

Guoy-Chapman, Stern, Graham-Devanathan-Mottwatts, Tobin, Bockris, Devanathan models, over potentials, exchange current density, derivation of Butler-Volmer equation, Tafel plot, semiconductor interfaces, theory of double layer at semiconductor, electrolyte - solution interfaces, structure of soluble layer interfaces, effect of light at semiconductor solution interface, electrocatalysis, electrocardiography, bioelectrochemistry.

Book Recommended :

1. Physical Chemistry, P.W Atkins, ELBS
2. Introduction to Quantum Chemistry, A.K. Chandra, Tata McGraw Hill
3. Quantum Chemistry, I. N. Levine, Prentice Hall
4. Coulson's Valence, R. McWeeny, ELBS
5. Chemical Kinetics, K.J. Laidler, McGraw-Hill
6. Kinetics and Mechanism of Chemical Transformations, J. Rajaraman and J. Kuriacose, McMillan.
7. Micelles, Theoretical and Applied Aspects, V. Moroi, Plenum
8. Modern Electrochemistry Vol. I and Vol.II, J.O.M. Bockris and A.K.N. Reddy, Plenum
9. Introduction to Polymer Science, R.Gowarikar, N.V. Vishwanaman and J. Sridhar, Wiley Eastern.

PAPER-IV
RECENT TREND IN CHEMISTRY

Time: 3 Hrs.

M.M. 100

Note: The paper will be divided into THREE sections.

Section-A : Ten questions (short type answer) two from each Unit will be asked. Each question will be of one mark and the candidates are required to attempt all questions. **Total 10 marks**

Section-B : Five questions (answer not exceeding 250 words) one from each Unit with internal choice will be asked and the candidates are required to attempt all questions. Each question will be of 10 marks.

Total 50 marks

Section-C : Four questions may be in parts covering all the five Units (answer not exceeding 500 words) will be asked. The candidates are required to attempt any TWO questions. Each question will be of 20 marks.

Total 40 marks

UNIT-I

Environmental chemistry - Atmosphere-chemical and photochemical reactions in the atmosphere, oxygen and ozone chemistry, green house gases and effect, hydrosphere - physical chemistry of sea water, eutrophication, sewage treatment, lithosphere and chemistry involved, smog formation, acid rains, Bhopal gas tragedy, Chernobyl, minamata disasters,

industrial pollution due to cement, sugar distillery, drug, paper and pulp, thermal and nuclear power plants, metallurgical and polymer industries, a brief idea of toxicological effects of arsenic, lead, cadmium, mercury, ozone, PAN, cyanide, pesticides, oxides of nitrogen, sulphur and carbon, carcinogens

UNIT-II

Analysis of pollution - Sampling and monitoring of air and water, determination of total dissolved solids, conductivity, acidity, alkalinity, hardness, chloride, sulphate, fluoride, phosphate and different forms of nitrogen, phenols, pesticides, surfactants, DO, BOD and COD, microorganisms-the catalysts of aquatic chemical reactions, water pollution laws and standards.

UNIT-III

Microwave spectroscopy - Theory, selection rules, diatomic molecule as non-rigid rotator, symmetric top molecules, P-Q-R-bands, instrumentation, limitations and application.

Raman spectroscopy - Theory, Stokes and anti-Stokes lines, Raman depolarization ratio, instrumentation, intensity of Raman peaks, applications.

Mossbauer spectroscopy - Theory, Mossbauer nuclides, instrumentation and applications

Photoelectron spectroscopy - Franck - Condon principle, types of electron spectroscopy, ESCA-theory,

instrumentation and applications, Auger emission spectroscopy-theory, instrumentation and applications.

Atomic absorption spectroscopy - Principle, instrumentation and applications

UNIT-IV

Green chemistry - Green reagent-dimethyl carbonate and other polymer supported reagents, green catalysts-acid catalyst, basic catalysts, oxidation catalysts, polymer supported catalysts, photocatalyst, green synthesis-phase transfer catalyst. microwave induction, ultrasound assisted, green solvents-reactions in acidic and neutral ionic liquids, green synthesis of polycarbonates, paracetamol, ibuprofen, citral, urethane, adipic acid and styrene.

UNIT-V

Introduction to computers and Computing (only overview required) - Basic structure and functioning of computers with a PC as an illustrative example, memory, I/O devices, secondary storage, specification of a typical PC, operating systems with DOS as an example, introduction to UNIX and WINDOWS, data processing, principles of programming, algorithms and flow-charts, brief idea of packages such as MATLAB, MS-OFFICE and FOXPRO

Computer programming in FORTRAN/C/BASIC - (The language features are listed here with reference

to FORTRAN. The instructor may choose another language such as BASIC or C and the features may be replaced appropriately). Elements of the computer language, constants and variables, operations and symbols, expressions, arithmetic assignment statement, input and output, format statement, termination statements, branching statements such as IF or GO TO statement, LOGICAL variables, double precision variables, subscripted variables and DIMENSION, DO statement, FUNCTION and SUBROUTINE, COMMON and DATA statements.

Programming in chemistry - Determination of (i) activity coefficient using Debye-Huckel limiting law (ii) root mean square, average and most probable velocities (iii) critical constants of a gas (iv) dissociation constant of a weak acid from equivalence conductance (v) electronegativity of an atom using Pauling's relation (vi) normality, molarity and molality of solution (vii) solubility of sparingly soluble salts (viii) concentration of complex using Beer-Lambert's Law (ix) half life and average life of radioactive nucleus (x) lattice energy of a crystal using Born-Landé equation.

Books Recommended :

1. Modern Spectroscopy, J.M. Hollas, John Wiley
2. Applied Electron Spectroscopy for Chemical Analysis, Ed.H. Emdawi and F.L.H. Wiley Interscience.

3. NMR, NQR, EPR and Mossbauer Spectroscopy in Inorganic Chemistry, R.V. Parish, Ellis Harwood.
4. Physical Methods in Chemistry, R.S. Drago, Saunders.
5. Basic Principles of Spectroscopy, R. Chang, McGraw Hill.
6. Computers and Common Sense, R. Hunt and J. Shelley, Prentice Hall.
7. Computational Chemistry, A.C. Norris.
8. Microcomputer Quantum Mechanics, J.P. Killgback, Adam Hilger.
9. Computer Programming in FORTRAN IV.V Rajaraman, Prentice Hall.
10. An Introduction to Digital Computer Design, V. Rajaraman and T. Radhakrishnan, Prentice Hall
11. Spectroscopy of Organic Compounds, P.S Kalsi, New Age International Ltd.
12. Green Chemistry, P.Anastas, RSC.
13. Environmental Chemistry, S.E. Manahan, Lewis Pub.
14. Environmental Chemistry, Sharma and Kaur, Krishna Pub.
15. Environmental Chemistry, A.K. De, Wiley Eastern
16. Environmental Chemistry, C. Baird, W.H. Freeman