RAJIV GANDHI PROUDHYOGIKI VISHWAVIDAYALAYA, BHOPAL

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

FIRST 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	AC1001	Inorganic Chemistry-I	3	1		4	70	20	10			100	
2	AC1002	Organic Chemistry-I	3	1		4	70	20	10			100	
3	AC1003	Physical Chemistry-I	3	1		4	70	20	10			100	
4	AC1004	Chemistry of Materials-I	3	1		4	70	20	10			100	
5	AC1005	Inorganic Chemistry-I			4	4				40	25	65	
6	AC1006	Organic Chemistry-I			4	4				40	25	65	
7	AC1007	Physical Chemistry-I			4	4				40	25	65	
8	AC1008	Chemistry of Materials-I			4	4				40	15	55	
			12	4	16	32	280	80	40	160	90	650	

Applied Chemistry

M.Sc. I SEMESTER

Course AC-101 (PAPER: Inorganic Chemistry-I)

(Effective From : July 2017)

Maximum Marks 70
Minimum Marks 28

UNIT I

Stereochemistry and Bonding in Main Group Compounds. VESPR theory and its application for treating structures of inorganic molecules and ions containing Ione pairs of electrons, shortcomings of VESPR model. MO treatment of polyatomic molecules. eg. ozone, nitrite, nitrate, hydarzoic acid and benzene.

UNIT II

Reaction Mechanism of Transition Metal Complexes. Inert and labile complexes, interpretation of lability and inertness of transition metal complexes on the basis of valence bond and crystal field theories. Kinetics of octahedral substitution: acid hydrolysis, factors affecting acid hydrolysis.

UNIT III

Metal-Ligand Baonding. Molecular orbital theory. Qualitative aspects of metal-Legand σ-bonding in octahedral, tetrahedral and square planar complexes. Jahn-Teller Effect

Electronic Spectra and of Transition Metal Complexes. Spectroscopic term, terms and microstates for the p^2 and d^2 configurations. Hund's rules for ground state terms, the correlation of spectroscopic terms into mulliken symbols, electronic trasition selection rules. Orgel diagrams for transition metal complexes (d^1-d^9 states). Jahn-teller effect and electronic spectra of complexes.

UNIT IV

Metal π-Complexes. Metal carbonyls: structure and bonding, vibrational spectra of metal carbonyls for bonding and structural elucidation. Dioxygen complexes. Wilkinson's catalyst

UNIT V

Borane Chemistry Metal Clusters, Bonding and topology of boranes, 4-digit coding (s,t,y,x) numbers for B_2H_6, B_4H_{10}, B_5H_9, B_5H_{11} and B_6H_{10} and their utilities. Acquaintance with carboranes and metallocarboranes. Metal clusters: synthesis, reactivity and bonding.

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. Megnetiochemistry, R.1.Carlin Spronger Verlag.
5. Comprehensive Coordination Chemistry eds.,G.Wilkinson,R.D.Gillars and J.A.McCleverty, Pergamon.

Applied Chemistry

M.Sc. I SEMESTER

Course AC1002(PAPERII: Organic Chemistry-II)

(Effective From : July 2017)

Maximum Marks 70
Minimum Marks 28

UNIT I

Structure and Bonding. Bonding in organic molecules. Delocalized chemical bonding-conjugation cross conjugation, Conjugation, resonance, hyper conjugation.

Aromaticity in benzenoid and non-benzenoid compounds, alternate and non-alternate hydrocarbons. Huckel's rule. Anti- aromaticity, homo- aromaticity.

Bonds weaker than covalent bond. Hydrogen bonding, crown ether complexes, and cyclodextrins.

UNIT II

Stereochemistry. Chirality, elements of symmetry, molecules with more than one chiral center, threo and erythro isomers. R and S configuration. Separation of enantiomers. Regioselective, stereospecific and stereoselective reactions. Asymmetric synthesis. Optical activity in the absence of chiral carbon (atropisomerism)- biphenyls, allenes and spiranes, and their nomenclature.

UNIT III

Organic reaction intermediates: Formation, Structure stability and reaction of carbonium ions. Carbanions, Free Radicals, Carbenes, Carbylamine Reaction, reamer tiemann reaction.

UNIT IV

Reaction Mechanism. Types of mechanisms, types of reactions, thermodynamic and kinetic requirements, and control, Potential energy diagrams, Transition states and intermediates, methods of determining mechanism, isotope effects.

Effect of structure on reactivity – resonance and field effects, steric effect. The Hammett equation and linear free energy , relationship, substituent and reaction constants. Taft equation.

UNIT V

Aliphatic Nucleophilic Substitution. The S_N 2, S_N1, Mixed S_N 2 and S_N1, and SET mechanisms. The S_N i mechanism. Reactivity effects of substrate structure, attacting nucleophile, leaving group and reaction medium. The neighbouring group mechanism, neighbouring group participation by π an σ bonds. Classical and neoclassical carbocations, norbornyl system, carbocation rearrangements.

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.

Applied Chemistry

M.Sc. I SEMESTER

Course AC1003(PAPER: Physical Chemistry-I)

(Effective From : July 2017)

Maximum Marks 70
Minimum Marks 28

UNIT-I

Thermodynamics and thermodynamic equilibrium

Introduction of thermodynamics and thermodynamic equilibrium.

First law of thermodynamic: concept of internal energy, Joule Thomson effect and its applications, Kirchoff equation and its applications.

Second law of thermodynamics: Carnot theorem and Carnot cycle. Physical concept of entropy & enthalpy, Gibb's-Helmholtz equation and its applications, thermodynamic derivation of law of mass action, Vant Hoft isotherm, Vant-Hoft isochore, The Clapeyron equation, Clauscius-Ciapeyron equation and their applications.

Third law of thermodynamics: Nernst Heat theorem

UNIT-II

Chemical kinetics and mechanism

Introduction of Chemical kinetics, (Order & molecularity), determination of reaction mechanisms; Arrhenius equation, effect of temperature on rate constant, Energy of activation, collision and transition state theories of rate constants; Uni & Bi molecular reactions; enzyme kinetics; salt effects; homogeneous catalysis; oscillatory reactions (Belousov- Zhabotinskii reaction), branching chain; H_2-O_2 reaction.

UNIT-III

Photo chemistry

Photochemical reaction Grotthus and Drapes law, Einstein's law of photochemical equivalence, quantum yield, primary and secondary processes, fluorescence and phosphorescence, luminescence in solids. Chain reactions, photolysis of HI, Acetone. High energy radiations, Elementary idea of lasers and its application.

UNIT - IV

Adsorption and adsorption isotherms

Adsorption (Physiosorption and chemisoption, factors affecting adsorption) Freundlich, Langnuir, & Gibbs adsorption isotherm, BET Theory & estimation of surface area .Micelles; Surface active agents, classification of surface active agents, micellization, critical micellar concentration (CMC), factors affecting the CMC of surfactants, Concepts of catalysis; Homogenous catalysis, kinetics of enzyme reactions,

UNIT-V

Colloids and colloidal state

Classification, stability, preparation and properties of colloids, precipitation, spontaneous ageing and coagulation of colloids. Optical and kinetic properties, electrical and electro kinetic phenomenon, and applications of electrophoresis, Donnan membrane equlibrium and its applications.

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. I SEMESTER

Course AC1004(PAPER: Chemistry of Material-I)

(Effective From : July 2017)

Maximum Marks 70
Minimum Marks 28

UNIT I

Water analysis and treatment

Sources, Impurities, Hardness and its units. Determination of Hardness, Industrial water requirement and characteristics, softening of water by various methods, boiler troubles. Internal/External treatments to boiler feed water, characteristics of municipal water and its treatment, water analysis (determination of alkalinity, temporary and permanent hardness by complexometry, Dissolved Oxygen, Biological Oxygen Demand, Chemical Oxygen Demand, chlorides, sulphates, dissolved CO_2 and residual Chlorine, Total Dissolved Solids). Numerical problems based on water analysis and water softening processes.

UNIT-II

Fuels and combustion

Fossil fuels and classification, calorific value and its determination by bomb calorimeter, proximate and ultimate analysis of coal and their significance. Ranking of solid fuel, carbonization. Manufacturing of coke, Petrochemicals derived from alkenes, benzene and its homologues. Cracking of hydrocarbons and mechanism of cracking, knocking, relationship between knocking and structure of hydrocarbon, improvement of anti knocking characteristics of IC engine fuels, diesel engine fuels, cetane number, gas analysis and numerical problems.

UNIT-III

Lubricants & Refractories

(A) Lubricants, Mechanism of Lubrication, classification, Lubricating oils, Greases or semi Solid Lubricants, Solid Lubricants, Synthetic Lubricants, Properties of Lubricating oils, cutting Fluids, Selection of Lubricants.

(B) Refractories : Introduction and properties, classification, characteristic properties of different refractoriness, failure and selection.

UNIT-IV

Corrosion

Electrode Potential, Electrochemical series and its application, Polarization, Galvanic Cell and concentration cell.

Corrosion-Introduction, factors affecting corrosion, dry and electrochemical corrosion and its mechanism, Types of corrosion pitting, waterline, intergranuler, stress, microbiological corrosion, corrosion fatigue. Erosion Corrosion, Passivity, Control and its prevention.

UNIT-V

Cement

(A) Manufacture of Portland cement, chemical composition of cement, setting & hardening, Heat of hydration of cement, ISI specification special cements, concrete & RCC, Decay of concrete.

(B) Gypsum, Plaster of Paris, Analysis of cement.

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. A Text Book of Engineering Chemistry – S.S.Dara & A.K.Singh, S. Chand Publication.
5. Applied Chemistry – Theory and Practice, O.P.Viramani, A.K.Narula, New Age Pub.
6. Polymer Science – Ghosh, Tata McGraw Hill.
7. Engineering Chemistry –Jain & Jain
8. Engineering Chemistry –Shashi Chawla