3. Explain the "dynamic equilibrium condition" for a suspended particle irregularly dispersed in a liquid. Under this equilibrium condition, deduce the relation between *diffusion coefficient* and *mobility*. 2+3

UNIT: 4152P

Answer any *five* : 5×5=25

4. Discuss the role of solvent and hydrophobic interaction on the structure of a protein.
5. Why sequence of DNA is so important in biological system? What is melting of DNA? How does melting temperature of DNA vary in presence of salt?
6. What is active transport? Which macromolecule is considered as pumping device for active transport? Give the thermodynamic scheme for active transport showing the exchange cycle and chemical cycle.
7. What are the mechanisms of nerve impulse generation and its propagation?
8. Discuss the cooperative and non-cooperative binding of ligands to multiple sites of a bio-polymer. How can you explain electrostatic interaction in multiple equilibriaum?
9. What is the mechanism of muscle contraction? What is the role of Ca^{2+} ions in muscle contraction?
10. Write notes on: i) Dynamic fluid structure of cell membrane. ii) Synaptic transmission.

Ex/P-XV-P/2022

M. Sc. Chemistry Examination, 2022

(4th Semester)

Physical Chemistry Special

Paper – XV-P

Time : Two hours Full Marks : 50

(25 marks for each unit)

Use a separate answer script for each Unit.

UNIT: 4151P

1. Describe the essential assumptions made by Einstein for the formulation of Brownian motion. Derive the Einstein's expression in differential form to evaluate the distribution of Brownian particles in space and time. Find that the spreading of distribution of the Brownian particles follows the behaviour of Gaussian curve, and hence show that the mean displacement is proportional to square root of time. 2+3+(3+3)
2. Explain theoretically that the existence of random force is essential for Brownian motion. Deduce the expression for the change of particle density with time in phase-space (1 dimensional q, p-space) under external force field for the Brownian particles with stating the significance of various terms appeared in those expressions. Show that the equation obeys Maxwell-Boltzmann distribution under equilibrium condition.

$2\frac{1}{2}+4+2\frac{1}{2}$