RAJIV GANDHI PROUDHYOGIKI VISHWAVIDAYALAYA, BHOPAL

Scheme of Examination w.e.f. July, 2017 batch

SECOND SEMESTER (M.Sc. Applied Chemistry)

S.No.	SUBJECT CODE	SUBJECT	Periods Per Week				Maximum Marks (Theory Slots)			Maximum marks (Practical Slots)		Total Marks	Remarks
			L	T	P	Total Credits	End Exam	Mid Sem Exam	Assignment/ Quiz	End Semester Practical/ Viva	Practical/ Record/ Assignment/ Quiz/ Presentation		
1	AC2001	Inorganic Chemistry-II	3	1		4	70	20	10			100	
2	AC2002	Organic Chemistry-II	3	1		4	70	20	10			100	
3	AC2003	Physical Chemistry-II	3	1		4	70	20	10			100	
4	AC2004	Chemistry of Materials-II	3	1		4	70	20	10			100	
5	AC2005	Inorganic Chemistry-II			4	4				40	25	65	
6	AC2006	Organic Chemistry-II			4	4				40	25	65	
7	AC2007	Physical Chemistry-II			4	4				40	25	65	
8	AC2008	Chemistry of Materials-II			4	4				40	15	55	
			12	4	16	32	280	80	40	160	90	650	

Applied Chemistry

M.Sc. II SEMESTER

Course AC2001 (PAPER: Inorganic Chemistry-II)

(Effective From : July 2017)

Maximum Marks 70
Minimum Marks 28

UNIT I

Metal-Ligand Equilibria in Solution. Stepwise and overall formation constants and their relationship, trends in stepwise constants, factors affecting the stability of metal complexes with reference to the nature of metal ion and ligand, chelate effect and its thermodynamic origin, determination of binary formation constants by Bjerrum method, Job's and Mole ratio methods.

UNIT II

A) **Chemistry of Non-Aqueous Solvents:**
Classification of Solvents, properties, levelling effect, type of reactions in solvents, chemistry of liquid ammonia, liquid dinitrogen tetraoxide and anhydrous sulphuric acid with respect to properties, solubilities and reactions.

B) **Nuclear and Radiochemistry:**
Radioactive decay and equilibrium, classification and different types of nuclear reactions, Q value, cross- sections, chemical effects of nuclear transformation, fission and fusion, fission product and fission field Production of radio-isotopes by nuclear reaction and radioactive techniques: Tracer technique and activation analysis.

UNIT III

Metal-Ligand Bonding. Molecular orbital theory: Qualitative aspect of metal-ligand π-bonding in octahedral complexes, tetrahedral and square planar complexes.

Electronic Spectra and Magnetic Properties of Transition Metal Complexes. Calculations of Dq, B and β parameters for Cr(III). Co(II) and Ni(II) complexes using electronic spectral data. Charge transfer spectra: ligand to metal and metal to ligand.

UNIT IV

Metal πComplexes. Metal nirosyls: Nitrosylating agents for synthesis of metal nitrosyls, vibrational specta and x-ray diffraction studies of metal nitrosyls for bonding and structure elucidation, important reactions of transition metal nitrosyl complexes pertaining to potentiality in air pollution control, biomedical applications. Dinitrogen complexes, Vaska's compound.

UNIT V

Group Theory. Symmetry elements and symmetry operations, symmetry groups or point groups, Schoenflies symbols, point group classification, matrix representation of symmetry operations, group, necessary conditions for any set of elements to form a group, subgroups, classes in a group.

Books Suggested

1. Advanced Inorgnic Chemistry,F.A.Cotton and Wilknson,John Wiley.
2. Inorganic chemistry, J.E.Huhey,Harpes &Row.

3. Chemistry of the Elements,N.N.Greenwood and A.Earnshow,Pergamon.
4. Inorganic Electronic Spectroscopy, A.B.P. Lever, Elsevier.
5. Megnetiochemistry, R.1.Carlin Spronger Verlag.
6. Comprehensive Coordination Chemistry eds.,G.Wilkinson,R.D.Gillars and J.A.McCleverty, Pergamon.
7. Synthesis and characterization of some novel nitrosyl compounds, R.C. Mourya Pioneer Publication, Jabalpur,2000.
8. Chemical Applications of Group Theory. F.A.Cotton, John Wiley.
9. Essential of nuclear chemistry, H.J.Arnikar.
10. Chemistry in non-aqueous solvents, H.S.Sisler Reinhold Publishing corporation, USA, 4Th edition (1965),.

Applied Chemistry

M.Sc. II SEMESTER

Course AC2002 (PAPER II: Organic Chemistry-II)

(Effective From : July 2017)

Maximum Marks 70
Minimum Marks 28

UNIT I

Aliphatic Electrophilic Substitution. Bimolecular mechanisms, S_E2 and S_Ei mechanisms. The S_E1 mechanism, electrophilic substitution accompanied by double bond shifts. Effect of substrates, leaving group and solvent polarity on the reactivity.

Aromatic Electrophilic substitution. The arenium ion mechanism, orientation and reactivity. The ortho / para ratio, ipso attack, Vilsmeier reaction, Fries rearrangement.

UNIT II

A) Elimination Reactions:

The E1, E2 and E1cB mechanisms. Orientation in Elimination reactions. Hoffman versus Saytzeff elimination, Pyrolytic syn-elimination, competition between substitution and elimination reactions, Reactivity: effects of substrate structures, attacking base, the leaving group, the nature of medium on elimination reactions. Pyrolytic elimination reactions.

B) Study of following reaction:

Beckman, Benzilic acid, Hoffman, Schmidt, Curtius, Lossen, Witting, Nederland prins, Hoffman-Martius and Demjanov reaction.

UNIT III

Addition to Carbon-Carbon Multiple Bonds. Mechanistic and stereochemical aspects of addition reaction. Hydroboration. Michael reaction. Sharpless asymmetric epoxidation.

Addition to Carbon Hetro atom Multiple Bonds. Mechanism of metal hydride reduction of carbonyl compounds, acids, esters and nitiles. Wittig reaction.

Mechanism of condensation reactions involving enolates. Mannich,. Benzoin, Perkin, and Stobbe reactions.

UNIT IV

Pericyclic Reactions: Part I. Molecular orbitals and their symmetry. Molecular orbitals of ethylene, 1,3-butadiene, 1,3,5-hexatriene and allyl system and their symmetry properties.

Pericyclic reactions. Characteristics and classification. Electrocylic reaction: conrotatory and disrotatory motions, 4n, 4n+2 and allyl systems. Woodward-Hoffmann correlation diagrams. FMO and PMO approach.

UNIT V

Colour and Chemical Constitution :

Theories and Classification of dyes. Methods and mechanism of application of dyes process and mechanism of diazotiozation and coupling. Preparation, structure and application of following dyes Azo dyes (Bismack Brown, Naphthol blue, Black-B, Congo red, Para red, Diamond black-F) Triphenyl Mathane dyes (Malachite Greeen, Rosnite aniline blue and Crystal violet) Anthraquininoid dyes (Alizarin), Indugoid dyes (Indigo) and Acridine dyes (Acridine Yellow)

Book Suggested

1. Organic Chemistry, J.Claden, N. Greeves, S. Warren, P. Wothers, Oxford University Press.
2. Advanced Organic Chemistry- Reactions, Mechanism and Structure, Jerry March, Wiley-Interscience.
3. Organic Chemistry, L.G. wade, Jr, Pearson Education Asia.
4. Organic Chemistry , P.Y.Bruice, Pearson Education.
5. Advanced Organic Chemistry, F.A. Carey and R. J.Sundberg, Plenum.
6. Organic Chemistry, J. McMurry, Thomson Asia.
7. Organic Chemistry, T.W.G. Solomons and C.B. fryhle, John Wiley (Asia)
8. A Guide Book to Mechanism in Organic Chemistry, Peter Sykes, Longman.
9. Organic Chemistry, R.T. Morrison and R.N.Boyd, Prentice-Hall.
10. Sterochemistry of Organic Compounds. E.L.Eliel and S.H. Wilen, John Wiley (Asia)
11. Sterochemistry of Organic Compounds. D.Nasipuri, New Age International.
12. Sterochemistry of Organic Compounds. P.S.Kalsi, New Age International.
13. Inroduction to Specroscopy, D.L.Pavia, G.M.Lampman and G.S. Kriz, Thomson , Brooks/ Cole.
14. Organic Spectroscopy, W. Kemp, ELBS, Macmillan.
15. Spectrometric Identification of Oraganic Compounds, R.M. Silverstein, G.C. Bassler and T.C.Morrill. John Willey
16. Applicatio of Spectroscopy of Oraganic Compounds, J.R. Dyer, Dyeer, Prentice Hall.
17. Spectroscopic Methods in Organic Chemistry. D.H.Willams, I. Fleming. Tata McGraw-Hill.

Applied Chemistry

M.Sc. II SEMESTER

Course AC2003 (PAPER: Physical Chemistry-II)

(Effective From : July 2017)

Maximum Marks 70
Minimum Marks 28

UNIT-I

Statistical Thermodynamics:

Weights and configurations, the mostprobable configuration, thermodynamic probability and entropy: Boltzmann- Planck equation. Ensembles, ensemble average and time average of property. Maxwell-Boltzmann (MB) distribution law and its application to viscosity and diffusion of gases. Partition function and its significance. Rotational, translational, vibrational and electronic partition functions. Use of spectroscopic data for evaluation of various partition functions. Relationship between partition function and thermodynamic properties. Sackur tetrode equation. Calculation of equilibrium constant using Partition function and thermodynamic properties. Sackur tetrode equation. Calculation of equilibrium constant using Partition function.

UNIT-II

Quantum Chemistry:

Introduction: Operators and related theorems, algebra of operators, commutator, linear operators, uncertainty principle, postulate of quantummechanics, properties of wave function, Schrodinger equation, wave function and its interpretation. Normalization and orthogonality, Eigen functions and Eigen values. Solutions of wave equation for a free particle and particle in a box problem. Transition dipole moment integral and selection rules. Application to electronic spectra of conjugated linear organic molecules. Linear and angular momentum, eigen function and eighen values of agular momentum operator, Ladder operator, addition of anularmomenta. Spin anular momenta, symmetric and antisymmetric wavefunctions, Pauli Exclusion Principle, Spectroscopic term symbols.

UNIT-III

Electochemistry:

Debye- Huckel theory of inter-ionic attraction, ionic atmosphere, time of relaxation, relaxation and electro-phoretic effects, Debye-Huckel-Onsagar equation and its validity for dilute solutions and at appreciably concentrated solutions. Abnormal ionic conductance of hydroxyl and and hydrogen ions. Activity coefficients: forms of activity coefficients and their interrelationship. Debye-Huckel limiting law for osmotic and activity coefficients of dilute electrolytic solutions and its applications to concentrated solutions. Debye-Huckel –Bronsted equations. Quantitative and Qualitative verification of. Debye-Huckel limiting law, Bjerrum theory ofion-ion association. Types of electrode, Determination of activity coefficients of an electrolyte using concentration cells, degree of dissociation of monobasic weak acid (approximate and accurate), instability constant of silver ammonia complex.

UNIT – IV

Chemical Kinetics:

Experimental methods of following kinetics of a reaction, chemical and physical (measurement of pressure, volume, EMF, conductance, diffusion current and absorbance) methods and examples. Steady state approximation and study of reaction between NO_2 and F_2, decomposition of ozone, and nitrogen pentoxide.

Fast reactions, study by stop flow techniques, relaxation method, flash photolysis, magnetic resonance method for kinetic studies.

UNIT-V

Cell and Batteries:

Primary batteries and Secondary cells, cell characteristic and cell capacity types of plates and separators and their significance in lead cells Batteries for space Fuel cells Photovoltaic effect of light solar batteries.

Recommended Books: -

1. A Test Book of Physical Chemistry by Samuel Glastone.Pub. Maxmillian Student Editions.
2. A.K. Chandra, Introduction to Quantum Chemistry, Tata Mc Graw Hill.
3. Physical Chemistry by Gordon M.Barrod Pub. International Science Edition Mc Graw Hill
4. A Test Book of Physical Chemistry by Irs N Levis Pub. Mc Graw Hill Int. Book Co.
5. Physical Chemistry by Gurdep Raj & Chatwal Pub. Goel Pub. Meerut
6. Test Book of Physical Chemistry by Negi & Anani Pub. Wiley E. Ltd.

Applied Chemistry

M.Sc. II SEMESTER

Course AC2004 (PAPER: Chemistry of Materials-II)

(Effective From : July 2017)

Maximum Marks 70
Minimum Marks 28

UNIT I

Paints and Pigments:

White Pigments: white lead, Zinc oxide, Lithopone, Titanium Dioxide. Blue Pigment: ultramarine Blue, Red Pigment: Red lead, Green Pigment: Chrome green. Yellow pigments: chrome yellow. Paints, varnishes and lacquers.

UNIT-II

Protective Metallic coatings:

Coating Processes, Metal cladding, Electrodeposition or Electroplating and their Applications. Factors affecting the nature of deposit, Electroplating of some metals: Nickel, copper, chromium, cadmium, zinc, silver, Tin. Displacement or Immersion plating, Metal spraying, Vapour deposition.

UNIT-III

Ceramics:

Classification, Raw materials, Manufacturing Process, Application of colours to Pottery, Porcelain and china. Manufacture. Earthernwares and stonewares.

UNIT-IV

A) **Adhesives:**

Classification, Preparation of Adhesives, Synthetic Resin Adhesives, Rubber based Adhesives, cellulose and silicate Adhesives, Uses of Adhesives.

B) **Abrasives:**

Types of Abrasives, Manufacture of Artificial Abrasives: Carborundum , Calcium carbide, Alundum, Synthetic graphite, Uses of Abrasive. Abrasive paper and Abrasive cloth.

UNIT-V

A) **Dielectrics or Electrical Insulating Materials:**

Dielectric properties, classification of insulating materials, Gaseous liquid, Solid and thermal insulating materials, Semiconductors.

B) **Super Conductors and Nano materials:**

Super Conductors, Introduction to nanoscience and nanotechnology, nano and Nature, Applications of nanotechnology and Nanomaterials: Nanobiotecnology, nanosensors, nanomedicines, nanophotonics, etc., Implications of nanotechnology, Futurefantasy and nanotechnology. Classification of nanomaterials; 1D,2D,3D with their examples.

Reference Books:

1. J.C. Kuriakose and J. Rajaram, "Chemistry in Engineering and Technology", Vol.1 & 2, Tata Mcgraw Hill Publishing Company (P) Ltd., New Delhi.
2. Engineering Chemistry – Gopalan Venkappayya, Vikash Publication.
3. Engineering Chemistry –B.K.Sharma, Krishna Publication.
4. Engineering Chemistry –Jain & Jain
5. Engineering Chemistry- O.G.Palanna, McGraw Hill Education (India) Private Limited.
6. G.Zhong Cao. Nanostructures and Nanomaterials: Synthesis, Properties and Applications, Imperial College Press(2004)
7. M.Ratner and D. Ratner. Nanotechnology: A Gentle Introductionto the Next Big Idea, Pearson Education (2003)

9. J.Schulte, Nanotechnology: Global Strategies, Industry Trends and Applications.
10. G.Schmid, Nanotechnology, Volume1: Principles and Fundamentals.