

1.4 APPLIED CHEMISTRY-I

L T P

2 - 2

RATIONALE

The role of Chemistry and chemical products in every branch of engineering is expanding greatly. Now a days various products of chemical industries are playing important role in the field of engineering with increasing number of such products each successive years. The strength of materials, the chemical composition of substances, their behaviour when subjected to different treatment and environment, and the laws of heat and dynamic energy have entered in almost every activity of modern life. Chemistry is considered as one of the core subjects for diploma students in engineering and technology for developing in them scientific temper and appreciation of chemical properties of materials, which they have to handle in their professional career. Effort should be made to teach this subject through demonstration and with the active involvement of students.

DETAILED CONTENTS

1. Language of Chemistry (6 hrs)

- 1.1 Definition of symbol, formula, valency and chemical equation.
- 1.2 Writing of the chemical formula of a simple chemical compound.
Calculation of percentage composition of a chemical compound
- 1.3 Essentials of a chemical equation, balancing of a chemical equation by Hit and Trial method

2. Atomic Structure (6 hrs)

Introduction to atom and its constituent particle, Dalton's , Rutherford's model. Bohr's model (postulates only), atomic number, mass number, isotopes, isobars, concept of atomic orbitals, shapes of S and P orbitals, quantum numbers, electronic configuration-Aufbau Principle, Hund's rule and Pauli's exclusion Principle, Hybridization (sp³, sp² and sp).

3. Chemical Bonding (4 hrs)

- 3.1 Electronic concept of binding.
- 3.2 Elementary account of electrovalent, covalent and coordinate bond formation on the basis of the electronic concept of valency with the help of suitable examples to each.
- 3.3 Orbital concept of covalent bond, Sigma and Pi bond.

4. Water (10 hrs)

- 4.1 Hard and soft water, types of hardness and its causes, disadvantages of hardness of water (i) in industrial use (ii) in boilers for steam generation.
- 4.2 Methods to remove hardness of water (i) Soda Lime process (ii) Ion-Exchange process. Simple numerical problems related to soda lime process.
- 4.3 Definition of degree of hardness of water and the systems to express the degree of hardness of water, (Estimations method not included)
- 4.4 Qualities of water used for drinking purposes, treatment of river water to make it fit for town supply.

5. Solutions (8 hrs.)

5.1 Concept of homogeneous solution (i) Colloids (ii) Suspensions (iii) Brownian Movement (iv) Osmosis (v) Acidity (vi) Basicity (vii) Equivalent weight and gram equivalent weight with suitable examples (viii) Mole (ix) Avogadro number (x) pH (xi) Industrial application of pH

5.2 Strength of a solution (i) Normality (ii) Molarity (iii) Molality as applied in relation to a solution.

5.3 Simple numerical problems related to volumetric analysis.

6. Electrolysis (6 hrs)

6.1 Definition of the terms: Electrolytes, Non-electrolytes conductors and non-conductors with suitable examples

6.2 Faraday's Laws of Electrolysis

6.3 Simple numerical problems based upon the laws of electrolysis

6.4 Different industrial applications of 'Electrolysis'

6.5 Elementary account of (i) lead acid battery and (ii) Ni-Cd battery

LIST OF PRACTICALS

1. Volumetric analysis and study of apparatus used therein.
2. Preparation of standard solution of oxalic acid or potassium dichromate
3. Determine the strength of a given solution of sodium hydroxide with the help of a standard solution of oxalic acid
4. Determine the strength of solution of HCl with the help of a solution of NaOH and an intermediate solution of standard oxalic acid
5. Estimation of total alkalinity of water volumetrically
6. Determine, pH of water sample using pH meter

RECOMMENDED BOOKS

1. "A Text Book of Applied Chemistry-I" by SS Kumar; Tata McGraw Hill, Delhi.
2. Chemistry in Engineering by J.C. Kuriacose and J. Rajaram; Tata McGraw-Hill Publishing Company Limited, New Delhi
3. Engineering Chemistry by Dr. S. Rabindra and Prof. B.K. Mishra ; Kumar and Kumar Publishers (P) Ltd. Bangalore-40

Other additional Books for Reading

1. Engineering Chemistry by Jain PC and Jain M
2. Chemistry of Engineering by Aggarwal CV
3. Chemistry for Environmental Engineers by Swayer and McCarty, McGraw Hill, Delhi
4. Progressive Applied Chemistry –I and II by Dr. G.H. Hugar; Eagle Prakashan, Jalandhar

2.4 APPLIED CHEMISTRY-II

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2 - 2

RATIONALE

The role of Chemistry and chemical products in every branch of engineering is expanding greatly. Now a days various products of chemical industries are playing important role in the field of engineering with increasing number of such products each successive years. The strength of materials, the chemical composition of substances, their behaviour when subjected to different treatment and environment, and the laws of heat and dynamic energy have entered in almost every activity of modern life. Chemistry is considered as one of the core subjects for diploma students in engineering and technology for developing in them scientific temper appreciation of chemical properties of materials, which they have to handle in their professional career. Effort should be made to teach this subject through demonstration and with the active involvement of students.

DETAILED CONTENTS

1. Metallurgy (10 hrs)

1.1 A brief introduction of the terms: Metallurgy (types), mineral, ore, gangue or matrix, flux, slag, concentration (methods of concentrating the ores), roasting calcination and refining as applied in relation to various metallurgical operations

1.2 Metallurgy of (i) Aluminium (ii) Iron (iii) copper with their physical and chemical Properties.

1.3 Definition of an alloy, purposes of alloying, composition, properties and uses of alloys-brass, bronze, monel metal, magnalium, duralumin.

2. Fuels (10 hrs)

2.1 Definition of a 'Fuel', characteristics of a good fuel and classification of fuels with suitable examples

2.2 Definition of Calorific value of a fuel and determination of calorific value of a liquid fuel with the help of Bomb calorimeter. Simple numerical problems based upon Bomb-calorimeter method of finding the Calorific values

2.3 Brief description of 'Proximate' and 'Ultimate' analysis of a fuel.

Importance of conducting the proximate and ultimate analysis of a fuel

2.4 Qualities of a good fuel and merits of gaseous fuels over those of other varieties of fuels

2.5 Manufacture, composition, properties and uses of (i) Water gas (ii) Oil gas (iii) Biogas (iv) LPG (V) CNG

3 Corrosion (3 hrs)

3.1 Meaning of the term 'corrosion' and its definition

3.2 Theories of corrosion i.e. (i) direct chemical action theory and (ii) electro chemical theory

3.3 Prevention of corrosion by

1. (a) Alloying

(b) Providing metallic coatings

2. Cathodic protections:

(a) Sacrificial

(b) Impressed voltage method

4 Lubricants (4 hrs)

4.1 Definition of (i) lubricant (ii) lubrication

4.2 Classification of lubricants

4.3 Principles of lubrication

(i) fluid film lubrication

(ii) boundary lubrication

(iii) extreme pressure lubrication

4.4 Characteristics of a lubricant such as viscosity, viscosity index, volatility oiliness, acidity, emulsification, flash point and fire point and pour point.

5. Classification and Nomenclature of Organic Compounds (7 hrs)

5.1 Homologous series

5.2 IUPAC Nomenclature of Hydrocarbons ,

Alcohols, Aldehydes and Ketones & Carboxylic acids

5.3 Hydrocarbons (Alkanes, Alkenes and Alkynes)-general preparation, Chemical properties and uses.

5.4 Alcohols (Diols and Triols not included)-general preparation, Chemical properties and uses.

5.5 Aldehydes and Ketones preparation properties and uses.

5.6 Monocarboxylic acids-general preparation, chemical properties and uses

6 Rubber and Polymers (2 hrs)

6.1 Definition of Rubber and Polymers

6.2 Types of Rubber

6.3 Classification of Polymers

6.4 Composition and uses of Polythene, PVC, Teflon, Bakelite.

LIST OF PRACTICALS

1. Gravimetric analysis and study of apparatus used there in

2. To determine the percentage composition of a mixture consisting of a volatile and a non-volatile substances

3. Determine the viscosity of a given oil with the help of “Redwood viscometer”

4. Estimate the amount of ash in the given sample of coal

5. Determination of copper in the given brass solution, or sample of blue vitriol volumetrically

6. Electroplate the given strip of Cu with Ni

7. Detection of organic compounds (Aldehydes, Ketones, Carboxylic acid, and Amines)

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