

North India's Leading...

MANTRAM TUITION CLASSES

Expert & Highly Efficient Faculty (With Years of practical experience)



Syllabus 2023-24
Panjab University

BSc

(CHEMISTRY)

SIXTH SEMESTER

SCO 80-81, Sec.15D, Chandigarh

www.mantramtuitionclasses.com

9501400172, 9779797575

CHEMISTRY
SEMESTER-6th
Scheme of Teaching and Examination

<i>Paper</i>	<i>Course</i>		<i>Teaching Hrs.</i>	<i>Max. Marks</i>
XXI	Inorganic Chemistry-B	30	3 periods per week	22+3 internal assessment
XXII	Organic Chemistry-B	30	3 periods per week	22+3 internal assessment
XXIII	Physical Chemistry-B	30	3 periods per week	22+3 internal assessment
XXIV	Laboratory Practicals		6 periods per week	22+3 internal assessment
			Total 15 periods/week	100

Paper-XXI: INORGANIC CHEMISTRY-B

Time : 3 Hrs
Max. Marks : 22+3
30 Hrs. (2 Hrs/Week)
3 Periods/Week

Objective of the course

To teach the fundamental concepts of Chemistry and their applications. The syllabus pertaining to B.Sc. (GENERAL) (Semester system) in the subject of Chemistry has been upgraded as per provision of the UGC module and demand of the academic environment. The course contents have been revised from time to time as per suggestions of the teachers of the Chemistry working in the Panjab University, Chandigarh and affiliated colleges. The syllabus contents are duly arranged unit wise and contents are included in such a manner so that due importance is given to requisite intellectual and laboratory skills.

UNIT-I **(7 Hrs.)**

Silicones and Phosphazenes :

Silicones and phosphazenes as examples of inorganic polymers, nature of bonding in triphosphazenes.

UNIT-II **(8 Hrs.)**

Hard and Soft Acids and Bases (HSAB) :

Classification of acids and bases as hard and soft Pearson's HSAB concept, acid-base strength and hardness and softness. Symbiosis, theoretical basis of hardness and softness, electronegativity and hardness and softness.

UNIT-III **(8 Hrs.)**

Electronic Spectra of Transition Metal Complexes:

Types of electronic transitions, L – S coupling, selection rules for *d-d* transitions, spectroscopic ground states, Orgel – energy level diagram for *d¹* and *d⁹* states, discussion of the electronic spectrum of [Ti(H₂O)₆]³⁺ complex.

UNIT-IV**(7 Hrs.)****Magnetic Properties of Transition Metal Complexes** :

Types of magnetic behaviour, methods of determining magnetic susceptibility, spin-only formula. Correlation of μ_s and μ_{eff} values, orbital contribution to magnetic moments, application of magnetic moment data for 3d-metal complexes.

Instructions for paper setters and candidates:

- i* Examiner will set total of **NINE** questions comprising **TWO** questions from each unit and **ONE** compulsory question of short answer type covering whole syllabi.
- ii* The students are required to attempt **FIVE** questions in all, **ONE** question from each unit and the Compulsory question.
- iii* Compulsory question carries six marks and remaining all questions carry four marks each.

Books suggested

- 1 Cotton, F.A., Wilkinson, G., Gaus, P.L., Basic Inorganic Chemistry; 2nd edition, Pubs: John Wiley and Sons, 1995.
- 2 Lee, J.D., Concise Inorganic Chemistry; 4th edition, Pubs: Chapman and Hall Ltd., 1991.
- 3 Shriver, D.E., Atkins, P.W., Langford, C.H., Inorganic Chemistry; 4th edition, Pubs: Oxford University Press, 2006.
- 4 Douglas, B., McDaniel, D., Alexander, J., Concepts and Models of Inorganic Chemistry; 3rd edition, Pubs: John Wiley and Sons Inc., 1999.
- 5 Porterfield, W.W., Inorganic Chemistry; Pubs: Addison-Wesley Publishing Company, 1984.
- 6 Miessur, G.L., Tarr, D.A., Inorganic Chemistry; 3rd edition, Pubs: Pearson Education Inc., 2004.
- 7 Jolly, W.L., Modern Inorganic Chemistry; 2nd edition, Pubs: Tata McGraw-Hill Publishing Company Ltd., 1991.
- 8 Purcell, K.F., Kotz, J.C., Inorganic Chemistry; Pubs: W.B. Saunders Company, 1977.
- 9 Puri, B.R., Sharma, L.P., Kalia, K.C. Principles of Inorganic Chemistry; 30th edition, Pubs: Milestones Publishers. 2006-07.

Paper-XXII: ORGANIC CHEMISTRY-B**Time : 3 Hrs****Max. Marks: 22+3****30 Hrs. (2 Hrs/Week)****3 Periods/Week****Objective of the course**

To teach the fundamental concepts of Chemistry and their applications. The syllabus pertaining to B.Sc. (GENERAL) (Semester system) in the subject of Chemistry has been upgraded as per provision of the UGC module and demand of the academic environment. The course contents have been revised from time to time as per suggestions of the teachers of the Chemistry working in the Panjab University, Chandigarh and affiliated colleges. The syllabus contents are duly arranged unit wise and contents are included in such a manner so that due importance is given to requisite intellectual and laboratory skills.

UNIT-I**(8 Hrs.)****Amino Acids, Peptides, Proteins and Nucleic Acids** :

Classification, structure and stereochemistry of amino acids. Acid-base behavior, isoelectric point and electrophoresis. Preparation and reactions of α - amino acids.

Structure and nomenclature of peptides and proteins. Classification of proteins. Peptide structure determination, end group analysis, selective hydrolysis of peptides. Classical peptide synthesis, solid – phase peptide synthesis. Structures of peptides and proteins. Levels of protein structure. Protein denaturation/renaturation.

Nucleic Acids : Introduction. Constituents of nucleic acids. Ribonucleosides and ribonucleotides. The double helical Structure of DNA.

UNIT-II**(7 Hrs.)****Synthetic Polymers** :

Addition or chain-growth polymerization. Free radical vinyl polymerization, ionic vinyl polymerization, Ziegler – Natta polymerization and vinyl polymers.

Condensation or step growth polymerization. Polyesters, polyamides, phenol formaldehyde resins, urea formaldehyde resins, epoxy resins and polyurethanes .

Natural and synthetic rubbers.

UNIT-III**(7 Hrs.)****Organic Synthesis via Enolates** :

Acidity of α -hydrogens, alkylation of diethyl malonate and ethyl acetoacetate. Synthesis of ethyl acetoacetate: the Claisen condensation. Keto-enol tautomerism of ethyl acetoacetate. Alkylation and acylation of enamines.

UNIT-IV**(8 Hrs.)****Organometallic Compounds** :

Organomagnesium Compounds: The Grignard reagents – Formation, structure and chemical reactions.

Organozinc Compounds: Formation and Chemical reactions.

Organolithium Compounds: Formation and Chemical reactions.

Instructions for paper setters and candidates:

- i. *Examiner will set total of **NINE** questions comprising **TWO** questions from each unit and **ONE** compulsory question of short answer type covering whole syllabi.*
- ii. *The students are required to attempt **FIVE** questions in all, **ONE** question from each unit and the Compulsory question.*
- iii. *Compulsory question carries six marks and remaining all questions carry four marks each.*

Books suggested

- 1 Morrison, R.T., Boyd, R.N., Organic Chemistry; 6th edition, Pubs: Prentice-Hall, 1992.
- 2 Wade Jr., L.G., Singh, M.S., Organic Chemistry; 6th edition, Pubs: Pearson Education, 2008.
- 3 Mukherji, S.M., Singh, S.P., Kapoor, R.P., Organic Chemistry; Pubs: New Age International, 1985, Vol. I, II, III.
- 4 Carey, F.A., Organic Chemistry; 4th edition, Pubs: McGraw-Hill, 2000.
- 5 Solomons, T.W., Fundamentals of Organic Chemistry; 5th edition, Pubs: John Wiley & Sons, 1997.
- 6 Streitwieser, A., Clayton, Jr., Heathcock, H., Introduction to Organic Chemistry; 3rd edition, Pubs: Macmillan Publishing Company, 1989.

Paper-XXIII: PHYSICAL CHEMISTRY-B

Time : 3 Hrs
Max. Marks : 22+3
30 Hrs. (2 Hrs/Week)
3 Periods/Week

Objective of the course

To teach the fundamental concepts of Chemistry and their applications. The syllabus pertaining to B.Sc. (GENERAL) (Semester system) in the subject of Chemistry has been upgraded as per provision of the UGC module and demand of the academic environment. The course contents have been revised from time to time as per suggestions of the teachers of the Chemistry working in the Panjab University, Chandigarh and affiliated colleges. The syllabus contents are duly arranged unit wise and contents are included in such a manner so that due importance is given to requisite intellectual and laboratory skills.

UNIT-I **(7 Hrs.)**

Solid State-I

:

Definition of space lattice, unit cell and Miller Indices

Laws of Crystallography – (i) Law of Constancy of Interfacial Angles, (ii) Law of Rationality of Indices, (iii) Law of Symmetry. Symmetry elements in crystals.

UNIT-II **(8 Hrs.)**

Solid State-II:

X-ray diffraction by crystals. Derivation of Bragg equation. Determination of crystal structure of NaCl, KCl and CsCl (Laue's method and powder method). Applications of Powder diffraction for structure determination, Thermal and photochemical reaction in solid state

UNIT-III **(8 Hrs.)**

Spectroscopy :

Introduction : Electromagnetic radiation, regions of the spectrum, basic features of different spectrometers, statement of the Born-Oppenheimer approximation, degrees of freedom.

Rotational Spectrum :

Diatomic molecules. Energy levels of a rigid rotor (semi – classical principles), selection rules, spectral intensity, determination of bond length, qualitative description of non-rigid rotor, isotope effect.

UNIT-IV **(7 Hrs.)**

Vibrational Spectrum :

Infrared Spectrum : Energy levels of simple harmonic oscillator, selection rules, pure vibrational spectrum intensity, determination of force constant and qualitative relation of force constant and bond energies, effect of anharmonic motion and isotope on the spectrum, idea of vibrational frequencies of different functional groups. Raman Spectrum : Concept of polarizability, pure rotational and pure vibrational, Raman spectra of diatomic molecules, selection rules.

Electronic Spectrum :

Concept of potential energy curves for bonding and antibonding molecular orbitals, qualitative description of selection rules and Franck- Condon principle.

Qualitative description of σ , π – and n M.O., their energy levels and the respective transitions.

Instructions for paper setters and candidates:

- i. Examiner will set total of **NINE** questions comprising **TWO** questions from each unit and **ONE** compulsory question of short answer type covering whole syllabi.*
- ii. The students are required to attempt **FIVE** questions in all, **ONE** question from each unit and the Compulsory question.*
- iii. Compulsory question carries six marks and remaining all questions carry four marks each.*

Books suggested

- 1 Atkins, P., Paula, J.de, Atkins Physical Chemistry; 8th edition, Pubs: Oxford university press, 2008.
- 2 Puri, B.R., Sharma, L.R., Pathania, M.S., Principles of Physical Chemistry; 43rd edition, Pubs: Vishal Publishing Co., 2008.
- 3 Barrow, G.M., Physical Chemistry; 6th edition, Pubs: McGraw Hill Company Inc, 1996.
- 4 Rao, C.N.R., University General Chemistry; Pubs: Macmillan of India, 1985.
- 5 Berry, R.S., Rice, S.A., Ross, J., Physical Chemistry; 2nd edition, Pubs: Oxford University Press, 2000.
- 6 Albert, R.A., Silbey, R.J., Physical Chemistry; 1 edition, Pubs: John Wiley & Sons Inc., 1992.
- 7 Dogra, S.K., Dogra, S., Physical Chemistry Through Problems, Pubs: Wiley Eastern limited, 1991.
- 8 Levine, I.N., Physical Chemistry; 5th edition, Pubs: Tata McGraw Hill Publishing Co. Ltd, 2002.
- 9 Moore, W.J., Basic Physical Chemistry; Pubs: Prentice Hall of India Pvt. Ltd., 1983.
- 10 Metz, C.R., Theory and Problems of Physical Chemistry; Schaum's outline series, 2nd edition, Pubs: McGraw-Hall Book Company, 1989.
- 11 Banwell, C.N., McCash, E.M., Fundamentals of Molecular Spectroscopy; 4th edition, Pubs: Tata McGraw Hill Publishing Co. Ltd., 1999.
- 12 Atkins, P. Friedman, R. Molecular Quantum Mechanics; 4th edition Pubs: Oxford University Press, 2007.
- 13 Levine, I.N., Quantum Chemistry; 5th edition, Pubs: Prentice Hall International Inc., 2000.

Paper – XXIV: LABORATORY PRACTICALS**Max. Marks: 22+3****ORGANIC CHEMISTRY**

Laboratory Techniques

Column Chromatography

Separation of fluorescein and methylene blue.

Separation of leaf pigments from spinach leaves.

Synthesis of Organic Compounds

- (a) Aliphatic electrophilic substitution.
Preparation of iodoform from ethanol and acetone.
- (b) Aromatic electrophilic substitution.

Nitration

Preparation of m-dinitrobenzene

Preparation of p-nitroacetanilide

Preparation of p-iodoaniline from aniline.

Preparation of methyl orange from N,N-dimethyl aniline and sulphanilic acid.

Halogenation

Preparation of p-bromoacetanilide

Preparation of 2,4,6 – tribromophenol

(c) Oxidation

Preparation of benzoic acid from toluene.

(d) Reduction

Preparation of aniline from nitrobenzene

Preparation of m-nitroaniline from m - dinitrobenzene

Stereochemical study of Organic Compounds via Models

R and S configuration of optical isomers.

E, Z configuration of geometrical isomers

Conformational analysis of cyclohexanes and substituted cyclohexanes.

General Instruction to the Examiners:

Note: Practical examination will be of four hours duration & shall consist of the following questions:

Q.No. 1*. Preparation of an organic compound : 7 marks

Q.No. 2. Experiment based on Laboratory Technique : 7 marks

Students shall be allowed the choice to opt for one experiment out of the three offered. The candidate will write theory, short procedure and calculations of that experiments in the next 10 minutes. Note – Book / Books is/are not allowed during writing.

Q.No. 3. Viva-Voce : 5 marks

Minimum of four questions (2 marks each) be asked on the background of practical course.

Q.No. 4. Note Book : 3 marks

*If a question on preparation is asked, then the students shall be required to give Equation, requirements & short procedure in the first 10 minutes. Note Books are not allowed during writing.

Books Suggested (Laboratory Courses)

- 1 Denny, R.C. Vogel's Quantitative Inorganic Analysis; 4th edition, Pubs: English Language Book Society, 1985.
- 2 Harwood, L.M., Moody, J., Experimental Organic Chemistry; 1st edition, Pubs: Blackwell Scientific Publications, 1989.
- 3 Palmer, W.G., Jamer, C., Swinehart, S., Experimental Inorganic Chemistry; 1st edition, Pubs: Perkin-Elmer Corporation, 1969.
- 4 Furniss, B.S., Rogers, V., Vogel's Text Book of Practical Organic Chemistry; Pubs: Dorling Kindersley Pvt. Ltd., 1989.
- 5 Garland, C.W., Experiments in Physical Chemistry; 1st edition, Pubs: McGraw Hill Book Company, 1989.
- 6 Bansal, R.K., Laboratory Manual of Organic Chemistry; 3rd edition, Pubs: Wiley Eastern Limited, 1994.
- 7 Furniss, B.S., Hannaford, A.J., Rogers, V., Smith, P.W.G., Tatchell, A.R., Vogel's Text Book of Practical Organic Chemistry; 4th edition, Pubs: Longman group, 1978.
- 8 Khosla, B.D., Garg, V.C., Gulati, A., Senior Practical Physical Chemistry; 11th edition, Pubs: R.Chand & Co., New Delhi, 2002.
- 9 Das, R.C., Behra, B. Experimental Physical Chemistry; Pubs: Tata McGraw Hill Publishing Co. Ltd., .
- 10 Levitt, B.P., Findlays Practical Physical Chemistry; 8th edition, Pubs: Longman group Ltd. London & New York, 1978

North India's Leading...

MANTRAM TUITION CLASSES

Expert & Highly Efficient Faculty (With Years of practical experience)



Join Tuition Classes For

BA
(MATHS)

BSc
(MATHS/PHYSICS/CHEMISTRY)

Semester I to VI



SCO 80-81, Sec.15D, Chandigarh
www.mantramtuitionclasses.com
9501400172, 9779797575