B.Sc./3rd Sem (H)/CHEM/22(CBCS)

# 2022

## 3rd Semester Examination

## CHEMISTRY (Honours)

## Paper : C 5-T

### [Physical Chemistry - II]

### (CBCS)

Full Marks : 40 Time : Two Hours

*The figures in the margin indicate full marks.*
*Candidates are required to give their answers in their own words as far as practicable.*

### Group - A

Answer any ***five*** questions. 2×5=10

1. What type of electric source [alternating current (AC) or direct current (DC)] is used in modern laboratory conductivity meter and why?
2. What is Reynold's number? How is it related to streamline and turbulant flow of a liquid?
3. What is thermodynamic equation of state?
4. Describe the criteria of a well behaved class of function in quantum mechanics.

P.T.O.

5. Write the Raoult's law for ideal solution.

6. Find the commutator of $x$ and $p_x$ operator.

7. Define fugacity co-efficient.

8. Define the term 'Chemical potential'.

## Group - B

Answer any ***four*** questions. 5×4=20

9. Describe the temperature effect on the viscosity of a liquid. Compare how it is different from that of a gaseous substance. 3+2=5

10. What is asymmetric effect in the Debye Huckel theory of ion atmosphere? How one can calculate the degree of dissociation of a weak electrolyte experimentally using Ostwald's dilution law? 2+3=5

11. What is transport number of ion? Describe the Hittrof's principle for the determination of transport number of ion in solution. 1+4=5

12. Define the term chemical potential. Describe the variation of chemical potential with temperature and show the variation on the graphical plot. 1+4=5

13. Set up the Schrodinger equation for one dimensional box and find its solution. 5

14. Derive the expression of Keq using Nernst distribution law for dimerization of benzene. 5

## Group - C

Answer any ***one*** question. 10×1=10

15. (a) In water medium conductance value of the following alkali metal ions increases in the following order $Li^+ < Na^+ < K^+$

But in Dioxan solvent we observe the reverse order — explain.

(b) What is Kohlraush's law of independent migration of ions? Explain with example.

(c) For the reaction $PCl_5(g) = PCl_3(g) + Cl_2(g)$, the equilibrium constant at 298K is $1.99 \times 10^{-7}$. The dissociation is endothermic and the value of enthalpy change under standard condition is 92 kJ at 298K. Calculate the equilibrium constant at 398K. 3+3+4=10

16. (a) Particle in a box has function $\psi_n = \sqrt{\frac{2}{a}} \sin \frac{n\pi}{a} x$.

Calculate the value of average position and average momentum.

(b) How the idea of degeneracy is explained from the energy expression of a particle in three dimensional box. 7+3=10

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