of the reaction. 4

(b) Write a brief account on isolation method for the determination of order of a reaction. 5

(c) Write down the unit of reaction rate. 1

Or

8. (a) A reaction is given as :

$2\ NO + Cl_2 = 2\ NOCl$

Mechanism :

$$NO + Cl_2 \underset{k_{-1}}{\overset{k_1}{\rightleftharpoons}} NOCl_2$$

$$NO + NOCl_2 \xrightarrow{k_2} 2\ NOCl$$

Show that the overall rate of the reaction is given by 5

$K\ [NO]^2\ [Cl_2]$ assuming that $K_2[NO] << k_{-1}$

(b) What is Michaelis constant in enzyme catalysis? 3

(c) Justify the following statement : 2

"Higher the activation energy of a reaction slower is the rate of the reaction." 2

9. (a) Write a brief account on micelle. 5

(b) Write a detailed note on electron and ion conducting polymers. 5

Or

10. (a) Write down the applications of liquid crystals. 4

(b) Write a detailed note on lithium-ion battery. 6

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