



SEMESTER 1

MGU-UGP (HONOURS)

Syllabus



Mahatma Gandhi University

Kottayam

Programme	BSc (Hons) CHEMISTRY					
Course Name	Fundamentals of Chemistry-1					
Type of Course	DSC A					
Course Code	MG1DSCCHE100					
Course Level	100-199					
Course Summary	This course covers the basic principles and concepts of atoms, elements, compounds, and fundamentals of organic chemistry. Students explore atomic structure, electron displacements in organic chemistry, reactive intermediates, and the periodic table to understand the foundation of chemical interactions.					
Semester	I	Credits		4	Total Hours	
Course Details	Learning approach	Lecture	Tutorial	Practical		Others
		3		1		75
Pre-requisites, if any	MGU-UGP (HONOURS)					

COURSE OUTCOMES (CO) *Syllabus*

CO No.	Expected Course Outcome	Learning Domains *	PO No
1	Apply atomic models to forecast and explain electronic configurations, atomic behaviour, and characteristics.	A	1,2
2	Describe the relevance of organic chemistry, catenation and hybridisation.	U	1,2,10
3	Evaluate electron displacement patterns in organic molecules using arrow notation.	E	1,2
4	Utilize arrow-pushing mechanisms to illustrate and solve simple chemical reactions involving reactive intermediates.	A	1,2

5	Analyse periodic trends, the relationship between electronic configuration and the chemical reactivity of elements, including the formation of chemical bonds.	An	1,2
6	Identify metals through flame and spot tests, chloride in water, and lead in food samples, and acquire skill in organic preparation.	S	1,2,10
*Remember (K), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C), Skill (S), Interest (I) and Appreciation (Ap)			

COURSE CONTENT

Content for Classroom Transaction (Units)

Module	Units	Course description	Hrs	CO No.
1	Atomic Structure			
	1.1	Atomic spectrum of hydrogen atom, explanation using Bohr atom model, limitations of Bohr atom model.	4	1
	1.2	Dual nature of matter, de Broglie equation, Heisenberg's uncertainty principle and its significance.	2	1
	1.3	Concept of orbit and orbital. Types of orbitals, shapes of s, p and d orbitals.	2	1
	1.4	Quantum numbers and their significance.	2	1
	1.5	Pauli's Exclusion Principle, Hund's rule of maximum multiplicity and Aufbau principle.	2	1
	1.6	Electronic configuration of atoms (upto atomic number 30). Stability of half-filled and completely filled electronic configurations.	3	1
2	Fundamentals of Organic Chemistry			
	2.1	Relevance of organic chemistry in day-to-day life (with 2-3 examples). Carbon: catenation and hybridisations (with examples ethane, ethene and ethyne).	3	2
	2.2	Arrow notations, bond fissions: curved arrow notation, drawing electron displacements with curved arrows, curved and fishhook arrows in	2	3,4

		organic reaction mechanisms. Polarity of bonds (basic concepts only).		
	2.3	Homolysis and heterolysis with examples. Reactive intermediates: formation, structure and stability of carbocations, carbanions, and free radicals.	4	3,4
	2.4	Electron displacement effects: inductive effect- influence of inductive effect in the acidity of carboxylic acids. Resonance effect (delocalization, contributing structures, and stability) - hyperconjugation	6	3,4
	Chemistry of Elements and Molecules			
3	3.1	Modern periodic law – long form periodic table. Classification of elements- s, p, d and f block, metal, non-metals and metalloids.	4	5
	3.2	Diagonal relationship and anomalous behaviour.	1	5
	3.3	Periodicity in properties: Atomic and ionic radii - ionization enthalpy - electron affinity (electron gain enthalpy) – electronegativity. Electronegativity scales: Pauling Scale	5	5
	3.4	Effective nuclear charge – Slater rule and its applications	2	5
	3.5	Valency and oxidation state with examples	1	5
	3.6	Introduction to molecules- types of bonds, ionic bond, covalent bond, coordinate bond	2	5
		Foundation Course 1 Practical		
4	4.1	1. Demonstration of atomic models using software (non-evaluative) 2. Detection of sodium, potassium, calcium, barium and strontium ions through flame test. 3. Spot test of nickel, zinc and copper. 4. Chloride ion detection in well water and tap water. 5. Detection of lead in food samples. 6. Draw structures of simple organic molecules and resonance structures using chem-sketch / chemdraw.	30	6

		<p>7. Preparation of 5-nitrosalicylic acid from salicylic acid.</p> <p>8. Preparation of <i>p</i>-nitroacetanilide from acetanilide.</p> <p>9. Separation of the Components of a mixture by decantation, extraction, filtration and sublimation techniques.</p>		
5	Teacher-Specific content			
Teaching and Learning Approach	Lecture sessions, interactive sessions including discussions, demonstrations, and experiments to engage students actively and visual aids like presentations, videos, and models to enhance understanding. Encourage students to ask questions during or after the lectures. Begin with safety instructions and guidelines for lab work. Allow students to conduct experiments under supervision (for lab work).			
Assessment Types	<p>MODE OF ASSESSMENT</p> <p>A. Continuous Comprehensive Assessment (CCA)</p> <p>Theory(25 marks)</p> <p>Assignments</p> <p>MCQ</p> <p>Viva</p> <p>Involvement in classroom activities</p> <p>Practical (15 marks)</p> <p>Lab skill/ analysis</p>			
	<p>B. End Semester Evaluation (ESE)</p> <p>Theory- 50 marks – 1.5 hrs</p> <p>i) MCQ 10 questions: 10 X 1 = 10</p> <p>ii) Short answer 4 questions (out of 6): 4 X 3 =12</p> <p>iii) Short essay 4 questions (out of 6): 4 X 7 = 28</p> <p>Practical -35 marks - 1 hrs</p> <p>i) Lab report: 10</p> <p>ii) Viva: 15</p> <p>iii) Writing procedure: 10</p>			

References

1. B. R. Puri, L. R. Sharma and K. C. Kalia, *Principles of Inorganic Chemistry*, Vikas Publishing Co. Jalandhar, 2013.

2. J. D. Lee, *Concise Inorganic Chemistry*, 5th Edn. Chapman & Hall, 2009.
3. P. W. Atkins and J. de Paula, *Physical Chemistry*, 11th Edn. Oxford University Press, 2018.
4. R.T Morrison, R.N. Boyd and S.K. Bhattacharjee *Organic Chemistry*, 7th Edn. Dorling Kindersley (India) Pvt. Ltd (Pearson Education), 2011.
5. T.W. Graham Solomon, C.B. Fryhle, S.A. Snyder, *Organic Chemistry*, John Wiley & Sons, 2014.
6. A. Bahl, and B.S. Bahl, *Advanced Organic Chemistry*, S. Chand, 2010.
7. F. A. Cotton, G. Wilkinson and P. L. Gaus, *Basic Inorganic Chemistry*, 3rd Edn. John Wiley, 2007.
8. D. F. Shriver and P. W. Atkins, *Inorganic Chemistry*, 4th Edn. Oxford University Press, 2006.
9. Vogels *Textbook of Quantitative Chemical Analysis*, 6th Edn. Pearson Education Ltd.
10. F. P. Miller, A. F. Vandome, McB. John, *Flame Test*, VDM Publishing, 2010.
11. S M. Basavarajaiah, G. Y. Nagesh, K. R. Reddy, *Compendious Practical Organic Chemistry: Preparations, Isolation, and Chromatography*, Notion Press, 2021.
12. T. Brown, C. Murphy, H. LeMay, *Laboratory Experiments for Chemistry*, Pearson, 2018.

SUGGESTED READINGS

1. J.E. Huheey, E.A. Keitler and R.L. Keitler, *Inorganic Chemistry—Principles of Structure and Reactivity*, 4th Edn, Pearson Education, New Delhi, 2013.
2. J.Clayden, N.Greeves, S. Warren and P.Wothers, *Organic Chemistry*, 2nd Edn. Oxford University Press, 2012.

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