

Mizoram University

UG/Bachelor's Degree Programme with Multiple Entry and Exit Options

Under the New Education Policy 2020

in

CHEMISTRY

First Semester

Semester	Course Code	Course Name	Components with Credits		Total credits
			Theory	Practical	
I	CHEM/MJ/100	Physical Chemistry-I	3	1	4
	CHEM/MJ/101	Inorganic Chemistry-I	4	-	4
	CHEM/MN/102	<i>[To be chosen from an MJ course offered by other disciplines]</i>	4	-	4
		Introductory Course (Interdisciplinary)	3	-	3
	AEC/103	MIL/English I	3	-	3
	VAC/104	Understanding India	2	-	2
					20

Physical Chemistry-I

CHEM/MJ/100

Credits: 3 (Theory) + 1 (Practical)

Theory

UNIT 1 Gaseous State-I

Kinetic Molecular model of a gas, Postulates and Derivation of Kinetic Gas Equation (KGE), Deviation from ideal behavior (causes); Compressibility factor (Z) and its variation with pressure for different gases; van der Waal's equation of state; Evaluation of Critical Constant from van der Waal's equation; critical compressibility factor (Z_c), Law of Corresponding states & Boyle temperature.

UNIT 2 Liquid State

Introduction, Vacancy theory of liquid, Free volume in liquid, Physical properties of liquids viz., surface tension, viscosity & refraction. Refraction Index, Specific refraction & Molar refraction (definitions only), Effect of temperature on surface tension & viscosity.

Liquid crystals – structure and types of liquid crystals (elementary discussion only).

UNIT 3 Colloids and Surface Chemistry

Classification of colloids, preparation of colloids, Bredig's and condensation methods, Peptization, Optical properties of colloids-Tyndall effect. Origin of charge on colloidal particles, protective colloids, gold number.

Physisorption & chemisorptions; molar enthalpy of adsorption, Langmuir, Freundlich & Gibbs adsorption isotherms.

UNIT 4 Chemical Kinetics & Catalysis

Concepts of Rate, Order and Molecularity of reaction, Effect of Temperature on Reaction Rate; Temperature Coefficient of a reaction, Arrhenius Equation; Concept of Activation energy, Collision Theory & Absolute Reaction Rate Theory. Types and characteristics of Catalysis, Enzyme catalysis; Michaelis–Menten equation; Turn over number (definition only)

Practical

1. Determination of Surface tension of a field liquid by Drop number method.
2. Determination of coefficient of viscosity by Oswald's viscometer of ethanol – water system.
3. Determination of water equivalent of a calorimeter.
4. Determination of heat of neutralization of a strong acid with strong base.
5. Study of Heat of dilution of H_2SO_4 and then determination of the strength of the unknown acid.
6. Preparation of colloidal sols of Arsenious sulphide, $Fe(OH)_3$, and Prussian blue sols.

NOTE: Experiments may be added/deleted subject to the availability of facilities.

Mark distribution of practical for end semester examination

1. Experiment(s)	13
2. Laboratory record	3
3. Viva voce	4
TOTAL	20

Suggested readings:

For Theory:

1. Puri, Sharma, & Pathania, Principles of Physical Chemistry, Vishal Publishing Co, Jalandhar.
2. A.S. Negi, S.C. Anand, A Text book of Physical Chemistry, New Age International Publishers, N. Delhi
3. N. B. Singh, S. S. Das, & Ram Ji Singh, Physical Chemistry, New Age International Publishers, N. Delhi.
4. Arun Bhal, B.S. Bhal & G.D. Tuli, Essential of Physical Chemistry, S. Chand & Co.

For Practicals:

1. B. Viswanathan and P.S. Raghavan, Practical Physical Chemistry, Viva Books Private Ltd. New Delhi
2. S. Chawla, Essentials of Experimental Engineering Chemistry, Dhanpat Rai & Co. New Delhi
3. J.B. Yadav, Advance Practical Physical Chemistry, Goel Publishing House, Meerut
4. A.I. Vogel, A Textbook of Quantitative Inorganic Analysis, Longman

Inorganic Chemistry-I

CHEM/MJ/101

Credits: 4

UNIT 1 Atomic Structure:

Review of Bohr's theory and its limitations; de-Broglie's concept of dual character of matter; Heisenberg's Uncertainty Principle; Schrodinger wave equation (derivation not required); quantum numbers and their significance; radial and angular wave functions (derivations not required) and probability distribution curves; atomic-orbitals; shapes of *s*, *p* and *d*-orbitals.

Pauli's Exclusion Principle, Hund's rule of maximum multiplicity, Aufbau's principle and its limitations.

Electronic configurations of the atoms. Stability of half-filled and completely filled orbitals, concept of exchange energy. Relative energies of atomic orbitals, Anomalous electronic configurations.

UNIT 2 Periodic Properties:

General features of long form of periodic table. Effective nuclear charge, shielding or screening effect, Slater rules, variation of effective nuclear charge in periodic table Detailed discussions (definition, factors affecting it, periodic trends including irregularities in periodic trends) of the following properties of the elements, with reference to *s* & *p*- block: (a) Atomic radii and Ionic radii (b) Ionization Energy (c) Electron Affinity (d) Electronegativity.

UNIT 3 Chemical Bonding - I:

Basic idea of ionic bond, covalent bond and coordinate bond.

Covalent character in ionic compounds, polarizing power and polarizability. Fajan's rule, polarization.

Ionic character in covalent compounds: Bond moment and dipole moment. ionic character from dipole moment and electronegativities.

Concept of hybridization, types, orientation of hybrid orbitals; Resonance and resonance energy, Valence shell electron pair repulsion (VSEPR) theory, shapes of simple molecules and ions containing lone pairs and bond pairs of electrons taking the following examples: BeF_2 , BF_3 , SnCl_2 , NH_3 , H_2O , H_3O^+ , H_2S , PCl_3 , PCl_5 , SF_4 , SF_6 , ClF_3 , ICl_2^- .

Unit 4 Oxidation-Reduction and general principle of metallurgy:

Oxidation and reduction; Oxidation number, calculation of oxidation number; Calculation of Equivalent Weights of Oxidants and Reductants. Balancing of redox reactions by ion-electron methods (simple redox reactions).

Standard Electrode Potential and its application to inorganic reactions. Occurrence of metals based on standard electrode potentials. Ellingham diagrams for reduction of metal oxides using carbon or carbon monoxide as reducing agent. Electrolytic Reduction, Hydrometallurgy. Methods of purification of metals: Electrolytic Kroll process, van Arkel - de Boer process and Mond's process, Zone refining.

Suggested readings

1. R.R. Puri, L.R. Sharma and K.C. Kalia, *Principles of Inorganic Chemistry*, Milestone Publishers & Distributors.
2. J.D. Lee, *Concise Inorganic Chemistry*, Oxford University Press.
3. R. Gopalan, *Inorganic Chemistry* for undergraduates, University Press
4. S. Prakash, G.D. Tuli, S.K. Basu & R.D. Madan. *Advanced Inorganic Chemistry*, Vol. I & II, S. Chand & Co.
5. R.D. Madan, *Modern Inorganic Chemistry*, S. Chand & Co.
6. W.U. Malik G.D Tuli and R.D Madan, *Selected Topics in Inorganic Chemistry*, S. Chand & Co.