ARSD College, University of Delhi

Model Course Handout/Lesson Plan

Course Name : B.Sc. (Hons) chemistry						
Semester	**Course Code**	**Course Title**	**Lecture (L)**	**Tutorial (T)**	**Practical (P)**	**Credit (C)**
I	32171102 CHEMISTRY – C II	**Physical Chemistry I:States of Matter & Ionic Equilibrium** (Section A: Liquid & Gases)	2			2
Teacher/Instructor(s)		**Dr. Shivangi Sharma**				
Session		**2021-22 (Nov-March)**				

Course Objective:

- To develop basic and advance concepts regarding the three states of matter.
- To derive the expressions for determining the physical properties of gases, liquids and solids.
- To study the concept of ionization in aqueous solution, pH, buffers and various applications of ionization.

Course Learning Outcomes: By the end of this course, students will be able to:

- Derive mathematical expressions for different properties of gas, liquid and solids and understand their physical significance.
- Explain the crystal structure and calculate related properties of cubic systems.
- Explain the concept of ionization of electrolytes with emphasis on weak acid and base and hydrolysis of salt.
- Apply the concepts of gas equations, pH and electrolytes while studying other chemistry courses and ever day life.

Lesson Plan:

Unit No.	Learning Objective	Lecture No.	Topics to be covered
1.	**Gaseous state**	1-4	Gaseous state: Kinetic molecular model of a gas: postulates and derivation of the kinetic gas equation;
		5-6	Collision frequency; collision diameter; mean free path, calculation of σ from η; variation of viscosity with temperature and pressure.

		7-10	Maxwell distribution and its use in evaluating molecular velocities (average, root mean square and most probable) and average kinetic energy, law of equipartition of energy, degrees of freedom and molecular basis of heat capacities.
		11-12	Maxwell distribution and its use in evaluating molecular velocities (average, root mean square and most probable) and average kinetic energy, law of equipartition of energy, degrees of freedom and molecular basis of heat capacities. Contd…
		13-16	Behaviour of real gases: Deviations from ideal gas behaviour, compressibility factor, Z, and its variation with pressure and temperature for different gases. Causes of deviation from ideal behaviour.
		17-19	Isotherms of real gases and their comparison with van der Waals isotherms, continuity of states,
		20-22	Critical state, relation between critical constants and van der Waals constants, law of corresponding states.
2.	**Liquid state**	23-24	Qualitative treatment of the structure of the liquid state; physical properties of liquids; vapour pressure, surface tension and coefficient of viscosity, and their determination.
		25-26	Effect of addition of various solutes on surface tension and viscosity.
		27-28	Explanation of cleansing action of detergents. Temperature variation of viscosity of liquids and comparison with that of gases.

Evaluation Scheme:

No.	Component	Duration	Marks
1.	Internal Assessment		25
	• Quiz		
	• Class Test		
	• Attendance		
	• Assignment		
2.	End Semester Examination	3 hr	75

Details of the Course		
Unit	**Contents**	**Contact Hours**
1 **Gaseous state**	Kinetic molecular model of a gas: postulates and derivation of the kinetic gas equation; collision frequency; collision diameter; mean free path and viscosity of gases, including their temperature and pressure dependence, relation between mean free path and coefficient of viscosity, calculation of σ from η; variation of viscosity with temperature and pressure. Maxwell distribution and its use in evaluating molecular velocities (average, root mean square and most probable) and average kinetic energy, law of equipartition of energy, degrees of freedom and molecular basis of heat capacities. Behaviour of real gases: Deviations from ideal gas behaviour, compressibility factor, Z, and its variation with pressure and temperature for different gases. Causes of deviation from ideal behaviour. Equation of states for real gases; van der Waals equation of state, its derivation and application in explaining real gas behaviour, Virial coefficients, calculation of Boyle temperature. Isotherms of real gases and their comparison with van der Waals isotherms, continuity of states, critical state, relation between critical constants and van der Waals constants, law of corresponding states.	22
2 **Liquid state**	Qualitative treatment of the structure of the liquid state; physical properties of liquids; vapour pressure, surface tension and coefficient of viscosity, and their determination. Effect of addition of various solutes on surface tension and viscosity. Explanation of cleansing action of detergents. Temperature variation of viscosity of liquids and comparison with that of gases.	6
	Total	**28**

Suggested Books:

Sl. No.	Name of Authors/Books/Publishers	Year of Publication/Reprint
-1	Atkins, P.W.; Paula, J.de.,Atkin's Physical Chemistry Ed., 10th Edition, Oxford University Press.	(2014)
2	Ball, D. W.,Physical Chemistry, 2nd Edition,Cengage Learning, India.	(2017)
3	Kapoor, K.L. A Textbook of Physical Chemistry, Vol 1, 6th Edition, McGraw Hill Education.	(2015)
4	Castellan, G. W. Physical Chemistry, 4th Edition, Narosa.	(2004)

Mode of Evaluation:	Internal Assessment / End Semester Exam