

Department of Chemistry, SCLS
B.Sc. (Hons) with Research in Chemistry
Semester III Examination 2024
Paper code: BCH-DSC 301

Title: BASICS OF PHYSICAL CHEMISTRY

(Write your Roll No. at the top immediately on receipt of this question paper)

Time: 2.5 Hours

Maximum Marks: 60

Note: Attempt all the questions. Marks of each question are given in parentheses. All parts of a question must be attempted in continuation. Start answering a fresh question on a new page. Cite examples and draw labeled diagrams wherever necessary.

Q. No	SECTION A: Very Short Type Questions	BTL	CL	PLO
	Attempt All of the following: (15 x 1 = 15)	-	O	
1.	What are Miller indices used for in crystallography?	1/2	1/2	1/2
2.	What is the law of constancy of interfacial angles?	1/2	1/2	1/2
3.	Define Bravais lattices.	1/2	1/2	1/2
4.	Define packing efficiency in the context of solid-state chemistry.	1/2	1/2	1/2
5.	Briefly explain the concept of voids in solid-state structures.	1/2	1/2	1/2
6.	What is the radial distribution function in the context of liquids?	1/2	1/2	1/2
7.	Explain the qualitative treatment of the structure of the liquid state.	1/2	1/2	1/2
8.	Define the vapor pressure of a liquid.	1/2	1/2	1/2
9.	Provide a qualitative discussion of the structure of water.	1/2	1/2	1/2
10.	What is Kirchhoff's equation used for in thermodynamics?	1/2	1/2	1/2
11.	How do you calculate work (w) and heat (q) for expansion or compression of ideal gases under isothermal conditions?	1/2	1/2	1/2
12.	How do you calculate the change in internal energy (ΔE) for a process involving changes in physical states?	1/2	1/2	1/2
13.	What is collision frequency in the kinetic molecular model?	1/2	1/2	1/2
14.	Define the mean free path in the context of gases.	1/2	1/2	1/2
15.	How is the viscosity of gases related to their mean free path?	1/2	1/2	1/2
Section B: Long type Questions: (Attempt any two out of four)				(2x10=20)
1.	What is the effect of adding solutes, temperature and pressure on vapor pressure, surface tension and viscosity of a liquid? Compare it with gases.	5/6	5/6	5/6/7
2.	What are the postulates of the kinetic molecular model of a gas? How is the kinetic gas equation derived from the kinetic molecular model of a gas?	5/6	5/6	5/6/7
3.	Explain point and stoichiometric defects in a crystal structure.	5/6	5/6	5/6/7
4.	How do detergents aid in cleaning action?	5/6	5/6	5/6/7
Section C: Attempt the following:				(5x5=25)
1.	State Bragg's law and its significance in X-ray diffraction. OR Calculate the interplanar spacing (d) in a crystal lattice if the X-ray wavelength (λ) used in a diffraction experiment is 0.154 nm, and the angle of diffraction (θ) is 30 degrees.	5/6	5/6	5/6/7
2.	Differentiate between crystalline and amorphous solids. OR	4/5/6	4/5/6	4/5/6

Define the Laws of Thermodynamics. Explain the concept of Gibbs free energy. What is entropy in thermodynamics?

3. Define compressibility factor (Z) and explain its variation with pressure for different gases. 5/6 4/5/6 4/5/6/7

OR

Determine the surface tension of a liquid using the capillary rise method. A capillary tube with a radius of 0.5 mm is immersed in the liquid, and the liquid rises to a height of 2.0 cm.

4. What are the causes of deviations from ideal gas behavior? How is collision diameter related to the behavior of real gases? 3/4/ 3/4/5/ 3/4/5
5 6

OR

What is the Maxwell distribution and how is it used to evaluate molecular velocities?

5. Explain the law of equipartition of energy and its relation to degrees of freedom. 3/4/ 3/4/5 3/4/5
5

OR

How is surface tension determined experimentally?
