|  |  |  |
| --- | --- | --- |
|  | **MUTHAYAMMAL ENGINEERING COLLEGE**  **(An Autonomous Institution)**  (Approved by AICTE, New Delhi, Accredited by NAAC & Affiliated to Anna University)  Rasipuram - 637 408, Namakkal Dist., Tamil Nadu. |  |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | | **MUST KNOW CONCEPTS** | | |  | **MKC** |
|  |  |  | | | |  |
| **CHEMISTRY** | |  | | | | **2020-2021** |
|  | | |  |  | | |
| **Course Code & Course Name** | | | **:** | **19BSS11 - ENGINEERING CHEMISTRY** | | |

**Year/Sem/Sec :**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **S.No.** | **Term** | **Notation**  **(Symbol)** | | **Concept / Definition / Meaning /**  **Units / Equation / Expression** | | **Units** |
| **Unit-I : Water Technology** | | | | | | |
|  | Hard water | - | | Presence of Salts Mg and Ca in water | | - |
|  | Soft water | - | | Absence of Salts Mg and Ca in water | | - |
|  | Alkalinity | - | | Due to presence of OH-,CO32- & HCO3- ions | | - |
|  | PPM | - | | Parts Per Million( 1 PPM= 1 Mg/Lit) | | - |
|  | Hardness | - | | Characteristic of water due to presence of Salts Mg and Ca in water | | PPM |
|  | EDTA | - | | Ethylene Diamine Tetra Acetic Acid | | - |
|  | Zeolite | Ze | | Green Sand, Molecular formula Na2O.Al2O3.xSiO2.yH2O | | - |
|  | Calgon | - | | Sodium Hexa Meta Phosphate –  Na2 [Na4 (PO3)6] | | - |
|  | Caustic Embrittlement | - | | Formation of irregular, intergranular cracks on the boiler metal. It is caused by high concentration of NaOH in boiler | | - |
|  | Carbonate Hardness | - | | Hardness of water due to presence of Ca(HCO3) and Mg(HCO3)  ( **Temporary hardness)** | | - |
|  | Non-Carbonate Hardness | - | | Hardness of water due to presence of sulphate and chloride Ca and Mg **(Permanent hardness)** | | - |
|  | Scale | - | | Hard and strong Coating on the surface of walls due to the presence of high concentrated salts in boiler | | - |
|  | Sludge | - | | Formation of loose and slimy precipitate due to the presence of high concentrated salts in boiler | | - |
|  | Priming | - | | Production of wet stream in boiler | | - |
|  | Wet Stream | - | | Stream containing droplets of water | | - |
|  | Foaming | - | | Production of persistent foam or bubbles on the surface of the water in boiler | | - |
|  | Erichrome Black T | EBT | | It is an indicator used for estimation of hardness by EDTA Method. It is form wine red coloured week colmplex with Ca2+ Mg2+ | | - |
|  | Buffer solution | - | | During the Chemical reaction pH should be maintained at particular range so that add buffer solution to reaction mixture | | - |
|  | Blow down operation | - | | It is process of removal of concentrated water by fresh water frequently from the boiler during steam production | | - |
|  | Carry over | - | | The droplets of liquid water carry with some dissolved salts and suspended impurities. | | - |
|  | Aeration | - | | The process of mixing water with air | | - |
|  | Disinfection | - | | The process of removal of bacteria from drinking water | |  |
|  | Break point chlorination | - | | It indicates the amount of chlorine to kill bacteria and to remove organic matter present in water | | - |
|  | Boiler corrosion | - | | The corrosion in boiler due to chemical or electrochemical attack of its environment | | - |
|  | Exchange resins | RH & ROH | | The resins containing may be basic or acidic functional group are capable exchanging anion and cations in hard water | | - |
| **Unit-II :Corrosion and its Control** | | | | | | |
|  | Corrosion | - | | Destruction or deterioration of metals or alloys | | - |
|  | Chemical or dry corrosion | - | | Corrosion due the direct attack or reaction of chemicals at dry condition | | - |
|  | Wet or electrochemical corrosion | - | | Corrosion due the electrochemical reaction on the metal surface at wet condition | | - |
|  | Anodic reaction | - | | Oxidation reaction which involves loss of electron | | - |
|  | Cathodic reaction | - | | Reduction reaction which involves gain of electrons | | - |
|  | Decarburization | - | | Removal of Carbon content from the steel | | - |
|  | Hydrogen embrittlement | - | | Crack and blister of metal surface due to the reduction of hydrogen | | - |
|  | Sacrificial anodic protection | - | | Metallic structure can be protected by connecting with more active metal | | - |
|  | Impressed current cathodic protection | - | | Metallic structure can be protected by passing direct current to nullify the corrosion current | | - |
|  | Paint | - | | Mechanical dispersion of pigment along with other ingredients | | - |
|  | Pigment | - | | Color producing substance in paint | | - |
|  | Electroplating | - | | One metal can be coated on other metal surface by passing direct current | | - |
|  | Electroless plating | - | | One metal can be coated on other metal or non -metal surface by using reducing agent without current | | - |
|  | Electrochemical Series | - | | Arrangement of various metallic electrodes based on their reduction electrode potential on hydrogen scale | | - |
|  | Oxidation Corrosion | - | | The direct reaction of oxygen on metal surface at low or high temperature in the absence of air | | - |
|  | Pilling bed worth rule | - | | The radio of the volume of the oxide film formed to the volume of metal consumed | | - |
|  | Stable oxide layer | - | | It is fine structured and gets adsorbed tightly to the metal surfave | | - |
|  | Unstable oxide layer | - | | It is produced on metal surface of nobel metals which easily decompose back in to metal and oxgen | | - |
|  | Volatile oxide layer | - | | The oxide layer volatilize as soon as it is formed, leaving the metal surface for further corrosion | |  |
|  | Inter-granular corrosion | - | | corrosion that occurs in the grain boundaries in a metal/alloy | | - |
|  | Pitting corrosion | - | | It is a localized attack, resulting in the formation of a hole around which the metal is relatively unattacked. | | - |
|  | Crevice corrosion | - | | Crevice between metal and non-metallic material is in contact with liquids | | - |
|  | Galvanic Corrosion | - | | when two different kinds of metals of the electrochemical series (more active metal and less active metal) are in contact with each other in the presence of solution or moisture | | - |
|  | Corrosion Inhibitors | - | | when added in a small concentration to an environment reduces the corrosion rate of a metal exposed to that environment | | - |
|  | Mixed inhibitors |  | | The substances, which reduce both the cathodic and anodic reactions | | - |
| **Unit-III :Polymer Chemistry** | | | | | | |
|  | Polymer | - | | Macromolecules with high molecular weight formed by repeating linking of monomers | | - |
|  | Monomer | - | | Micromolecule which combines with each other to form polymer | | - |
|  | Polymerization | - | | Process large no of small molecules combine to form a polymer | | - |
|  | Addition polymerization | - | | Polymerization follow addition reaction (Single type of monomer having minimum one double bond ) | | - |
|  | Condensation polymerization | - | | Polymerization follow Condensation reaction (monomer having two polar groups ) | | - |
|  | Co or joint polymerization | - | | Polymerization follow addition reaction (more than one type of monomer involve in polymerization ) | | - |
|  | Homopolymer | - | | Polymer containing same type of monomer (Polyethene) | | - |
|  | Heteropolymer | - | | Polymer containing more than one type of monomers (Nylon 6,6) | | - |
|  | Degree of polymerization | - | | No of repeating units in a polymer chain | | - |
|  | Functionality | - | | No of reactive sites ( Functional Group) in a monomer | | - |
|  | Isotactic | - | | Functional groups are projected at same side with respect to main chain | | - |
|  | Syndiotactic | - | | Functional groups are projected at alternate side with respect to main chain | | - |
|  | Atactici | - | | Functional groups are projected at randomly with respect to main chain | | - |
|  | Plastics | - | | High molecular weight organic materials which can moulded into any desired shape by the application of heat and pressure | | - |
|  | Thermoplastics | - | | Soften on heating | | - |
|  | PVC | - | | Polyvinylchloride | | - |
|  | Polydispersive index | PDI | | Ratio of weight average molecular weight and number average molecular weight | | - |
|  | Natural polymer | - | | Polymer exist as natural resources | | - |
|  | Synthetic Polymer | - | | Polymers made by artificially using chemicals | | - |
|  | Random polymer | - | | Monomers are arranged in randomly | | - |
|  | Block polymer |  | | Monomers are arranged block wise | |  |
|  | Degree of polymerization | - | | The number of repeating units in the polymer chain | | - |
|  | Graft polymer | - | | Different monomers as its backbone | | - |
|  | Sterospecific polymer | - | | The orientation of monomeric units in a polymer molecule can takes place an orderly or disorderly fashion with respect to main chain | | - |
|  | Functionality | - | | The number of bonding sites or reactive sites or functional present in monomer | |  |
| **Unit-IV :Energy Resources & Storage Devices** | | | | | | |
|  | Nuclear energy | - | | The enormous amount of energy released during nuclear reaction | | - |
|  | Nuclear fission | - | | Process of heavier nuclei splits into two or more smaller nuclei with liberation of large amount of energy | | - |
|  | Nuclear fusion | - | | Process of two small nuclei combine to form single nuclei with liberation of large amount of energy | | - |
|  | Critical Mass | - | | The minimum amount of fissionable material required to continue nuclear chain reaction | | - |
|  | Super Critical Mass | - | | More than the Critical Mass | | - |
|  | Sub- Critical Mass | - | | Smaller than the Critical Mass | | - |
|  | Solar cell | - | | It is a device which convert solar energy in to electricity | | - |
|  | Control rod | - | | Control the speed of nuclear reaction in reactor by absorbing neutrons formed during nuclear reaction ( Cd & B) | | - |
|  | Moderators | - | | Slow down the speed of neutron in nuclear reactor (water, Heavy water & Graphite) | | - |
|  | Breeder reactor | - | | Convert non-fissionable material in to fissionable material | | - |
|  | Battery | - | | The arrangements of several electrochemical cells connected in a series | | - |
|  | Primary battery | - | | Not rechargeable battery due to irreversible cell reaction | | - |
|  | Fuel cell | - | | Convert energy of fuel into electrical energy | | - |
|  | Solid state battery | - | | Electrolyte also used in solid state ( Lithium battery) | | - |
|  | Lithium Battery | - | | battery of Future | | - |
|  | Fuel Cells | - | | Which convert chemical energy in to electricity without combustion | | - |
|  | NICAD Battery | - | | Nickel-Cadmium Battery | | - |
|  | Multiplication factor | - | | The number of neutrons resulting from single fission reactions | | - |
|  | Wind energy | - | | Energy recovered from the force of wind | | - |
|  | Wind mills | - | | The wind energy harnessed by making use of wind mills | | - |
|  | Spallation | - | | Heavy nucleus in to several fragments | | - |
|  | Fuel battery | - | | Large number of fuel cell is connected in series | | - |
|  | Electrolyte | - | | Dissociate of ions | |  |
|  | Lead acid Battery | - | | Electrical energy converted in to chemical energy | | - |
|  | Primary battery | - | | Electro chemical cell reaction is irreversible | | - |
| **Unit-V :Refractories & Abrasives** | | | | | | |
|  | Abrasives | - | | It is a hard substances, used for polishing, shaping, drilling and grinding operations | | - |
|  | Natural Abrasives | - | | Diamond, Corundum, Emery, Quartz, Garnet | | - |
|  | Hardness | - | | It is an ability of an abrasive to grind or scratch away other material | | - |
|  | Moh’s Scale | - | | It is an unit of hardness of abrasives | | Mohs |
|  | Soft Abrasives | - | | Hardness in the range of 1-4 in moh’s Scale | | Mohs |
|  | Abrasive power | - | | The strength of an abrasive to grind to another material | | - |
|  | Refractories | - | | It is a material, withstand high temperature and load without softening and melting | | - |
|  | Pyrometric Cone Equivalent | PCE | | It is used to measure refractoriness of a refractories | | - |
|  | Rerfractorines under load | R.U.L | | The load bearing capacity of a refractory can be measured | | - |
|  | Porosity | - | | The ratio between pores volume and the bulk volume of refractories | | - |
|  | Thermal Spalling | - | | It is the property of breaking, cracking or peeling off a refractory material under high temperature. | | - |
|  | Carborundam | - | | SiC | | - |
|  | Bauxite | - | | Alumina bricks are manufactured from bauxite, ore of alumina | | - |
|  | Types of Refractory’s | - | | Acid, Basic and Neutral | | - |
|  | Toughness | - | | Hard and brittleness of the abrasive | | - |
|  | Diamond | - | | Pure crystalline of carbon | | - |
|  | Corundum | - | | Pure crystalline of alumina | |  |
|  | Dimensional Stability | - | | The volume change of refractory when subjected to higher temperature | | - |
|  | Quartz | - | | Si O2 | | - |
|  | Garnet | - | | The combination of Trisilicates of alumina, magnesia and ferrous oxide. General formula : X3Y2(SiO4)3 | | - |
|  | Graphite | - | | Neutral Refractory’s | | - |
|  | Grinding wheel | - | | It is used for removal of scales from iron surfaces, cutting tool harpening | | - |
|  | loose powder | - | | To clean the surface prior to coating abrasive powders are used. | | - |
|  | Reversible dimensional changes | - | | The uniform expansion and contraction of a refractory material | | - |
|  | Irreversible dimensional changes | - | | contraction or expansion of a refractory | | - |
| **Placement Questions** | | | | | | |
|  | Chemistry | - | | Chemistry is the scientific discipline involved with elements and compounds composed of atoms, molecules and ions: their composition, structure, properties, behavior and the changes they undergo during a reaction with other substances | | - |
|  | Organic chemistry | - | | Organic chemistry is the study of carbon containing compounds | | - |
|  | Inorganic chemistry | - | | Inorganic chemistry deals with other than carbon compounds | | - |
|  | Physical chemistry | - | | Physical chemistry is the study of macroscopic, atomic, subatomic, and particulate phenomena in chemical systems | | - |
|  | Normality | N | | Normality is a measure of concentration equal to the gram equivalent weight per liter of solution | | - |
|  | Molarity | M | | Molarity indicates the number of moles of solute per liter of solution (moles/Liter) | | - |
|  | Molality | m | | Molality is a measure of the concentration of a solute in a solution in terms of amount of substance in a specified amount of of the solvent | | - |
|  | Avogadro's number | - | | Avogadro's number, number of units in one mole of any substance equal to 6.02214076 ×1023  atoms, ions, or molecules | | - |
|  | Atom | - | | It is the smallest particle of a chemical element that can exist | | - |
|  | Molecules | - | | Molecules are made up of atoms that are held together by chemical bonds | | - |
|  | Chemical bond | - | | A chemical bond is a lasting attraction between atoms, ions or molecules that enables the formation of chemical compounds | | - |
|  | Types of bonds | - | | There are three major types of chemical bonds: ionic, covalent, and metallic bond | | - |
|  | Ionic bond | - | | Ionic bond form due to the transfer of an electron from one atom to another | | - |
|  | Covalent bond | - | | Covalent bond involve the sharing of electrons between two atoms | | - |
|  | Metallic bonding | - | | It is a type of chemical bonding that rises from the electrostatic attractive force between conduction electrons and positively charged metal ions | | - |
|  | Orbital | - | | It is a specific path, in which electrons are revolved around the nucleus of an atom | | - |
|  | Types of orbitals | - | | There are four types of orbitals namely s, p, d and f | | - |
|  | Chemical equilibrium | - | | Chemical equilibrium is the state in which both reactants and products are present in same concentrations which have no change with time | | - |
|  | Acid | - | | An acid is a molecule or ion capable of donating a proton (hydrogen ion H+) | | - |
|  | Base | - | | Bases are substances that, in aqueous solution, release hydroxide (OH−) ions | | - |
|  | Stoichiometry or law of conservation of mass | - | | total mass of the reactants equals the total mass of the products | | - |
|  | Oxidation | - | | Oxidation is the loss of electrons during a reaction by a molecule, atom or ion | | - |
|  | Reduction | - | | Reduction is the gaining of electrons during a reaction by a molecule, atom or ion | | - |
|  | Salt | - | | Salt is a solid chemical compound consisting of an ionic assembly of cations and anions | | - |
|  | Hydrolysis | - | | It is a chemical process in which a molecule of water is added to a substance | | - |
|  | | |  | |  | |
| **Faculty Team Prepared** | | | **Signatures** | |  | |
|  | Prof. S. Elavarasan | |  | |
|  | Dr.G.Venkatesh | |  | |  | |
|  | Dr.S.Anand | |  | |  | |
|  | P.Balamurugan | |  | |  | |
|  | P.Manimegalai | |  | |  | |
|  | C. Kathiravan | |  | |  | |
|  | M.Nivetha | |  | | **HoD** | |