COURSE WISE BREAKUP

Fourth Year Eighth Semester

SPECILIZATION PHYSICAL CHEMISTRY

THEORY

COURSE CODE	TITLE	CREDIT HOURS	MARKS
CHEM-474	PAPER-IV: PHYSICAL CHEMISTRY	03	100
CHEM-475	PAPER-V: PHYSICAL CHEMISTRY	03	100
CHEM-476	PAPER-VI: PHYSICAL CHEMISTRY	03	100

PRACTICALS

COURSE CODE	TITLE	CREDIT HOURS	MARKS
CHEM-472	PHYSICAL CHEMISTRY (RESEARCH PROJECT)	06	200

- **Total Credits of the Semester = 15 (theory 09 & practicles 06 credits)**
- **Maximum Marks = 500 (theory 300 & practicles 200 marks)**

4th Year; 8th Semester

PAPER-IV

Title of the Course: **PHYSICAL CHEMISTRY** Code: **CHEM-474**

Credit Hours: **03** Marks: **100**

Course Contents:

Chemical Kinetics

Derivation of the rate equations. Theory of absolute reaction rate. Reversible reactions, parallel reactions and consecutive reactions. Correlation between physical properties and concentration. Comparison of collision and absolute reaction theories. Advanced theories of unimolecular reactions. Potential energy surfaces. Thermodynamic formulation of reaction rates. Calculation of entropy and enthalpy changes. Thermal decomposition of nitrogen pentaoxide. Reactions in solutions. Influence of ionic strength on the reaction rate. Effect of dielectric constant of the medium on the rate of the reaction. Single sphere activated complex model. Double sphere activated complex model. Complex reactions. Chain reactions. Single chain carrier with second order breaking. One chain carrier with first order breaking. Two chain carrier with second order breaking. Experimental techniques for fast reactions.

RECOMMENDED BOOKS:

1. Albery J., Electrode Kinetics, Clarendon, Oxford (1975).
2. Espenson, J. H. Chemical Kinetics and Reaction Mechanism 2nd ed., McGraw Hill London (2002).
3. Espenson J.H. "Chemical Kinetics and Reaction Mechanisms" 2nd ed. McGraw Hill, New York (1995).
4. Frost A.A. and Pearson R.G. "Kinetic and Mechanism" 2nd ed. John Wiley and Sons Inc, New York (1961).
5. Laidler K.J. "Chemical Kinetics" 3rd ed. Pearson Education Company, New York (1987).
6. Laidler L.J. "Reaction Kinetic VII, II Reaction in Solution" Pergamon Press, New York (1963).

4th Year; 8th Semester

PAPER-V

Title of the Course: **PHYSICAL CHEMISTRY** Code: **CHEM-475**

Credit Hours: **03** Marks: 100

Course Contents:

Radiation Chemistry

Development and advancement in radiation chemistry. Radiation dosimetry. Fricke dosimeter, dosimetry in pulse radiolysis. Energy states in radiation chemistry. Exited states, production formation through excited states. Fragmentation, predissociation, photochemical decay. Evidence for the existence of excited state and its types. Ions and electrons, radiolysis of gases. radiolysis of liquids, solids, and frozen liquids and gases behaviour of ions in radiation chemistry. General energy transfer. characteristic and applications of gas, liquid and solid phase radiolysis. Instrumentation, purity of chemicals and methods. Recent application of radiation chemistry.

Photochemistry

Scope of photochemistry. Energy transfer in photochemical reaction. Quantum yield of emission process radiation and nonradiation process. Kinetics and Quantum yields of radiative and nonradiative process (fluorescence, phosphorescence, inter system crossing, internal conversion , quenching), and Stern-Volmer reactions. Photosensitized reactions. Photochemical reaction in gas phase and in solutions. Flash photolysis. Advance approach to kinetics of photochemical reactions. Applied photochemistry. atmospheric photochemistry. Photosynthesis, photochemistry of polymers, photomedicines. Techniques in photochemistry, introduction, light source. Incandescent filament lamps, discharge lamps, lasers, synchrotron reaction,

4th Year; 8th Semester

PAPER-VI

Title of the Course: **PHYSICAL CHEMISTRY** Code: **CHEM-476**

Credit Hours: **03** Marks: **100**

Course Contents:

Solid State Chemistry

Intermolecular forces. Symmetry of condensed systems. Properties of solids (electrical, mechanical and optical). Lattice defects, doping for defects. Electron-gas model, heat capacity paradox, electrical conductivity. Band theory of metallic state. Conductors semiconductors and insulators. Controlled valency and hopping phenomena, p & n-type
conductivity, p, n-junctions. Solid-state reactions. Developments in superconductivity.

Surface Chemistry and Catalysis

Solid surfaces. Gas solid interface. Thermodynamics of adsorption. Heterogeneous catalysis. Kinetic and mechanisms of catalyzed reactions. Adsorption at liquid surfaces. Enzymatic catalysis. Organized molecular assemblies. Colloidal solutions. Catalyst preparation methods. Industrial catalysts.

RECOMMENDED BOOKS:

1. Calvert J.G. and Pitts J.N. "Photochemistry" John Wiley, New York (1966).
2. Wayne and Richard P. "Photochemistry" Macmillan (1988).
3. Hughes G. "Radiation Chemistry" Oxford Series, UK (1973).
4. Spinks J.W.T. and Woods R.J. "An introduction to Radiation Chemistry" Wiley Inter Sci. Pub, USA (1976).
5. O'Donnell J.H. and Sangster D.F. "Principle of Radiation Chemistry" Edward Arnold Pub, UK (1970).
6. Baco Z.M. and Alexander P. "Fundamentals of Radiobiology" CLBS, UK (1972).
7. Suppan P. "Principle of Photochemistry" The Chemical Soc. UK (1973).
8. Aziz F. and Rodgers M.A.J., "Radiation Chemistry Principles and Application" Ed., VCH Publishers, Inc. (1987)
9. Wayne R.P. "Principles and Application of Photochemistry", University Press Oxford London (1988).

10. Segal H. “Enzyme Kinetics” John Wiley New York (1975).
11. Schlutz A.R. “Enzyme Kinetics” (1964) Cambridge University Press England.
12. Wetson R. and Schwavz H.A. “Chemical Kinetics” Prentice Hall Inc, New Jersey (1972).
13. West A.R. “Solid State Chemistry”, J. Wiley, New York (1989).

4th Year; 8th Semester

Title of the Course: **PHYSICAL CHEMISTRY (RESEARCH PROJECT)**

Code: **CHEM-472** Credit Hours: **06** Marks: **200**

RECOMMENDED BOOKS:

1. Braun R.D. and Walters F. “Application of Chemical Analysis” (1982).
2. David P. “Experiments in Physical Chemistry” 5th ed. (1989).
3. Shoemaker C.W., Nibler G.J.W. and Christian G.D. “Analytical Chemistry” 6th ed. (2004).
4. James A.M. and Prichard F.E. “Practical Physical Chemistry” 3rd ed. Longman (1974).
5. Mowry S. and Ogren P.J., J. Chemical Education, **76**(7) (1999).
6. Shoemaker D.P., Garland C.W. and Nibler J.W. “Experiments in Physical Chemistry” McGraw Hills, New York (1989).