

**Course Name : 03 Years Diploma in Engineering****Semester : First****Subject Title : Engineering Chemistry-I****Subject Code : 104 / 108****Teaching and Examination Scheme:**

Teaching Scheme			Examination					
L	T	P	Full Marks.	External Exam Marks	Internal Exam Marks	External Pas Marks	Total Pass Marks	Duration of External Exams
03			100	80	20	26	40	3 Hrs
Practical		2	50	40	10	13	20	4 Hrs

**NOTE:**

**Internal marks will be allotted on the basis of two snap tests and 2 assignment of equal marks to be conducted by the faculty teaching the subject.**

**RATIONALE:**

Chemistry is a basic science subject which is essential to all engineering courses. It gives knowledge of engineering materials, their properties, related applications & selection of materials for engineering applications.

Due to technological progress there are hazardous effects on environment & human life. The core knowledge of environmental effects will bring awareness in students about the precautions & preventions to be taken to reduce the ill effects.

This subject will generate curiosity of carrying out further development in engineering fields.

**OBJECTIVES:** The student will be able to:

1. Draw the orbital configuration of different elements.
2. Represent the formation of molecules schematically.
3. Describe the mechanism of electrolysis.
4. Identify the properties of metals & alloys related to engineering applications.
5. Identify the properties of non metallic materials, related to engineering applications.
6. Compare the effects of pollutants on environments & to suggest preventive measures & safety.

**Content: Theory**

Chapter No.	Name of the Topic	Hours	Marks
01	<p><b>Atomic Structure</b>            Definition of Atom, Fundamental Particles of Atom – their Mass, Charge, Location, Definition of Atomic no, Atomic Mass no., Isotopes &amp; Isobars, &amp; their distinction with suitable examples, Bohr's Theory, Definition, Shape of the orbitals &amp; distinction between Orbits &amp; Orbitals, Hund's Rule, Aufbau's Principle (till Atomic no. 30), Definition &amp; types of valency (Electrovalency &amp; Covalency), Octet Rule, Duplet Rule, Formation of Electrovalent &amp; Covalent Compounds e.g. NaCl, CaCl<sub>2</sub>, MgO, AlCl<sub>3</sub>, CO<sub>2</sub>, H<sub>2</sub>O, Cl<sub>2</sub>, NH<sub>3</sub>, C<sub>2</sub>H<sub>4</sub>, N<sub>2</sub>, C<sub>2</sub>H<sub>2</sub>. Distinction between electrovalent &amp; covalent compounds.</p>	06	12
02	<p><b>Electrochemistry</b>            Electrolytic dissociation, Arrhenius Theory of Ionisation, Degree of Ionisation &amp; factors affecting degree of ionization. Significance of the terms involved in Electrolysis- Such as Conductors, Insulators, Dielectrics, Electrolyte, Non Electrolyte, Electrolysis, Electrolytic Cell, Electrodes. Mechanism of Electrolysis. Concept of electrode potential such as reduction potential &amp; oxidation potential. Electrochemical Series, Electrolysis of CuSO<sub>4</sub> Solution by using Cu Electrode &amp; Platinum Electrode, Electrolysis of NaCl solution &amp; fused NaCl by using carbon electrode, Faraday's first &amp; second law of Electrolysis &amp; Numericals, Electrochemical Cells &amp; Batteries, Definition, types such as Primary &amp; Secondary Cells &amp; their examples. Construction, Working &amp; Applications of Dry Cell &amp; Lead – Acid Storage Cell, Applications of Electrolysis such as Electroplating &amp; Electro refining, Electrometallurgy &amp; Electrotyping</p>	08	16
03	<p><b>Metals &amp; Alloys</b>  <b>3.1 Metals (Marks:10)</b>            Occurrence of Metals, Definition of Metallurgy, Mineral, Ore, Gangue, Flux &amp; Slag, Mechanical Properties of metals such as Hardness, Toughness, Ductility, Malleability, Tensile strength, Machinability, Weldability, Forging, Soldering, Castability. Stages of Extraction of Metals from its Ores in detail i.e. Crushing, Concentration, Reduction, Refining. Physical Properties &amp; Applications of some commonly used metals such as Fe, Cu, Al, Cr, Ni, Sn, Pb, Zn, Co, Ag, W.  <b>3.2 Alloys (Marks: 08)</b>            Definition of Alloy, Purposes of Making alloy. Preparation Methods, Classification of Alloys such as Ferrous &amp; Non Ferrous &amp; their examples. Composition, Properties &amp; Applications of Alnico, Duralumin, Dutch Metal, German Silver / Nickel Silver, Gun Metal, Monel metal, Wood's Metal, Babbit metal.</p>	10	18

04	<p><b>Non Metallic Materials</b>  <b>4.1 Plastics (Marks: 04)</b>          Definition of Plastic, Formation of Plastic by Addition &amp; Condensation Polymerisation by giving e.g. of Polyethylene &amp; Bakelite plastic Respectively, Types of Plastic, Thermosoftening &amp; Thermosetting Plastic, with Definition, Distinction &amp; Compounding of Plastics – Resins, Fillers, Plasticizers, Accelerators, Pigments &amp; their examples, Engineering Applications of Plastic based on their properties.</p> <p><b>4.2 Rubber (Marks: 04)</b>          Natural Rubber: Its Processing, Drawbacks of Natural Rubber, Vulcanisation of Rubber with Chemical Reaction.          Synthetic Rubber: Definition, Distinction Between natural &amp; synthetic rubber. Properties of rubber such as elasticity, abrasion resistant, stress &amp; strain and related engg. application.</p> <p><b>4.3 Thermal Insulating Materials (Marks: 04)</b>          Definition &amp; types. Characteristics of insulators. Thermal insulators. Properties &amp; Applications of glasswool, Asbestos, Cork.</p>	06	12
05	<p><b>Environmental Effects (Awareness Level)</b>  <b>5.1 Pollution &amp; Air pollution (Marks 10)</b>          Definition of pollution &amp; pollutant, Causes of Pollution, Types of Pollution - Air &amp; Water Pollution.  <b>Air Pollution</b>          Definition, Types of Air pollutants their Sources &amp; Effects, Such as Gases, Particulates, , Radio Active Gases, Control of Air Pollution, Air Pollution due to Internal Combustion Engine &amp; Its Control Methods, Deforestation their effects &amp; control measures. Causes , Effects &amp; control measures of Ozone Depletion &amp; Green House Effects.</p> <p><b>5.2 Water Pollution &amp; Wastes (Marks 12)</b>          Definition, Causes &amp; Methods of Preventing Water Pollution, Types of Waste such as Domestic Waste, Industrial Waste, their Physical &amp; Biological Characteristics, Concept &amp; significance of BOD, COD, Biomedical Waste &amp; E – Waste, their Origin, Effects &amp; Control Measures.          Preventive Environmental Management (PEM) Activities.</p>	12	22
<b>Total</b>		<b>42</b>	<b>80</b>

**Practical:**

**Intellectual Skills:** 1. Analyse given solution  
 2. Interpret the results

**Motor Skills** : 1. Observe Chemical Reactions  
 2. Measure the quantities Accurately  
 3. Handle the apparatus carefully

**List of Experiments:**

**01 – 07** Qualitative Analysis of **four salts** , Containing One Basic & One Acidic Radical Listed below

**Basic Radicals:**

$\text{Pb}^{+2}$ ,  $\text{Cu}^{+2}$ ,  $\text{Al}^{+3}$ ,  $\text{Fe}^{+2}$ ,  $\text{Fe}^{+3}$ ,  $\text{Cr}^{+3}$ ,  $\text{Zn}^{+2}$ ,  $\text{Ni}^{+2}$ ,  $\text{Ca}^{+2}$ ,  $\text{Ba}^{+2}$ ,  $\text{Mg}^{+2}$ ,  $\text{K}^{+}$ ,  $\text{NH}_4^{+}$ .

**Acidic Radicals:**

$\text{Cl}^{-}$ ,  $\text{Br}^{-}$ ,  $\text{I}^{-}$ ,  $\text{CO}_3^{-2}$ ,  $\text{SO}_4^{-2}$ ,  $\text{NO}_3^{-}$ .

- 05 To Determine E.C.E. of Cu by Using  $\text{CuSO}_4$  Solution & Copper Electrode
- 06 To standardize  $\text{KMnO}_4$  using Sodium oxalate.
- 07 To determine percentage of Fe in the given mohr's salt.
- 08 To Prepare a chart to showing application of metals like Fe, Cu, Al, Cr, Ni, Sn, Pb, Co.
- 09 To determine Carbon Monooxide,  $\text{CO}_2$  content emission from petrol vehicle
- 10 To Determine Dissolved Oxygen in a Water Sample.

**Learning Resources:****Reference Books:**

Sr. No.	Author	Name of the book	Publisher
01	Jain & Jain	Engineering Chemistry	Dhanpat Rai and Sons
02	S. S. Dara	Engineering Chemistry	S. Chand Publication
03	B. K. Sharma	Industrial Chemistry	Goel Publication
04	S. S. Dara	Environmental Chemistry & Pollution Control	S. Chand Publication
05	Vedprakash Mehta	Polytechnic Chemistry	Jain brothers
06	Uppal	Engineering Chemistry	