

BIRLA INSTITUTE OF TECHNOLOGY & SCIENCE, PILANI – GOA CAMPUS
INSTRUCTION DIVISION
FIRST SEMESTER 2008-2009
Course Handout (Part - II)

Date: 02/08/2008

In addition to part-I (General Handout for all courses appended to the time table) this portion gives further specific details regarding the course.

Course No. : CHEM C141
 Course Title : Chemistry I
 Instructor-in-charge : R. N. BEHERA
 Instructors : A.P. Koley, R.N. Behera, A.M. Saxena, K.P. Jayadevan, T.L. Thomas,
 N.N. Ghosh, A. Chattopadhyay, R. N. Panda

Scope and Objective of the Course: The course provides a comprehensive survey of the concepts involved in the study of the electronic structure of atoms and molecules, spectroscopy, phase and chemical equilibrium, electrochemistry, and chemical kinetics, ..

Text Book: ‘The Elements of Physical Chemistry’, P.W. Atkins & Julio de Paula, Fourth edition (Oxford University Press, Oxford 2005).

Reference Books :

1. ‘Atkins’ Physical Chemistry’, P.W. Atkins & Julio de Paula, Seventh edition (Oxford, 2002).
2. ‘Concise Inorganic Chemistry’, J.D. Lee, 5th edn. (Blackwell Science, Oxford 1999).

Course Plan :

L N	Topic	Learning Objectives	Text
1 - 4	Quantum Theory	Origins of Quantum Mechanics, Wave function, Schrodinger Equation, Uncertainty, Simple Applications	12.1-12.11
5 - 7	Atomic Structure and Spectra	Hydrogenic Atom: Energy Levels and Wavefunctions, Orbitals, Spectral Transitions, Many-electron Atoms: Pauli Principle, Orbital Approximation, Aufbau Principle, Periodic Trends	13.1-13.11 13.12 - 13.15 (SR)
8 - 11	Chemical Bonding: Valence Bond and Molecular Orbital Theories	Lewis Theory, VSEPR Model, VB Theory: Electron Pair Bond, Hybridization, Resonance, MO Theory: LCAO, Bonding and Antibonding Orbitals, Diatomic Molecules, Bonding in Solids	A4.2, A4.3 14.1-14.14 15.1-15.7
12 –15	Spectroscopy: Rotational, Vibrational, and Electronic	General Features, Diatomic Rotational and Vibrational Energy Levels and Spectra; Electronic Spectra: Franck-Condon Principle, Types of Transition, Fluorescence & Phosphorescence, Lasers	19.1 – 19.15 20.1 – 20.6
16 - 17	Magnetic Resonance	Principles, Chemical Shift, Fine Structure, Spin Relaxation, Proton decoupling, EPR Spectra	21.1 – 21.6 21.10 – 21.11
18 -19	Thermodynamics: the First Law, Internal Energy and Enthalpy	Thermodynamic Systems, State Functions, Thermal Equilibrium and Temperature, Work, Internal Energy and Heat Capacity	2.1-2.8
20 - 21	Thermochemistry	Application of the Ist Law to Physical and Chemical Changes, Lattice Enthalpy	3.1-3.7 15.6

22 - 24	Thermodynamics: the Second Law, Entropy, Gibbs Energy, the Third Law	Natural and Reversible Processes, Entropy and Second Law, Calculation of Entropy Changes, Absolute Entropies, Spontaneity and Equilibrium, Gibbs Energy	4.1-4.11
25 - 26	Statistical Thermodynamics	Boltzmann Distribution, Partition Function and Thermodynamic Properties.	22.1-22.6
27 - 28	Phase Equilibria: Pure Substances, Phase Rule and Phase Diagrams	Conditions of Stability, Gibbs Energy and Thermodynamics of Phase Transition, Phase boundaries, Phase Rule	5.1 – 5.8
29 - 30	Mixtures: Thermodynamic Description, Colligative Properties	Partial Molar Properties, Ideal, Ideal-dilute and Real Solutions, Boiling and Freezing points, Osmosis	6.1– 6.8
31 - 32	Chemical Reaction Thermodynamics	Reaction Gibbs Energy, Reaction Quotient, Equilibrium Constant, Coupled Reactions, Response to Conditions	7.1 – 7.10
33 - 34	Equilibria in Aqueous Solution	Proton Transfer Equilibria, Acid-Base Titration, Buffers, Solubility	8.1 – 8.9
35 - 37	Electrochemistry: Conductivity of solution, Electrochemical Cells and Applications, Electrode Processes	Ionic Mobility and Conductivity, Electrodes and Half-reactions, Cells, Cell Reactions and Potentials, Standard Potentials, Electrochemical Series	9.1 9.2 (SR)* 9.3 – 9.13
38 - 42	Chemical Kinetics: Reaction Rates, Temperature Dependence, Reaction Mechanisms and Rate Laws	Rate Laws, Order, Rate Constants, Arrhenius Equation, Transition state theory. Formulation of rate laws, steady state approximation, reactions in solution, catalysis, chain reactions, Photochemical processes, adsorption	10.1-10.2 (SR) 10.3-10.11 11.1–11.3 (SR) 11.4–11.15, 20.9, 16.3,16.4
43-44	Molecular Interactions	Interactions due to Partial Charges, Dipoles & Induced Dipoles, H-Bonding	17.1 – 17.9

*SR: Self-Reading

Evaluation Scheme:

Component	Duration	Weightage%	Date, Day & Time	Remarks
Test – I	1 hr.	30%	19/09/08 F 8.30 AM	Closed Book
Test – II	1 hr.	30%	04/11/08 T 8.30 AM	Open Book
Comprehensive Examination	3 hrs.	40%	01/12/08 M (FN)	Closed Book

Chamber Consultation Hour: To be announced in the tutorial class.

Notices: Notices concerning the course will be displayed on the C wing Students' Notice Board / FTP site of the Institute (ftp://10.1.1.223/).

Instructor-in-Charge
CHEM C141