

| Course Code: 22BCHA1 | Allied-I A | T/P | C | H |
|-------------------------|---|-----|---|---|
| | GENERAL CHEMISTRY – I | T | 3 | 3 |
| Objectives | The objective of this paper is to introduce the basic concepts of the atomic structure, periodic table, chemical bonding, adsorption and catalysis. Students will get an idea about the types of organic reactions, intermediates formed and some important polymer products. | | | |
| Unit-I | Atomic Structure 1.1 Definition of atom, atomic number, atomic mass, Bohr's model of an atom. 1.2 Orbit -Orbitals –Quantum numbers. 1.3 Heisenberg uncertainty principle, De Broglie equation, Einstein equation. 1.4 Filling up of orbitals – Aufbau principle, Hund's rule, Pauli's exclusion principle, electronic configuration of elements. | | | |
| Unit-II | Periodic Table 2.1 Mendeleff's periodic law, characteristics of Mendeleff's periodic table, Merits and demerits. 2.2 Long form of the periodic table and its characteristics. 2.3 Periodic variation on properties – Atomic radius, ionization potential, electron affinity, electronegativity. 2.4 Classification of elements based on electronic configuration. | | | |
| Unit- III | Chemical Bonding 3.1 Valence Bond theory – s-s, s-p, p-p overlap sigma and pi bond. 3.2 Hybridization – sp, sp ² , sp ³ with suitable example. 3.3 VSEPR theory – Molecules with regular and irregular geometry. 3.4 Molecular Orbital theory, bonding and antibonding orbital – MO diagram of N ₂ , O ₂ - bond order | | | |
| Unit -IV | Adsorption and Catalysis 4.1 Definition of the various terms – adsorbate, adsorbent, adsorption, absorption. Adsorption of gases on solids. 4.2 Physical adsorption – Chemical adsorption, factors influencing adsorption, application of adsorption. 4.3 Catalysis – classification of catalysis, characteristics of catalysis, Theories of catalysis. 4.4 Promoters and poison – enzyme catalysis, acid-base catalysis and autocatalysis with suitable example – applications. | | | |
| Unit-V | 5.1 Homolytic fission – Heterolytic fission of a bond. Nucleophiles and electrophiles and their classification. 5.2 Reaction intermediates: Carbanion, carbonium ion, free radicals and their stability. 5.3 Types of organic reactions, substitution, addition, elimination, rearrangement, polymerization. 5.4 Preparation and uses of Nylon 6, Nylon 66, Terylene, Viscose rayon, cellulose | | | |

acetate and cellulose nitrate.

Reference for Text Books:

Puri, Sharma & Pathania, *Advanced Physical Chemistry*.

Soni P.L. *Text book of Inorganic Chemistry*.

SathyaPrakash, *Advanced Inorganic Chemistry*.

Soni P.L. *Text Book of Organic Chemistry*.

Arun Bahl and B.S. Bahl, *Text Book of Organic Chemistry*.

Outcomes

Students can be able to understand the fundamentals of the atomic structure, periodic table, chemical bonding, adsorption and catalysis. They become familiar with the types of organic reactions, intermediates formed and also the use of important polymer products in daily life.

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|---------------------------------|----------------------------|------------|----------|----------|
| Course Code: 22BCHAP1 | Allied-I A | T/P | C | H |
| | VOLUMETRIC ANALYSIS | P | 2 | 2 |

Maximum Marks: 60

Hrs.: 2

| S. No | Standard | Link | Estimation |
|-----------------------------------|---------------------------|----------------------|----------------------|
| Acid – Base neutralization | | | |
| 1 | Sodium carbonate | Hydrochloric acid | Sodium hydroxide |
| 2 | Oxalic acid | Sodium hydroxide | Oxalic acid |
| 3 | Sodium carbonate | Hydrochloric acid | Sodium Carbonate |
| Redox – Permanganometry | | | |
| 4 | Oxalic acid | Permanganate | Ferrous sulphate |
| 5 | Ferrous ammonium sulphate | Permanganate | Ferrous sulphate |
| 6 | Oxalic acid | Permanganate | Oxalic acid |
| 7 | Ferrous ammonium sulphate | Permanganate | Oxalic acid |
| Dichrometry | | | |
| 8 | Ferrous ammonium sulphate | Potassium dichromate | Ferrous sulphate |
| Iodimetry | | | |
| 9 | Potassium dichromate | Sodium thiosulphate | Potassium dichromate |
| 10 | Potassium dichromate | Sodium thiosulphate | Copper sulphate |
| 11 | Potassium dichromate | Sodium thiosulphate | Permanganate |

Internal 40 marks

External 60 marks

Distribution of external marks:

Record - 10 marks

Procedure - 10marks

Estimation - 40marks

Less than 1% - 40 marks

1-2 % - 30 marks

2-3 % - 20 marks

3-4 % - 15 marks

Above 4% - 10 marks

Note: University practical Examination – 3 Hours

| Course Code: 22BCHA2 | Allied-I B | T/P | C | H |
|-------------------------|---|-----|---|---|
| | GENERAL CHEMISTRY – II | T | 3 | 3 |
| Objectives | Students can gain knowledge about the hydrides and oxides, to study the gas laws, physical properties of liquids and solids and the types of nuclear reactions. Students can understand about stereochemistry and the applications of organic compounds. | | | |
| Unit-I | 1.1 Hydrides: Classification of hydrides with suitable example. Preparation, properties and uses of LiAlH_4 , NaBH_4 . 1.2 Oxides – Classification based on chemical behavior and oxygen content. 1.3 Hydrogen peroxide: Preparation, oxidizing and reducing properties, uses. 1.4 Ozone: Preparation, oxidizing and reducing properties, uses. | | | |
| Unit-II | 2.1 Postulates of kinetic theory of gases – Derivation of expression for pressure of gas on the basis of kinetic theory, deducing basic gas laws. 2.2 Ideal gases and real gases – deviations of real gases from ideal behaviour – reason for the deviation. 2.3 Derivation of Vander Waals gas equation. Law of corresponding state – reduced equation of state and its significance. 2.4 Average, RMS and most probable velocities (Equation only- No derivation). Calculating the above velocities. | | | |
| Unit- III | 3.1 Liquid state: Surface tension – Viscosity – Trouton’s rule and its significances. 3.2 Solid state – types of solids, crystals, unit cell 3.3 Crystallographic system – Bravais lattice, simple, body centered, face centered cubic lattice 3.4 Conductors, semiconductors (intrinsic and extrinsic semiconductor) – Insulators. | | | |
| Unit -IV | 4.1. Nuclear Chemistry: Composition of the nucleus – mass defect – binding energy – Radioactivity – half-life period –radioactive series - Soddy’s group displacement law – illustration 4.2. Nuclear fission – Definition – theories of fission – application of fission – the principle of atom bomb. 4.3. Nuclear fusion – Definition – emission of energy – stellar energy –Principle of Hydrogen bomb. Differences between nuclear fission and nuclear fusion. 4.4. Application of radioactivity – in medicine, agriculture, tracer technique and carbon dating. | | | |
| Unit-V | 5.1 Stereochemistry – Geometrical isomerism- Definition- Maleic and fumaric acid, Cis butene and trans butene. 5.2 Optical isomerism – Definition - optical activity- Asymmetric carbon-dextro rotary and laevorotary- optical isomerism in tartaric acid- Racemic mixture. – enantiomers and diastereo isomers. 5.3. Synthetic application of Grignard reagent. 5.4. Important compounds used as solvents and pesticides- Preparation and uses of | | | |

chloroform, Carbon tetrachloride, DDT, BHC, and Freon.

Reference for Text Books:

Arun Bahl and B.S. Bahl, *Text Book of Organic Chemistry* .

Puri, Sharma & Pathania, *Advanced Physical Chemistry* .

Sathyaprakash, *Advanced Inorganic Chemistry* .

Soni P.L. *Text Book of Organic Chemistry* .

Soni PL. *Text book of Inorganic Chemistry* .

Outcomes

The chemistry of hydrides and oxides can be well understood. Students can gain knowledge on the gas laws, physical properties of liquids and solids and the nuclear reactions. They can understand about stereochemistry and the applications of organic compounds.

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|---------------------------------|---------------------------------------|------------|----------|----------|
| Course Code: 22BCHAP2 | Allied-I B | T/P | C | H |
| | INORGANIC QUALITATIVE ANALYSIS | P | 2 | 2 |

Maximum Marks: 60

Hrs.: 2

To analyze an inorganic salt containing one simple / interfering anion and one cation.

Internal 40 marks

External 60 marks

Distribution of external marks:

Record - 10 marks

One anion with correct procedure -20marks

Group separation - 10 marks

One cation with correct procedure - 20 marks

60 marks

Note: University practical Examination – 3 Hours

| Course Code: 22BCHA3 | Allied-II A | T/P | C | H |
|-------------------------|---|-----|---|---|
| | GENERAL CHEMISTRY – III | T | 3 | 3 |
| Objectives | The objective is to introduce the basic concepts of metallurgy, alloys, polymers and fuel gases. Students will get an idea about the coordination chemistry, halogen family, carbides, bioinorganic chemistry, amino acids, carbohydrates, vitamins and chemotherapy. | | | |
| Unit-I | 1.1. Metallurgy: ores – minerals - general methods of ore dressing – different types of metal refining. 1.2. Alloys and Amalgams: Definition – Alloys of Copper and Nickel – Amalgams: examples – Applications of alloys and amalgams. 1.3. Polymers- Synthesis, properties and uses of Silicones Bio degradable polymers. 1.4. Preparation and applications of Fuel gases – water gas, semi water gas, producer gas, natural gas and oil gas (manufacturing details not needed). | | | |
| Unit-II | Coordination Chemistry 2.1. Definition of coordination complexes, ligands and classification of ligands with example. Differences between complexes and normal compounds. Naming of complexes. Effective atomic number rule. 2.2. Theories of co-ordination compounds: Werner's theory. Chelates - Definition and applications of chelate formation. Metal porphyrin complexes. 2.3. Metal carbonyls, classification and modern applications as catalysts. 2.4. Structure of EDTA and its application. Applications of Coordination compounds. | | | |
| Unit- III | 3.1. Halogens – Position of halogens in the Periodic Table – General trends in the properties of halogens – Deviation of Fluorine from other elements of the group. 3.2. Interhalogen Compounds: definition, XY, XY₃, XY₅ and XY₇ types with examples. Pseudohalogens and pseudohalides – definition with examples. 3.3. Carbides: Types of Carbides – Covalent, ionic, and interstitial carbides with suitable examples. 3.4. Chemistry of Boride, Borazole, Borax. | | | |
| Unit -IV | 4.1. Bio-inorganic Chemistry- Significance of metal and metal ions in biological ions in biological systems. Role of alkaline and alkaline earth metal ions (Na, K, Mg, Ba, Ca) in biological systems. 4.2. Metalloporphyrin – Hemoglobin- Role of iron in Hemoglobin 4.3. Chlorophyll – Role of magnesium ion in Chlorophyll. 4.4. Metal poisoning – Cadmium and Mercury poisoning | | | |
| Unit-V | 5.1. Amino acids: classification of amino acids – peptide formation – isoelectric point – proteins – primary, secondary and tertiary structure (definitions only). 5.2. Carbohydrates: Classification and examples – reducing and non-reducing sugars interconversion of glucose and fructose. Sucrose: Hydrolysis – inversion of sucrose structure of glucose, fructose and sucrose (structural elucidation not | | | |

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| | <p>required).</p> <p>5.3. Vitamins: Definition – classification – sources – deficiency and diseases</p> <p>5.4. Chemotherapy: Definition and example for (i) Analgesics (ii) Antibacterials (iii) Anti-inflammatory (iv) Antipyretic (v) Antibiotic (vi) Antiviral (vii) Antiseptics (viii) Antimalarials (ix) Anaesthetic.</p> |
| <p>Reference for Text Books:</p> <p>Puri, Sharma & Pathania, <i>Advanced Physical Chemistry</i> .</p> <p>Soni P.L. Text book of Inorganic Chemistry .</p> <p>SathyaPrakash, <i>Advanced Inorganic Chemistry</i> .</p> <p>Soni P.L. <i>Text Book of Organic Chemistry</i> .</p> <p>Arun Bahl and B.S. Bahl, <i>Text Book of Organic Chemistry</i> .</p> | |
| <p>Outcomes</p> | <p>Students can be able to understand the basic concepts of metallurgy, alloys, polymers and fuel gases. Students can gain knowledge about the coordination chemistry, halogen family, carbides, bioinorganic chemistry, amino acids, carbohydrates, vitamins and chemotherapy.</p> |

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|---------------------------------|----------------------------|------------|----------|----------|
| Course Code: 22BCHAP3 | Allied-I B | T/P | C | H |
| | VOLUMETRIC ANALYSIS | P | 2 | 2 |

Maximum Marks: 60

Hrs.: 2

| S. No | Standard | Link | Estimation |
|-----------------------------------|---------------------------|----------------------|----------------------|
| Acid – Base neutralization | | | |
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| 2 | Oxalic acid | Sodium hydroxide | Oxalic acid |
| 3 | Sodium carbonate | Hydrochloric acid | Sodium Carbonate |
| Redox – Permanganometry | | | |
| 4 | Oxalic acid | Permanganate | Ferrous sulphate |
| 5 | Ferrous ammonium sulphate | Permanganate | Ferrous sulphate |
| 6 | Oxalic acid | Permanganate | Oxalic acid |
| 7 | Ferrous ammonium sulphate | Permanganate | Oxalic acid |
| Dichrometry | | | |
| 8 | Ferrous ammonium sulphate | Potassium dichromate | Ferrous sulphate |
| Iodimetry | | | |
| 9 | Potassium dichromate | Sodium thiosulphate | Potassium dichromate |
| 10 | Potassium dichromate | Sodium thiosulphate | Copper sulphate |
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Less than 1% - 40 marks

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Above 4% - 10 marks

Note: University practical Examination – 3 Hours

| Course Code: 22BCHA4 | Allied-II B | T/P | C | H |
|-------------------------|--|-----|---|---|
| | GENERAL CHEMISTRY – IV | T | 3 | 3 |
| Objectives | To provide the detailed chemistry about thermodynamics, match industry, paper making and corrosion. To introduce the students about the separation techniques, kinetics of reaction, basic electrochemical laws and important dyes and its application. To help the students to understand the basics of clinical chemistry. | | | |
| Unit-I | Thermodynamics 1.1 Energetics: Energy – various forms of energy – internal energy – first law of thermodynamics and its mathematical derivation. 1.2 Enthalpy: Definition – Molar heat capacity at constant volume and constant pressure – relationship between C_p and C_v – Hess's law – applications of Hess's law. 1.3 Second law of thermodynamics in different forms – Distinction between reversible and irreversible processes – thermodynamical criteria for reversible and irreversible processes. 1.4 Entropy – physical significances of entropy - Derivation of Helmholtz free energy change and Gibbs free energy change. | | | |
| Unit-II | 2.1. Match Industry, Pyrotechny and Explosives: Raw materials needed for match industry- manufacturing process. 2.2. Pyrotechnics – colored smokes –Explosives- Definition – classification- Nitroglycerin, dynamite, cordite, TNT and picric acid. 2.3. Corrosion of Metals: Definition – various methods of preventing corrosion – coating with other metals (galvanising, tinning and electroplating) – cathodic protection and painting, corrosion inhibitor. 2.4. Chemistry of paper: Raw materials – manufacturing process – bleaching and colouring. | | | |
| Unit- III | 3.1. Separation and Purification Techniques: Solvent extraction – Soxhlet extraction. 3.2. Principles and applications of distillation, fractional distillation, steam distillation – crystallization and sublimation. 3.3. Desiccants – classification – choice of desiccant – vacuum drying – drying of solid and liquid. 3.4. Chromatography: Column, Paper, Thin layer, Gas and Ion Exchange chromatography – principles, method and applications | | | |
| Unit -IV | Chemical Kinetics: rate and rate constant of a chemical reaction. Order and molecularity of reaction. Factors deciding the rate of a reaction. First order rate equation. Half-life of a reaction. 4.2. Conductance, specific conductance, equivalent conductance, effect of dilution on specific and equivalent conductance. 4.3. Ostwald's dilution law – common ion effect, pH- Definition – Buffer solution- Definition-Examples – Buffer action- Henderson equation. 4.4. Definition –Distinction and examples of primary cells- secondary cells – Standard cell, Cadmium standard cell, reference electrode, calomel electrode. | | | |

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| Unit-V | <p>5.1. Dyes: definition – Otto-Witt theory of colour and constitution – bathochromic shift and hypsochromic shift – classification of dyes with examples according to structure and applications. Preparation and uses of following dyes: Methyl orange, phenolphthalein, indigo and alizarin.</p> <p>5.2. Clinical chemistry – Composition of blood – blood grouping – determination of blood groups and matching – blood pressure – hypertension – determination.</p> <p>5.3. Determination of glucose in serum – Nelson method and Somogyi method</p> <p>5.4. Estimation of glucose in urine – Benedict's test. Estimation of Haemoglobin - Detection of diabetes and anemia</p> |
| <p>Reference for Text Books:</p> <p>Puri, Sharma & Pathania, <i>Advanced Physical Chemistry</i>.</p> <p>Soni PL. <i>Text book of Inorganic Chemistry</i>.</p> <p>SathyaPrakash, <i>Advanced Inorganic Chemistry</i>.</p> <p>Soni P.L. <i>Text Book of Organic Chemistry</i>.</p> <p>Arun Bahl and B.S. Bahl, <i>Text Book of Organic Chemistry</i>.</p> | |
| Outcomes | <p>It may give a clear knowledge about thermodynamics, match industry, paper making and corrosion. The students will acquire knowledge of the separation techniques, kinetics of reaction, basic electrochemical laws and important dyes and its application. The students will have a better understanding of the basics of clinical chemistry.</p> |

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|---------------------|---------------------------------------|------------|----------|----------|
| Course Code: | Allied-II B | T/P | C | H |
| 22BCHAP4 | INORGANIC QUALITATIVE ANALYSIS | P | 2 | 2 |

Maximum Marks: 60

Hrs.: 2

To analyze an inorganic salt containing one anion (simple / interfering) and one cation.

Internal 40 marks

External 60 marks

Distribution of external marks:

Record - 10 marks

One anion with correct procedure - 20 marks

Group separation - 10 marks

One cation with correct procedure - 20 marks

60 marks

Note: University practical Examination – 3 Hours
