



DEPARTMENT OF CHEMISTRY
UNIVERSITY OF LUCKNOW
LUCKNOW

Four Year Undergraduate Course Structure
Subject: Chemistry Semester II

| Paper | Major Branch | Type | Credits | Total Credits |
|----------------|------------------------|----------------|---------|---------------|
| Paper 3 (P3) | Physical Chemistry 1 | Theory | 4 | 4 |
| Paper 4 (P4) | Chemistry Practical 1 | Practical | 4 | 4 |
| VC 1 | Chemistry Vocational 1 | Food Chemistry | 4 | 4 |
| Paper 3 (P2'') | Physical Chemistry 1 | Minor Theory | 4 | 4 |
| P3' | Second major subject | Theory | 4 | 4 |
| P4' | second major subject | Theory | 4 | 4 |
| | Total Credits | | | 24 |



DEPARTMENT OF CHEMISTRY
UNIVERSITY OF LUCKNOW
LUCKNOW

Four Year Undergraduate Course Structure
Subject: Chemistry Semester II

Physical Chemistry 1 (Major P3 and Minor P2")

Semester II

Paper 3

Credits 4

Course outcome

CO-1- Students would gain knowledge regarding the basic of computers and mathematical concepts of log, permutation and combination, differential and integration of some relevant functions.

CO-2- Student would gain understanding of gaseous state, critical phenomenon, liquid state, solid state, colloidal state and liquid crystals.

CO-3- It would help students recognize the importance of chemical kinetics and catalysis.

Unit I

- I. Mathematical Concepts: Logarithmic relations, curves scratching, equation of straight line and slopes, tracing of curves, differentiation of simple functions like x , e^x , x^n , $\sin x$, $\log x$; 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



**DEPARTMENT OF CHEMISTRY
UNIVERSITY OF LUCKNOW
LUCKNOW**

**Four Year Undergraduate Course Structure
Subject: Chemistry Semester II**

- c. Symmetry elements in crystals and law of symmetry.
- X. Diffraction-X-ray diffraction by crystals. Derivation of Bragg's equation. Laue's 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.
- 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 spectrophotometry.
- 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, Khetrpal, 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



DEPARTMENT OF CHEMISTRY
UNIVERSITY OF LUCKNOW
LUCKNOW

Four Year Undergraduate Course Structure
Subject: Chemistry Semester II
Chemistry Practical 1

Semester II

Paper 4 (P4)

Credits 4

Course Objective:

After successful completion of the first semester of Under graduation, students coming in this semester for practical's will be provided knowledge about the experiments based on analysis of mixtures, volumetric and gravimetric.

Course Outcomes:

CO-1. the student will be able to analyse the given mixture and identify anions and cations present.

CO-2. achieve knowledge about different types of reaction.

CO-3. understand various tests to identify the radicals.

CO-4. able to write reactions and structure.

CO-5. acquire the skill to perform the experiment in the real lab once they understand different steps in the procedure.

CO-6. Having expertise in making solutions accurately.

CO-7. To acquired enough knowledge to answer questions based on experiments.

Inorganic Chemistry

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



**DEPARTMENT OF CHEMISTRY
UNIVERSITY OF LUCKNOW
LUCKNOW**

**Four Year Undergraduate Course Structure
Subject: Chemistry Semester II**

Record & Viva

Books Recommended

- (a) Chemistry Practical by S. Giri, D.N. Bajpai and O.P. Shukla, S. Chand Publication.
- (b) Practical Chemistry Volume 1-3 by Fateh Bahadur, Vishal Publication
- (c) Advanced Physical Chemistry by J.B. Yadav, Goel Publication



**DEPARTMENT OF CHEMISTRY
UNIVERSITY OF LUCKNOW
LUCKNOW**

**Four Year Undergraduate Course Structure
Subject: Chemistry Semester II
Food Chemistry**

Semester II Chemistry Vocational 1 (VC 1) Credits 4

Course outcome

Students admitted in B.Sc. Chemistry semester program will gain precise insight into the:

CO-1- Chemistry of water and its significance in foods

CO-2- Role of each component of food such as carbohydrates, proteins, fats, vitamins and minerals and their interaction.

CO-3- Functional aspects of various food components and to study their role in food processing.

CO-4- Enzyme activity in different food systems and their functional importance in preparation of food additives.

Unit I

Water molecule, hydrogen bonding, different types of water, physical properties of water, water activity and its role in food processing and storage, industrial and nutritional significance of water.

Unit II

Carbohydrates: Role of carbohydrates in food industry, sugars starch, cellulose, glucans, hemicellulose, gums, pectic substances, polysaccharides. Plant pigments and their role in food industry. Proteins: Major protein systems and factors affecting them, the nature of interaction in proteins derived from milk. egg proteins, meat proteins, fish muscle proteins, oil seed proteins and cereal proteins.

Unit III

Lipids: Refining of crude oils, hydrogenation. Vegetables and animal fats, butter, oleo oil and their use in cooking, frying and shortening. Flavor changes in fats and oils. Lipid oxidation, factors affecting lipid oxidation, autooxidation, biological significance of auto-oxidized lipids.

Unit IV

Enzymes: Enzyme activity in different food systems, food enzyme technology, immobilization of enzymes, removal of toxicants through enzymes, flavor production by enzymes. Additives, Emulsifiers, Antioxidants & their role in product preparation.

Vitamins: Role of vitamins in food industry, effect of various processing treatments.



**DEPARTMENT OF CHEMISTRY
UNIVERSITY OF LUCKNOW
LUCKNOW**

**Four Year Undergraduate Course Structure
Subject: Chemistry Semester II**

References Books

- a) Principles of Food Chemistry by John deMan, Springer.
- b) Food chemistry by H.K Chopra P.S Panesar, Alpha Science International Ltd.
- c) Food chemistry by Owen R. Fennema, CRC Publications.
- d) Food Chemistry by Lillian Hoagland Meyer, Reinhold Publishing Corporation.
- e) Food theory and application second edition by Jane Bower, Pearson
- f) Spices and Seasonings: A Food Technology Handbook, by Donna R. Tainter, Antony T.Grenis, Wiley
- g) Handbook of Herbs and Spices: Volume 3 edited by K.V. Peter Woodhead Publishing