

2.4 APPLIED CHEMISTRY-II

L T P
3 - 2

RATIONALE

The role of chemistry in every branch of engineering and technology is expanding greatly. Now a days, various chemical products 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 demonstrations/ minor projects and with the active involvement of students.

Note:- Teachers should give examples of engineering/technology applications of various concepts and principles in each topic so that students are able to appreciate learning of these concepts and principles.

DETAILED CONTENTS

1. Metallurgy (08 hrs)
 - 1.1 A brief introduction of the terms: Metallurgy (types), mineral, ore, gangue or matrix, flux, slag, concentration (methods of concentrating the ores), ore, roasting, calcinations, smelting and refining of metal.
 - 1.2 Metallurgy of (i) Aluminium (ii) Iron
 - 1.3 Definition of an alloy, purposes of alloying, composition, properties and uses of alloys, monel metal, magnalium, duralumin, alnico, stainless steel and invar.
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 solid 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 coal. Importance of conducting the proximate and ultimate analysis of a fuel
 - 2.4 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
 - 2.6 Composition, calorific values and applications of (i) LPG (ii) CNG (iii) Power alcohol

- 2.7 Fuel rating
 - 2.7.1 Octane number for petrol
 - 2.7.2 Cetane number for diesel

- 3 Corrosion (06 hrs)
 - 3.1 Definition of corrosion
 - 3.2 Theories of corrosion i.e. (i) direct chemical action theory and (ii) electro chemical theory
 - 3.3 Passivity
 - 3.4 Prevention of corrosion by
 - 3.4.1 Alloying
 - 3.4.2 Providing metallic coatings
 - 3.4.3 Cathodic protections:
 - (a) Sacrificial
 - (b) Impressed voltage method
 - 3.4.4 Heat treatment (quenching, annealing, tempering & normalizing)

- 4 Lubricants (06 hrs)
 - 4.1 Definition of (i) lubricant (ii) lubrication
 - 4.2 Classification of lubricants
 - 4.3 Principles of lubrication
 - 4.3.1 fluid film lubrication
 - 4.3.2 boundary lubrication
 - 4.3.3 extreme pressure lubrication
 - 4.4 Properties of lubricants
 - 4.4.1 Physical properties: viscosity, viscosity index, flash-point, fire-point, cloud-pour point, oiliness, volatility, emulsification
 - 4.4.2 Chemical properties-Total acidity number (TAN) saponification and iodine value, coke number and aniline point.
 - 4.5 Criterion for selection of a good lubricant

- 5 Glass (04 hrs)
 - 5.1 Glass: Chemical composition, types of glasses and their applications
 - 5.2 Manufacture of ordinary glass and lead glass

- 6. Classification and Nomenclature of Organic Compounds (06 hrs)

Classification of Organic Compounds, functional group, Homologous Series, IUPAC-Nomenclature of various homologous series i.e. alcohols, aldehydes, ketones, carboxylic acids, and phenols. (First six members of each series only)

7. Polymers & Plastics (08 hrs)
- 7.1 Definition of polymer, monomer & degree of polymerization
 - 7.2 Brief introduction of addition & condensation polymers with suitable examples (PVC, Polyester, Teflon, Nylon 66, Bakelite)
 - 7.3 Definition of plastic & type of plastics (thermo & thermo setting plastics) with suitable examples
 - 7.4 Applications of polymers & plastics in daily life.

LIST OF PRACTICALS

1. Gravimetric analysis and study of apparatus used
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. Determine the flash point of the given oil with the help of Abel’s Flash Point Apparatus
5. Estimate the amount of moisture in the given sample of coal
6. Estimate the amount of ash in the given sample of coal
7. Electroplate the given strip of Cu with Ni
8. Confirmation test of alcohol, aldehydes, carboxylic acid
9. To determination the total acidity number of a lubricant
10. Detection of metal iron in the rust (solution of rust in concentrated HCl may be given)
11. To study the effect of metal coupling on corrosion of metals

INSTRUCTIONAL STATREGY

Teacher may take help of various models and charts while imparting instructions to make the concepts clear. More emphasis may be laid on discussing and explaining practical applications of various chemical processes and reactions. In addition, students should be encouraged/motivated to study those processes in more details, which may find practical applications in their future professional life.

RECOMMENDED BOOKS

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

5. Engineering Chemistry by Jain PC and Jain M Dhanpatrai publishers. New Delhi
6. Chemistry of Engineering by Aggarwal CV
7. Chemistry for Environmental Engineers by Swayer and McCarty, McGraw Hill, Delhi
8. A Text Book of Applied Chemistry-I by Sharma and Others; Technical Bureau of India, Jalandhar
9. A Text Book of Applied Chemistry-II by Dr. J K Sharma (Hindi version), Abhishek Publications, Sec. 17-C, Chandigarh.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	08	16
2	10	20
3	06	14
4	06	14
5	04	08
6	06	12
7	08	16
Total	48	100