**ANNEXURE – I**

**STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU**

**DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS**

**N - SCHEME**

(Implements from the Academic year 2019-2020 onwards)

Course Name : All branches of Diploma in Engineering and Technology and Special

Programmes except DMOP, HMCT and film & TV.

Subject Code : 40014

Semester : I Semester

Subject Title : **ENGINEERING CHEMISTRY – I**

**TEACHING AND SCHEME OF EXAMINATION**

Number of weeks per semester: 15 weeks

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| --- | --- | --- | --- | --- | --- | --- |
| Subject | Instructions | | Examination | | | |
| ENGINEERING CHEMISTRY- I | Hours / Week | Hours / Semester | Marks | | | Duration |
| 5 Hrs. | 75 Hrs. | Internal Assessment | Board Examination | Total |
| 25 | 100 \* | 100 | 3 Hrs. |

\* Examination will be conducted for 100 Marks and it will be reduced to 75 Marks.

**Topics and Allocation of Hours:**

|  |  |  |
| --- | --- | --- |
| **UNIT** | **Topic** | **Time** |
| 1 | Atomic Structure, Periodic Table, Acids and Bases | 13 hrs. |
| 2 | Surface Chemistry, Catalysis, Nanotechnology | 13 hrs. |
| 3 | Technology of water – I, Technology of water –II, Glass | 13 hrs. |
| 4 | Metallurgy, Extraction of iron, Powder metallurgy | 13 hrs. |
| 5 | Nuclear chemistry, Cement, Ceramics, Refractory | 13 hrs. |
|  | REVISION, ASSESMENT TEST AND MODEL EXAM | 10 Hrs. |
|  | **Total** | **75 Hrs.** |

**RATIONALE:**

The subject Engineering Chemistry-I lay foundation of all the elements, structure and periodic classification. It imparts knowledge about few Engineering Materials like cement ceramic, refractory Glass etc. Prime importance is given to technology of water, its analysis of few parameters like pH TDs Hardness, dissolved chlorine, e-coli etc. it provides basic concepts about metal extraction heat treatment and powder metallurgy. The latest trends on nano technology, its application of various fields of engineering is also dealt with.

**OBJECTIVES:**

1. The objective of this Course is to make the student:
2. Study about the importance of Engineering Chemistry in industry.
3. Know about atomic structure, chemical bonding, periodic classification and acids and bases.
4. Learn about surface chemistry, colloidal particles and nano-particles and their application.
5. Know about water and its analysis, treatment, catalysis and glass.
6. Know about the fundamentals of metal extraction, iron and steel manufacture, heat treatment and powder metallurgy.

**40014 ENGINEERING CHEMISTRY– I**

**DETAILED SYLLABUS**

**Contents: Theory**

|  |  |  |
| --- | --- | --- |
| **Unit** | **Name of the Topic** | **Hours** |
| **I** | **1.1 Atomic Structure and Chemical Bonding**  Fundamental particles – proton–electron–neutron–atomic number – mass number – extra nuclear part – filling up of electrons – aufbau principle–s–p–d–f orbitals – electronic configuration – octet rule – electrovalent bond –sodium chloride formation – covalent bond – formation of ammonia.  **1.2 Periodic Table**  Modern periodic law – periodic classification of elements – features of modern periodic table – properties of s–p–d–f block elements.  **1.3 Acids and Bases**  Properties of acids and bases – Lewis concept of acids and bases – advantages – pH and pOH – Definition – Numerical problems – Indicator – Definition – Buffer solution – Definition – Types of buffer solution with examples – Application of pH in industries | **5 Hrs.**  **4 Hrs.**  **4 Hrs** |
| **II** | **2.1 Surface Chemistry**  Colloids – True solution and Colloidal solution – Definition – Differences – Types of colloids – Lyophilic and Lyophobic colloids – Differences – Properties – Optical – mechanical – electrical – Electrophoresis and Coagulation – Industrial applications of colloids – Smoke Precipitation by Cottrell’s method, Purification of water, Cleansing action of soap, Sewage disposal – tanning–and artificial rain.  **2.2 Catalysis**  Catalyst – Positive – Negative catalyst – Definition – Types of catalysis – Homogeneous and Heterogeneous – Promoter – Catalyst poison – active centre – Definition – Characteristics of a catalyst – Industrial applications of catalysts.  **2.3 Nanotechnology**  Nano particles – definition – properties – application of Nanotechnology – Engineering – medicine – biomaterial. | **5 Hrs.**  **4 Hrs.**  **4 Hrs.** |
| **III** | **3.1 Technology of Water – I**  Sources of water – depletion of underground water – Reasons – Rain water harvesting (Basic ideas) – advantages – Hard water and soft water – Hardness of water – Carbonate and Non – carbonate hardness – Methods of expressing hardness – mg/lit and ppm – Simple problems – Disadvantages of hard water – Estimation of total hardness by EDTA method – Problems involving Total, Carbonate and Non – carbonate hardness in ppm – Disadvantages of using hard water in boilers – Scale formation, Corrosion of boiler metal, Caustic Embrittlement – Priming and Foaming.  **3.2 Technology of Water –II**  Softening of hard water–Ion – Exchange method and Reverse Osmosis method – Municipal supply – purification of drinking water–Quality of potable water – parameters of potable water – pH–TDS – Dissolved Chlorine permissible limits – determination of ecoli (preliminary idea)  **3.3** **Glass**  Composition of glass – Manufacture of glass – annealing of glass – Varieties – of Glass – Optical glass, Wind shield glass and Photo chromatic glass | **5 Hrs.**  **5 Hrs.**  **3 Hrs.** |
| **IV** | **4.1 Metallurgy**  Mineral – ore – Types of ores – flux–slag – gangue – metal extraction process – Concentration of ores – Gravity separation – Froth flotation method – Magnetic separation – Roasting – calcinations – smelting reduction – purification process.  **4.2 Extraction of Iron**  Blast furnace – cast iron – steel manufacture – Bessemer converter –heat treatment of steel – hardening – annealing – tempering  **4.3 Powder metallurgy**  Definition – Powder metallurgical process – Preparation of Metal Powder – Atomization – Reduction of Metal Oxide – blending –compacting – sintering – finishing – Applications of Powder Metallurgy. | **5 Hrs.**  **4 Hrs.**  **4 Hrs.** |
| **V** | **5.1** **Nuclear Chemistry**  Radio activity – alpha – beta – gamma rays – charge and mass – isotope – isobar – Radioactive decay – alpha emission – beta emission – gamma emission – half life period – simple problems –Nuclear fission – nuclear fusion – chain reaction – nuclear reactor –reactor core – nuclear reactor coolant – Control rods – neutron moderator – steam turbine – Application of radio isotopes.  **5.2 Cement**  Definition – Manufacture of Portland Cement – Wet Process – Setting of Cement (No equation) –Ceramics **–**  White pottery – Definition – Manufacture of White pottery – Uses – Definition of glazing – purpose – Method – Salt glazing – liquid glazing.  **5.3** **Refractories**  Definition – requirements of a good refractory – types with examples and uses–uses of silica, fireclay and alumina. | **6 Hrs.**  **5 Hrs.**  **2 Hrs.** |

**Text Book:**

1. Engineering Chemistry – I Tamil Nadu Text Book Corporation

2. Engineering Chemistry – Jain & Jain – Dhanpat Rai & Sons.

3. A Text Book of Engineering Chemistry – S.S. Dara – S. Chand Publication.

**Reference Book:**

1. Engineering Chemistry – Uppal – Khanna Publishers.

2. Chemistry – Higher Secondary – Second Year – Volume I & II – Tamil Nadu Text Book Corporation – 2018

3. Rain Water Harvesting – Hand Book – Chennai Metro Water.

**ENGINEERING CHEMISTRY – I**

**Learning Structure**

**Application:**

Apply the knowledge in selecting methods and materials required for engineering purpose. Acquire knowledge about pH, TDS, Hardness of water and learn about removal of hardness. Study of application of pH, colloids, nanotechnology, powder metallurgy and radioactive isotopes in industries.

**Procedure:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Defining atom, chemical bonding, periodic classification of elements importance of pH, buffer and industrial application | Defining colloidal, catalyst nano partials and application of colloidal, catalysis nanotechnology in industries. | Defining hardness, softness, explanation of hardness and study of removal of hardness, municipal supply of water and study of glass | Defining ore, gange, flux slag and study of various, concentration methods, extraction of ion and steel and production of powder metallurgical products | Defining radio activity fission and fusion reactions study of cement ceramics and refractory. |

**Concept:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Understanding about chemical bonding types pH and buffer action. | Understanding about nanotechnology colloids and catalyst | Understanding about various types ore and concentration methods, iron steel powder metallurgy. | Understanding about the technology of water, removal of hardness and potable water. | Understating about nuclear chemistry and engineering materials like cement ceramic and refractory. |

**Facts:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Atomic Structure and Chemical Bonding  Periodic Table  Acids and Bases | Surface Chemistry  Catalysis  Nanotechnology | Technology of Water – I  Technology of Water –II  Glass | Metallurgy  Extraction of Iron  Powder metallurgy | Nuclear Chemistry  Cement  Refractories |

**BOARD EXAMINATION - QUESTION PATTERN**

**Engineering Chemistry I**

**Time : 3 Hours Max. Marks 100**

**PART A** - 8 Questions to be answered out of 12 questions

**PART B** -8 Questions to be answered out of 12 questions

**PART C** -All the 5 Questions to be answered

Each Question in Part C Contain 3 Sub Questions Out Of Them 2 Sub Questions To Be Answered For 6 Marks Each

|  |  |  |
| --- | --- | --- |
| **Part A** | **8 x 2** | **16 Marks** |
| **Part B**  Short Answer Type | **8 x 3** | **24 Marks** |
| **Part C**  Descriptive answer type questions  Each question in Part C contains 3 sub questions out of them 2 Sub Questions to be answered For 6 Marks Each. | **5 x 2 x 6** | **60 Marks** |
| **Total** |  | **100 Marks** |

Out of the 3 Sub questions in **PART C**, one sub question must be on problem based to test the analytical ability/logical ability /diagnostic ability/conceptual ability relevant to that subject content. Equal importance is to be given to whole syllabus.

**Clarks table will not be permitted for the Board Examinations.**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Sl.No | Addition in  n-scheme | Deletion in  n-scheme | Remarks for | |
| Addition in  n-scheme | Deletion in  n-scheme |
| UNIT I | Aufbau principle | 1.2 Molecular mass-Avagadros hypothesis | fundamentals for electronic configuration(already existed in previous scheme) | Pure chemistry |
|  | Periodic table-periodic classification-features-properties-s-p-d-f block elements |  | to have complete idea about the elements used in engineering (already existed in previous scheme) |  |
| UNIT II |  | Solution |  | Fundamentals of pure chemistry |
| UNIT III | Dissolved chlorine, e-coli |  | Fundamentals of applied technology of water parameters |  |
| UNIT IV | Fundamentals of metallurgy-iron steel manufacture-heat treatment of steel | TITANIUM-TUNGSTEN-ALLOYS  Electrohemistry | FUNDAMENTALS OF ENGINEERING CHEMISTRY (already existed in previous scheme) | NEW INTRODUTION MADE DELETION  Shifted to engineering chemistry I |
| UNIT V | Nuclear chemistry | Corrosion and prevention | FUNDAMENTALS OF ENGINEERING CHEMISTRY (already existed in previous scheme | shifted to Engineering Chemistry I |