Chem-205 PHYSICAL CHEMISTRY Credit Hours: 3 (2 +1)

Introduction of the course:

The course is organized to provide an adequate knowledge about basic concepts in Physical chemistry including thermodynamics, chemical kinetics etc.

Course Objectives:

The course is designed:

1. To introduce students about the key concepts of physical chemistry
2. To introduce about thermodynamics, chemical kinetics etc.

Theory

1. **Chemical Thermodynamic**

   Equation of states, ideal and real gases, the vander waals equation for real gases, critical phenomena and critical constants.

   Extensive and intensive properties, molar heat capacities, second law of thermodynamics, concept of entropy, entropy change in reversible and irreversible process, entropy change for an ideal gas, entropy change due to mixing of ideal gases, effect of temperature and pressure on entropy, concept of free energy, effect of temperature and pressure on free energy, relationship between standard free energy and equilibrium constants.

2. **Chemical Kinetics**

   Derivation of kinetics expression of zero order, first order, second order (with same and different concentrations), nuclear decay as first order reaction, derivations for determining rate constants and half life periods, measurement of order of the reaction with different methods, Arrhenius equation and determination of various Arrhenius parameters.

3. **Solutions and Colloids**

   Physical properties of liquids, surface tension, viscosity, refractive index etc.

   Osmotic pressure and its measurements, abnormal colligative properties (association and dissociation of solutes), fractional distillation and concept of azeotrops, concept of colloids,

   Classification of colloids, dialysis, electro-dialysis, sedimentation, precipitation, ultra-filtration, emulsions and gels, tyndall cone effect.

4. **Surface Chemistry**

   Interface, Adsorption, types of adsorption at liquid surface, adsorption isotherms (Freundlich and Langmuir), catalysis, and kinetics of enzyme catalysis.

Lab

1. Preparation of standard molar, normal, molal and percentage solutions.
2. Standardization of secondary standard acids and bases solutions by volumetric methods.
3. Determination of surface tension, parachor and percentage composition by surface tension measurement.
4. Determination of viscosity, rheochor and percentage composition by viscosity measurement.
5. Determination of refractive index, molar refractivity and percentage composition by refractive index method.
6. Conductometeric and potentiometric strong acid-base titrations using conductometer and pH meter respectively.

Teaching-learning Strategies

1. Lectures
2. Group Discussion
3. Laboratory work
4. Seminar/ Workshop

Learning Outcome:

1. Students are expected to get familiarized with the with the essential tools of calculus to apply the

concepts and the techniques in their respective disciplines

Assessment Strategies:

1. Lecture Based Examination (Objective and Subjective)
2. Assignments
3. Class discussion
4. Quiz
5. Tests

Recommended Readings:

1. Adamson A. W. "Understanding Physical Chemistry" 3rd Ed., Benjamin Cummings Publishing Company Inc.
2. Akhtar M.N.& Ghulam Nabi, "Textbook of Physical Chemistry", ilmi Kutab Khana, Lahore. 3. Bhatti H.N. and K.Hussain, "Principles of Physical Chemistry"; Carwan Book House, Lahore.
3. Maron S.H. & B. Jerome, "Fundamentals of Physical Chemistry", Macruthan Publishing Co., Inc. New York. (Also published by National Book Foundation).
4. Atikins P.W.& M.J.Clugston, "Principles of Physical Chemistry" Pitman Publishing Company (1988).
5. Moore W.J. "Physical Chemistry", 5th Ed. Longmans Publishers.
6. Jones M. "Elements of Physical Chemistry" Addison-Sesky Publishing Company.
7. G.M.Barrow, International six Edition "Physical Chemistry".
8. IRA. N. Levine fourth edition "Physical Chemistry"
9. Alberty and Danials, "Physical Chemistry"
10. Castallon, "Physical Chemistry"
11. Laidler & Meiser "Physical Chemistry"
12. Friemental "Chemistry in Action"

****