Department of Chemistry
University of Lucknow
Lucknow
B.Sc. Syllabus

Physical Chemistry

Semester II **Paper 3** **Max Marks: 100 (80 + 20)**

UNIT I

I. Mathematical Concepts: Logarithmic relations, curves scratching, equation of straight line and slopes, tracing of curves, differentiation of simple functions like x, ex, xn, sinx, logx; maxima and minima, partial differentiation. Integration of some useful/relevant functions; Permutations and Combinations. Factorials, Probability.

II. Computers: General introduction to computers, different components of a computer. Hardware and Software, input-output devices, binary numbers and its arithmetic; introduction to computer languages, Programming and operating systems.

UNIT II

III. Gaseous State: Deviation of gases from ideal behaviour, van der Waals equation of State.

IV. Critical phenomenon: PV isotherms of real gases, continuity of states, the isotherms of van der Waals equations, relationship between critical constants and van der Waals constants, the law of corresponding states, reduced equation of states.

V. Molecular Velocities: Qualitative discussion of the Maxwell's distribution of molecular velocities, collision numbers, mean free path and collision diameter. Liquification of gases (based on Joule Thomson effect).

VI. Liquid State: A qualitative description of intermolecular forces, structure of liquids,structural differences between solids, liquids and gases.

VII. Liquid crystals: Difference between liquid crystal, solid and liquid. Classification, structure of nematic, smectic and cholestric liquid crystals. Thermography and seven segment cell.

UNIT III

VIII. Solid State: Definition of unit cell and space lattice.

IX. Laws of crystallography:

a. Law of constancy of interfacial angles

b. Law of rationality of indices

c. Symmetry elements in crystals and law of symmetry.

X. Diffraction-X-ray diffraction by crystals. Derivation of Bragg's equation. Laueôs method and powder method, determination of crystal structure of NaCl, KCl and CsCl

XI. Colloidal State: Solids in liquids (sols): properties- Kinetic, optical and electrical; stability of colloids, protective action, Hardy-Schulz law, gold number.

XII. Liquids in liquids (emulsions): types of emulsions, preparation. Emulsifier.

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XIII. Liquids in solids (gels): classification, preparation and properties, inhibition, general applications of colloids.

UNIT IV

XIV. Chemical Kinetics:

a. Molecularity and order of reaction, concentration dependence of rates, integrated rate expression for- zero order, first order, second order, pseudo order reactions, half-life.

b. Determination of the order of reaction: Differential method, method of integration, half-life method and isolation method.

c. Brief outlines of experimental methods of studying chemical kinetics: conductometric, potentiometric, optical methods, polarimetry and spectrophotometery.

d. Theories of chemical kinetics: Arrhenius theory of reaction rate, effect of temperature on rate of reaction, concept of activation energy. Simple collision theory based on hard sphere model, transition state theory (equilibrium hypothesis).Thermodynamics aspect of transition state theory.

XV. Catalysis: Catalysis, classification of catalysis, characteristics of catalysed reactions,

Text Books (Theory Courses):

a. Physical Chemistry, Puri Sharma & Pathania.
b. Pradeep Physical Chemistry, Khetrapal, Pradeep Publication.
c. Computers and Common Sense, R. Hunt and Shelly, Prentice Hall.

Reference Books:

a. Physical Chemistry. G.M. Barrow. International Student Edition, McGrawHill
b. Physical Chemistry, R.A. Alberty, Wiley Eastern Ltd.
c. The Elements of Physical Chemistry, P.W. Atkins, Oxford.
d. Physical Chemistry Through problems, S.K. Dogra and S. Dogra, Wiley Eastern Ltd.
e. Basic Programming with Application, V.K. Jain, Tata McGraw Hill.
f. Physical Chemistry, Glasstone

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Chemistry

Semester II **Practical** **Max Marks: 100**

Inorganic

I. Qualitative Analyses:

a. Identification of cations and anions in a mixture of inorganic compounds soluble in water/dilute acids (Macro/semi-micro analysis- cation analysis, separation of ions from group 0-VI, anion analysis). Only six radicals.

II. Quantitative Analysis:

a. *Volumetric Analysis*

i. Determination of acetic acid in commercial vinegar using NaOH

ii. Determination of alkali content - antacid tablet using HCl.

iii. Estimation of calcium content in chalk as calcium oxalate by permanganometry

iv. Estimation of hardness of water by EDTA

v. Estimation of ferrous ions by dichromate method

vi. Estimation of copper using thiosulphate.

b. *Gravimetric Analysis*

i. Ba as $BaSO_4$ in the given solution of $BaCl_2$

ii. Analysis of Cu as CuSCN

iii. Analysis of Ni as $Ni(DMG)_2$

Record & Viva