SEMESTER – II

MDC-2 (T) : Inorganic Chemistry: Atomic Structure, Chemical Bonding and Fundamental of organic Chemistry

Course Objective

The Objective of CBCS based four year undergraduate Programme (FYUGP) in Chemistry Hons for Semester I & II, Specially for Major & Minor course is to provide the clear conception and understanding about theory and practical course mentioned in the syllabus.

MDC-2 : Inorganic Chemistry I Atomic Structure and Chemical Bonding

(Theory: 2 credits)

Unit	Topics to be covered	No. of Lectures
1	**Atomic Structure:** What is Quantum mechanics? Time independent Schrodinger equation and meaning of various terms in it. Significance of ψ and ψ^2, Schrödinger equation for hydrogen atom. Radial and angular parts of the hydogenic wavefunctions (atomic orbitals) and their variations for 1s, 2s, 2p, 3s, 3p and 3d orbitals (Only graphical representation). Radial and angular nodes and their significance. Radial distribution functions and the concept of the most probable distance with special reference to 1s and 2s atomic orbitals.	04
2	**Chemical Bonding and Molecular Structure** MO Approach: Rules for the LCAO method, bonding and antibonding MOs and their characteristics for *s-s*, *s-p* and *p-p* combinations of atomic orbitals, nonbonding combination of orbitals, MO treatment of homonuclear diatomic molecules of 1st and 2nd periods (including idea of *s-p* mixing) and heteronuclear diatomic molecules such as CO, NO and NO^+. Comparison of VB and MO approaches.	04
	Organic Chemistry	
3	**Aliphatic Hydrocarbons** Functional group approach for the following reactions (preparations & reactions) to be studied in context to their structure. **Alkanes:** (Upto 5 Carbons). *Preparation:* Catalytic hydrogenation, Wurtz reaction, Kolbe's synthesis, from Grignard reagent. *Reactions:* Free radical Substitution: Halogenation. **Alkenes:** (Upto 5 Carbons) *Preparation-* Elimination reactions: Dehydration of alkenes and dehydrohalogenation of alkyl halides (Saytzeff's rule); cis alkenes (Partial catalytic hydrogenation) and trans alkenes (Birch reduction). *Reactions:* cis-addition (alk. KMnO4) and trans-addition (bromine), Addition of HX (Markownikoff's and anti-Markownikoff's addition), Hydration, Ozonolysis, oxymercuration-demercuration, Hydroboration-oxidation. **Alkynes**: (Upto 5 Carbons) *Preparation:* Acetylene from CaC_2 and conversion into higher alkynes; by dehalogenation of tetra halides and dehydrohalogenation of vicinal-dihalides. *Reactions:* formation of metal acetylides, addition of bromine and alkaline $KMnO_4$, ozonolysis and oxidation with hot alk. $KMnO_4$.	06

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4	**Gaseous state:** Kinetic molecular model of a gas postulates and concept of an Ideal gas, Derivation of the kinetic gas equation and various gas laws; Maxwell's Distribution of Molecular velocities and its use in evaluating different types of molecular velocities – Most Probable Velocity, Average (Mean) Velocity, Root Mean Square (RMS) Velocity, and Average kinetic energy; Relationship between various molecular velocities; Law of equipartition of energy, degrees of freedom and molecular basis of heat capacities. Viscosity of gases, co-efficient of viscosity and its dependence on temperature and pressure; Collision frequency, Collision diameter and Mean free path; Relationship between mean free path (λ) and co-efficient of viscosity (η), Calculation of collision diameter (σ) from co-efficient of viscosity (η). Behaviour of real gases: Deviations form ideal gas behavior, compressibility factor Z, and its variation with pressure for different gases; Causes of deviation from ideal behaviour. Equation of states for real gases; Van der Waals equation of state, its derivation and application in explaining real gas behaviour, Virial coefficients, calculation of Boyle temperature; Isotherms of real gases and their comparison with van der Waals isotherms, continuity of states, critical state & critical constants, relation between critical constants and van der Waals constants, law of corresponding states.	06
	TOTAL	20

Suggested Readings :

19. Advanced Inorganic Chemistry, F.A. Cotton, G. Wilkinson.
20. Concise Inorganic Chemistry, J.D. Lee, Blackwell Science, 2001.
21. Inorganic Chemistry, J.E. Huheey, E.A. Keiter and R.I. Keiter. Pearson Education Asia, 2000.
22. Inorganic Chemistry, ELBS 2nd Edition, D.F. Shriver, P.W. Atkins and C.H. Langford. Oxford University Press 2002.
23. Principles of Inorganic Chemistry. B.R. Puri, L.R. Sharma, Jauhar S.P., S.N. Chand & Co.
24. Inorganic Chemistry, 3rd Edition (ISE) A.G. Sharpe Addison Wesley.

Reference Books:

25. J. D. Lee: *A new Concise Inorganic Chemistry*, E L. B. S.
26. F. A. Cotton & G. Wilkinson: *Basic Inorganic Chemistry*, John Wiley.
27. Douglas, McDaniel and Alexader: *Concepts and Models in Inorganic Chemistry*,
28. John Wiley.
29. James E. Huheey, *Ellen Keiter and Richard Keiter: Inorganic Chemistry: Principles*
30. *of Structure and Reactivity*, Pearson Publication.
31. T. W. Graham Solomon: *Organic Chemistry, John Wiley and Sons.*
32. Peter Sykes: *A Guide Book to Mechanism in Organic Chemistry,* Orient Longman.
33. E. L. Eliel: *Stereochemistry of Carbon Compounds*, Tata McGraw Hill.
34. I. L. Finar: *Organic Chemistry* (Vol. I & II), E. L. B. S.
35. R. T. Morrison & R. N. Boyd: *Organic Chemistry*, Prentice Hall.
36. Arun Bahl and B. S. Bahl: *Advanced Organic Chemistry,* S. Chand

14.6.23 14.6.23

MDC-2(P): Physical Chemistry Lab.

When the students will finish this practical course , they will be skilled in:-

- **: determination of coefficient of viscosity of various types of liquids and also in the determination of the surface tension of the various types of liquids.**
- **: molecular weight determination by victor Meyer Method.**
- **: pH dermination of various types of buffer solutions.**

MDC-2(P) :Physical Chemistry Lab.

(Practical: 1 credit)

Practical :

Surface tension measurements using Stalagmometer

Determine the surface tension of aqueous solutions by (a) drop number, (b) drop weight method.

Viscosity measurement using Ostwald's viscometer.

3. Determination of co-efficient of viscosity of an unknown aqueous solution.
4. Study of variation of viscosity with different concentration of sugar solutions.

Molecular weight of a volatile compound

Determination of molecular weight of a volatile compound using Victor Meyer's method.

Suggested Readings :

4. Khosla, B.D.; Garg, V.C. & Gulati, A.; Senior Practical Physical Chemistry; R. Chand & Co, NewDelhi.
5. Garland, C.W.; Nibler, J.W.; Shoemaker, D.P.; Experiments in physicalChemistry, 8th Edition, McGraw-Hill, New York.
6. Yadav, J. B.; Advanced Practical Physical Chemistry, 32nd Ed; Goel Publishing House.

14.6.23 14.6.23

(C) Multidisciplinary Courses to be offered

Sl. No.	Sem	Type of Course	Name of Course	Credits	Marks
1.	I	MDC-1	To be selected from the basket	3	100
2.	II	MDC-2	To be selected from the basket	3	100
3.	III	MDC-3	To be selected from the basket	3	100

Sub Total = 09