

A.V.V.M. SRI PUSHPAM COLLEGE (AUTONOMOUS), POONDI

Programme: M. Sc.

Department: Chemistry

Syllabus Revision 2017-2018

S.No.	Courses	Number of courses having changes
1.	Core Course	04
2.	Elective Course	01
	TOTAL	05

Total Number of Courses : 23

Total Number of Courses having changes : 05

Percentage of Revision : 21.7 %

Note:

The content of the syllabus which has been revised is highlighted.

M.Sc., CHEMISTRY (2017 – 2018)

Sl. No	SEM	Category	Paper Code	Title of the Paper	Maximum Marks			Minimum Marks			Hours Week	Credits
					CIA	E.E.	Total	CIA	E.E.	Total		
1	I	Core	17P1CHC1	Physical Chemistry – I	25	75	100	10	30	50	7	5
2		Core	17P1CHC2	Inorganic Chemistry – I	25	75	100	10	30	50	6	4
3		Core	17P1CHC3	Analytical chemistry	25	75	100	10	30	50	6	5
4		Core	17P1CHCP1	Physical Chemistry Practical – I (non Electrical)	40	60	100	16	24	50	6	3
5		Major Elective-I	17P1CHEL1A 17P1CHEL1B	Medicinal Chemistry/ Bio Chemistry	25	75	100	10	30	50	5	4
6	II	Core	17P2CHC4	Organic Chemistry – I	25	75	100	10	30	50	5	5
7		Core	17P2CHC5	Physical Chemistry – II	25	75	100	10	30	50	5	5
8		Core	17P2CHC6	Physical Methods in Chemistry - I	25	75	100	10	30	50	5	5
9		Core	17P2CHC7	Polymer Chemistry	25	75	100	10	30	50	5	4
10		Core	17P2CHCP2	Physical Chemistry Practical-II (Electrical)	40	60	100	16	24	50	5	3
11		Major Elective-II	17P2CHEL2A 17P2CHEL2B	Paint Chemistry / Cheminformatics	25	75	100	10	30	50	5	4
12	III	Core	17P3CHC8	Organic Chemistry – II	25	75	100	10	30	50	5	5
13		Core	17P3CHC9	Physical Methods in Chemistry-II	25	75	100	10	30	50	5	5
14		Core	17P3CHC10	Industrial Chemistry	25	75	100	10	30	50	5	5
15		Core	17P3CHCP3	Organic Practical – I	40	60	100	16	24	50	5	3
16		Core	17P3CHCP4	Organic Practical – II	40	60	100	16	24	50	5	3
17		EDC	17P3CHEDC	Chemistry in Every Day life	25	75	100	10	30	50	4	
			Communicative skill & Personality development		-	-	-	-	-	-	1	-
18	IV	Core	17P4CHC11	Inorganic Chemistry – II	25	75	100	10	30	50	6	6
19		Core	17P4CHCP5	Inorganic Practical – I	40	60	100	16	24	50	6	3
20		Core	17P4CHCP6	Inorganic Practical – II	40	60	100	16	24	50	6	3
21		Major Elective-III	17P4CHEL3A/ 17P4CHEL3B	Recent Trends in Chemistry / Applied Chemistry	25	75	100	10	30	50	6	4
22		CN	17P4CHCN	Comprehensive Knowledge Test	-	100	100	-	50	50	5	2
23		Project	17P4CHPR	Project Industrial internship (Along with Industrial visit)	40	60	100	16	24	50	-	4
			Communicative skill and personality development		-	-	-	-	-	-	1	-
			Total				2300				120	90

M.Sc. Chemistry

Semester	Subject Code	Title of the Paper	Hours of Teaching / Week	No. of Credits
I	17P1CHC2	Inorganic Chemistry – I	6	4

UNIT – I

Acids and Bases: Bronsted and Lewis acids and bases pH, pKa, acid – base concept in non aqueous medium buffer solution, Protonic Acids – Proton Affinities – Differentiating and leveling solvents – Acidic-Behaviour of the Binary hydrides – strength of oxyacids – Hydrolysis – Amphoteric oxides – Non protonic concepts of acid – Base Reactions – Lux concept –Solvent ion theory of Acids and Bases – Liquid Ammonia, Acetic acid, bromine trifluoride, Dinitrogen tetroxide, liquid hydrogen fluoride as solvents – classification on Acids and Bases as Hard or Soft – Acid-Base strength and Hardness and softness –Theoretical basis of Hardness and softness – Electro negativity and Hardness and Softness.

UNIT – II

Nuclear Chemistry: Radioactive decay – Theories of decay processes – Laws of radioactivity – Detection and Measurements of radiations – Nuclear structure – Composition of nuclei – properties of nuclei – nuclear radii – nuclear spin etc. nuclear stability – nuclear models – liquid drop, shell and collective models – Nuclear forces – meson field theory.

Artificial Radioactivity: Nuclear reactions – transmutation – Stripping and pick up, Fission products and fission yields, fusion, spallation and fragmentation reactions scattering reactions – nuclear cross section–Q–value Nuclear reactors – charged particle accelerators – neutron sources –gamma ray and X – ray sources . Radioactive techniques – tracer technique neutron activation and isotopic dilution analysis, counting techniques such as G.M. ionization and proportional counter. Applications of nuclear science in agriculture and biology. Radiation risks and medical benefits – Natural and manmade isotopes.

UNIT – III

Polyacid anions: Basic building units of vanadate, molybdate, and tungstate ions – apex sharing (structure only) Heteropoly anions – structure only Rings Phosphazenes – structure – Boron hydrides and carboranes

Clusters: Metal cluster – dinuclear – structures of $\text{Re}_2\text{Cl}_8^{2-}$ qualitative M.O. diagrams for dinuclear rhenium and molybdenum complexes to explain the strength of quadrupole bond – Cluster bonding models – Wade and Lohar.

UNIT – IV

Solid state chemistry: Crystal structure – classification of ionic structure – AX_1 , AX_2 , AX_3 types – Ax type (ZnS, NaCl, CsCl) structure only – AX_2 type (fluorite, rutile, beryl, cristobalite) structure only – layer structure – CdI_2 , nickel arsenate. Schottky and Frenkel defects – explanation and calculation of number of defects per cm³ – metal excess defect – F-centre and interstitial ions – metal deficiency defects – positive ion absent – extra interstitial negative ions.

UNIT – V

Main Group Chemistry: Chemistry of boron – borane higher boranes, carboranes, borazines and boron nitrides. Chemistry of silicon – silanes, higher silanes, multiple bonded systems, disilanes, silicon nitrides, siloxanes and silicates. P-N compounds, cyclophosphazenes S.N. compounds – S_4N_4 (SN). **Ionic Model:** Lattice energy – Born – Lande equation – Born Haber cycle-radius ratio-fajans rule-Kapustinski equation – High Tc superconductors – Solid state reactions – Types and examples.

References:

1. Badie E.Duglas and Danl H. McDaniel Concepts and models in Inorganic Chemistry, Indian Edition, 1970, Oxford and IBH Publishing Co., New Delhi.
2. J.D. Lee. A New concise Inorganic Chemistry, 4th Edition, ELBS, 1995 (UNIT – II)
3. G. Friedlander, J.W. Kennedy and J.M. Miller, Nuclear and Radiochemistry (Unit-III)
4. Keith F.P Purchell and John C. Kotz, Inorganic Chemistry, Saunders Golden Sunburst series, W.B. Saunders company, Philadelphia.
5. Cotton and Wilkinson, Advanced Inorganic Chemistry, 5th Edition, John Wiley & sons, New York (Unit IV)
6. W.Kain and B. Schwederski, Bioinorganic Chemistry of life, John Wiley and Sons, New York (Unit V)
7. James E. Huheey, Ellen A. Keiter and Richard L. Richard L. Keiter, Inorganic Chemistry Principles of structure and Reactivity, 4th Edition, Addition –Wesley, New York (Unit – I)
8. Shriver and Atkins, Inorganic Chemistry, III Edition Oxford, 1999, India Gopsons Pvt. Ltd., A – 14 Sector Noida.
9. Advanced Inorganic Chemistry – Gurdeep Raj – 23rd reversed and enlarged edition – Goal Publishing House, Meerut.

Semester	Subject Code	Title of the Paper	Hours of Teaching /Week	No. of Credit
I	17P1CHEL1A	Major Elective-I Medicinal Chemistry	5	4

UNIT –I

Definitions: The nature and source of drugs, pharmacologically active principles in plants. The terms- Drugs, pharmacology, pharmacognosy, pharmacy, Therapeutics, Toxicology, chemotherapy, pharmacopoeia, First aid –Important rules of first aid - Cuts, Abrasions and Bruises, Fractures, bleeding for blood, maintain breathing. Burns and fainting. First aid box -T.B, Asthma, Jaundice, Piles, Leprosy, Typhoid, Malaria, Cholera, Filariasis - causes- symptoms-diagnosis –prevention and treatment.

Unit II

Anticonvulsants, Stimulants and Antipyretic Analgesics

Anticonvulsants - classification, synthesis and mode of action; Muscle relaxants-classification, synthesis and mode of action. Central nervous system stimulants-classification, synthesis and mode of action; Antipyretic analgesics classification, synthesis and mode of action;

Unit III

Antihistamines, Anti-inflammatory and Antiparkinson drugs

Antihistaminics - synthesis and mode of action of histamine H₁ receptor antagonists and histamine H₂-receptor blockers; prevention of histamine release; structure-activity relationships amongst H₁-receptor blockers. Non-steroidal anti-inflammatory drugs(NSAID)-synthesis and mode of action of heteroarylacetic acid analogues, arylacetic acid analogues, arylpropionic acid analogues, naphthalene acetic acid analogues, gold compounds, salicylic acid analogues and pyrazolones and pyrazolodiones; Antiparkinsonism agents-synthesis and mode of action of piperidine analogues, pyrrolidine analogues and phenothiazine analogues.

UNIT – IV

Anaesthetics: Ideal anaesthetic agent – classification according to mode of action, General Anaesthetics – volatile ether, vinyl ether, Halothane, Trichloro ethylene – structure, advantages and disadvantages, non-volatile – Thiopental sodium – properties structure, advantages and disadvantages , local anaesthetics- requisites, cocaine-structure and advantages antiseptics and disinfectants – distinction between disinfectants and antiseptics, phenol co-efficient. Psychedelic drugs- lysergic acid diethylamide (LSD)- Pharmacological action of LSD- mechanism of action – therapeutic uses – adverse effects. Marijuana – Pharmacological action and therapeutic uses.

UNIT – V

Cancer- types causes spread treatment – antineoplastic drugs- alkylating agents, antimetabolites, hormones, antibiotics, radioactive isotopes, adrenocorticosteroids. **Diabetes** –types- control of diabetes insulin, oral hypoglycaemic sulphonyl ureas-tolbutamide, chlorpropamide glibenclamide-structure and uses. Biguanides – phenformin and metformin. **AIDS** – Causes – symptoms – prevention and treatment.

Text Books:-

1. Jaya Shree ghosh – A textbook of pharmaceutical chemistry.
2. Ashutosh Kar, **Medicinal Chemistry**, New Age International, 1996.
3. W.O.Foye, **Principles of medicinal chemistry**, 2nd Edn., Lea & Febiger, Philadelphia, 1981.

Reference Books:-

1. M.E.Wolff, **Burger's medicinal chemistry**, 4th Edn., John Wiley & Sons, New York, 1981.
2. F.F.Blicke and R.H.Cox, **Medicinal Chemistry**, John Wiley & Sons, New York, 1959.
3. D.Lednicher and L.A.Mitscher, **Organic Chemistry of drug synthesis**, John Wiley & Sons, New York, 1959.
4. E.Hoover, **Remington's Pharmaceutical sciences**, 15th Edn. Mack Publ.Company, Easton, 1975.
5. S. Lakshmi – pharmaceutical chemistry.
6. K.Bhawate Sundari – Applied chemistry.

Semester	Subject Code	Title of the Paper	Hours of Teaching /Week	No. of Credits
II	17P2CHC5	Physical Chemistry - II	5	5

UNIT - I**Quantum Chemistry – II**

Rigid rotator – harmonic oscillator – rotational and vibrational quantum numbers and selection rules for rotational and vibrational transitions – Bohr's correspondence principle – hydrogen atom – shapes and nodal properties of orbital. Principles of approximation methods – many electron atoms – wave functions – one electron orbital – Pauli's principles and / Slater determinants – variation methods application to hydrogen and helium atoms – perturbation method for non degenerate systems – application of perturbation theory to helium atom. Hartree – Fock self consistent field method – L.S. and J-J coupling. Born – Oppenheimer approximation Huckel pi – electron theory and its application to ethylene, butadiene and benzene.

UNIT – II**Quantum Statistics**

Quantum statistics – Bose Einstein and Fermi – Dirac statistics – Comparison of them with MB. Statistics – application of B.E. statistics of photon gas and super fluidity of liquid helium. Application of F.D. statistics to electron gas and thermionic emission. Heat capacity of solids – Einstein and Debye's treatment – Concepts of negative Kelvin temperature.

Third law of Thermodynamics:

Law of Thermodynamics: Need for the third law – Nernst heat theorem and other forms of stating the third law. Thermodynamic quantities as absolute zero – statistical meaning of third law – apparent exception to the third law.

Non – equilibrium Thermodynamics: Thermodynamics of irreversible processes – Onsager reciprocal relations – steady state conditions.

UNIT – III**Ionics**

Transport of ions in solution – Debye – Huckel Onsager theory – Debye – Falkenhagen and wein effects – Modification to Debye – Huckel Onsager theory – Activity of ions in solutions – Experimental determinations – Debye – Huckel limiting law. Activity coefficient at higher concentration – Bjerrum model. Electrode – electrolyte equilibrium – Nernst equation and its limitations – equilibrium electrode potential – Classification of electrodes, concentration cells, liquid junction potentials – thermodynamic quantities from EMF data. Electrochemical energy – storage systems – primary and secondary batteries – fuel cells.

UNIT – IV**Electro Kinetic Phenomena**

Electrical double layer potential –theory of multilayers at electrode – electrolyte interface – double layers capacity – electro kinetic phenomena – Zeta potential electro osmosis and sedimentation potential.

Process at electrodes – The rate of charge transfer – current density – Butler – Volmer equation – Tafel equation.

Principles of electrode position of metals – electrochemical corrosion metal constructions and use of Pourbaix and Evans diagrams and prevention of corrosion – Electrochemical oxidations and reduction.

UNIT – V

Surface Phenomena

Surface Phenomena: Terminology – Differences between adsorption and absorption- classification- Physisorption and chemisorption– solid – liquid interfaces, solid – gas interfaces,– Factors influencing adsorption of gases on solids- Adsorption isotherms- Freundlich's, Langmuir and BET isotherms – surface area determination. Applications of adsorptions-Activated carbon-application in the treatment of polluted water and other applications of activated carbon. Some interfacial aspects on Micelles, Reverse micelles, Micro emulsions and membranes.

Reference:

1. S. Glasstone, Introduction to Electrochemistry
2. Vogel, A Textbook of Quantitative Inorganic analysis, Longman.
3. Bockris and Reddy, Electro chemistry
4. P.W. Atkins, Physical Chemistry, ELBS 6th edition.
5. A.K.Chandra, Introduction to Quantum chemistry
6. Donald.A.mcquarrie, Quantum chemistry
7. R.K.prasad, Quantum chemistry
8. Jain & Jain, Engineering Chemistry.

Semester	Subject Code	Title of the Paper	Hours of Teaching /Week	No. of Credit
II	17P2CHC7	Polymer chemistry	5	4

UNIT – I

Physical Properties and applications of Polymers: Mechanical – Stress – strain measurements, Electrical – conducting polymer – polyacetylene, polyaniline. Industrially important polymers – Natural and synthetic rubber – polyesters, polytetrafluoroethylene, (TEFLON), Polystyrene, ion-exchange Resins, polyacrylonitrile – carbon fibres, polyvinyl chloride and polyacrylates.

UNIT – II

Synthesis and Kinetics: Kinetics of polymerization – free radical chain polymerization, cationic polymerization, anionic polymerization, copolymerization, Degree of polymerization, chain length, chain transfer, chain termination, stereo regular polymerization, zeigler Natta catalysts.

UNIT – III

Characterization: Crystalline Nature – X-ray diffraction, study of polymers, degree of crystallinity, Differential scanning Calorimetry, Thermogravimetric analysis of polymers. Glass Transition Temperature – factors affecting Glass Transition Temperature, properties associated with Glass Transition Temperature, Crystallinity and Melting point – Relations to structure.

UNIT – IV

Chemical Reaction Cyclization: Hydrolysis, Acidolysis, Hydrogenation, Addition and substitution reaction cross linking – Vulcanization, graft and Block Copolymers. Type of degradation – Thermal, Mechanical, Oxidative, Hydrolytic and photo degradation.

UNIT – V

Classification and Molecular weight Determination: Basic concepts of polymer science – molecular forces and chemical bonding in polymers – classification of polymer – addition polymers, condensation. Major mass and size of polymers – Number average and weight average molecular weight – methods of molecular weight determination. Osmometry viscosity, light scattering, sedimentation, Ultra centrifuge; Molecular weight distribution curve

References:

1. V.R. Gowarikar – polymer science, wiley Eastern, 1986
2. K.J. Saunders, Organic Polymer Chemistry – Chapman and Hall, 1976
3. Raymound, B. Seymour, Polymer Chemistry – An introduction, Marcel Dekker Inc. NY 1981.
4. Fred W. Billmeyer – Text book of polymer science, john – wiley.
5. K. Gupta, fundamentals of polymer science and Engineering, Tata, McGraw Hill.
6. Stepak, polymer characterization of processing technology, Academic press, Indian.

Semester	Subject Code	Title of the Paper	Hours of Teaching/ Week	No. of Credits
III	17P3CHC10	Industrial Chemistry	5	5

Unit I

Basic ideas about unit operation – Flow Chart – Chemical Conversion – Batch versus Continuous process – Chemical Process selection – Design – Chemical Process Control – Chemical process of economics- market evaluation – Plant location- Management for productivity activity – Research & Development and its role in chemical industries.

Unit – II

General Survey of chemicals used in everyday life, Cosmetics – talcum powder, tooth paste, shampoo – nail polish – Perfumes – Soaps and detergents – General Formulation and preparation – Hazards of cosmetic use.

Unit – III

Food and Nutrition – Carbohydrates – Proteins fats, minerals and Vitamins – Definition sources and their physiological importance – balanced diet – Adulterants in Milk – Ghee – Oil – Coffee powder – Chili Powder – Pulses – Turmeric powder – identifications.

Unit – IV

Plastics – Polythene – PVC, Bakelite, Polyester resin – properties and applications, Natural rubber, Synthetic rubber – Vulcanization – Classification and its applications – Color chemicals used in food – soft drinks and its health hazard.

Unit – V

Manufacture of Cement, Introduction – Types of cement – high alumina cement – Water proof cement – slag cement- acid resisting cement – White cement – colored cement – pozzolana cement – setting of cement – properties of cement – testing of cement – uses of cement – concrete -cement Industries in India.

References:

1. Norrish Shreve. R. and Joseph A. Brink Jr Chemical Process Industries, McGraw Hill, Industrial Book Company London.
2. Mohapatra – elements of Industrial chemistry 1988 in Delhi – Kalyani publications.
3. B.K.Sharma Industrial Chemistry 1st edition – Goel publications – Meerat 1983.