



SNS COLLEGE OF TECHNOLOGY
(An Autonomous Institution)
COIMBATORE-35



1. Define corrosion. What are the consequences of corrosion

Corrosion is defined as “the gradual destruction or degradation of metals/alloys due to chemical or electrochemical reaction with its environment”.

The consequences of corrosion.

- Due to formation of corrosion product over the machinery, the efficiency of the machine gets lost.
- The products get contaminated due to corrosion.
- The corroded equipment must be replaced frequently.
- Corrosion releases toxic products, health hazard, etc.
- Plant gets failure due to corrosion.

2. List out the differences between dry corrosion and wet corrosion

S.No	Dry or chemical corrosion	Wet or Electro chemical corrosion
1.	It occurs in dry state.	It occurs in presence of moisture or electrolyte.
2.	It follows adsorption mechanism.	It follows the mechanism of electrochemical reaction.
3.	Corrosion products accumulate on the same spot where corrosion occurs.	Corrosion occurs at anode while products formed at cathode.

3. What is pilling bedworth rule?

- a. According to pilling-Bedworth rule, if the volume of the oxide layer formed is less than the volume of the metal, the oxide layer is porous and non-protective.
- b. On the other hand, if the volume of the oxide layer formed is greater than the volume of the metal, the oxide layer is non-porous and protective.

4. Define inhibitors. Mention their types.

A corrosion inhibitor is a substance, which reduces the corrosion of metal, when it is added to the corrosive environment.

Example:

Anodic inhibitors : Chromates, Nitrates, Phosphates of transition elements.

Cathodic inhibitors : Antimony or Arsenic oxides, Na_2SO_3 , N_2H_4

Vapour phase inhibitors (VPI): Di cyclo hexyl ammonium Nitrate



5. What are vapour phase corrosion inhibitors? Give an example

Vapour phase inhibitors (VPI) are organic inhibitors, which readily vapourise and form a protective layer on the metal surface. VPI are used in the protection of storage containers, packing materials, sophisticated equipments, etc.

Example: Dicyclo hexyl ammonium Nitrate, Benztriazole.

6. Compare sacrificial anode method and impressed current method.

S.No	Sacrificial anode method	Impressed current method
1	No external power supply is necessary.	External power supply must be present.
2	This method requires periodical Replacement of sacrificial anode.	Here anodes are stable and do not disintegrate.
3	Investment is low.	Investment is more.
4	This method is most economical method especially when short-term protections required.	This method is well suited for large structures and long term operations.

7. What is galvanic corrosion?

When two different metals are in contact with each other in presence of an aqueous solution or moisture, galvanic corrosion occurs.

Here the more active metal acts as anode and the less active metal acts as cathode. Example: In Zn-Fe couple, Zn acts as anode and undergoes corrosion. But in Fe-Cu couple, Fe acts as anode and undergoes corrosion.

8. Bolt and nut made of the same metal is preferred in practice. Why?

It is preferred in practice because galvanic corrosion is avoided due to homogeneous metals (no anodic and cathodic part)

9. What is differential aeration corrosion?

Differential aeration corrosion occurs when a metal is exposed to varying concentration of oxygen or air.

10. What are fire retardant paints?

Fire retardant paints are protective, decorative coating designed to reduce the spread of flames in the event of a fire. It is formulated with special additives that help slow the spread of flames in the event of a fire.



11. What is Electroplating?

Electro plating is the process of depositing the coating metal on the base metal by passing electric current through an electrolytic solution containing the soluble salt of the coating metal.

UNIT II-NANO CHEMISTRY

1 What is top-down approach? Give an example

Top down process involves the conversion of bulk materials into smaller particle of nano-scale structure.

1. Laser Ablation Method
2. Ball milling

2. What is Bottom up approach? Give an example

It involves building-up of materials from the bottom by atom by atom ($\approx 0.1\text{nm}$), molecule by molecule or cluster by cluster.

Chemical Vapour Deposition method

Sol-gel method

Solvo Thermal Analysis

3. What are nano particles? Give an example

Nano particles are the particles, the size of which ranges from 1-100nm., Gold Nano Particle, ZnO Nano Particle.

4. How do nano materials differ from bulk materials?

- The size of nano particles are less than 100 nm in diameter but bulk materials are larger in micron size.
- Nano particles are collection of few molecules that is less than 100 nm but bulk materials contains thousands of molecules.
- Surface area of nano particles is more than the bulk materials.
- Hardness of the nano materials are 5 times more than the bulk materials
- Strength of nano materials are 3-10 times higher than the bulk materials
- Nano particles possess size dependent properties, but bulk materials possess constant physical properties.
- Corrosion resistance and wear resistance is more than the bulk materials
- Nanoparticles, due to its size, possess unexpected optical (visible) properties.



5. What are types of nano materials?

Zero Dimensional nano materials: Nano Clusters, Quantum Dots

One Dimensional nano materials- Nano rods, Nanowires and Nanotubes

6. List out the properties of carbon nano tubes

- CNTs are very strong.
- It can withstand extreme strain intension and posses elastic flexibility
- The atoms in a Nanotube are continuously vibrating back and forth
- It is highly conducting and behaves like metallic or semiconducting materials
- It has very high thermal conductivity and kinetic properties

7. List out the uses of carbon nanotubes.

- It is used in battery technology and in industries as catalyst
- It is also used as lightweight shielding materials for protecting electronic equipments
- CNTs are used effectively inside the body for drug delivery
- It is used in composites
- It also act as an efficient catalysts for some chemical reactions
- It acts as a very good biosensor.
- It is also used in water softening process as a filter

8. Write the uses of solgel method.

- a. Sol-gel is a chemical solution process used to make ceramic and glass materials in the form of thin films, fibers or powders.
- b. Used in healthcare, cosmetics ,food, and special chemicals



UNIT III-FUEL AND COMBUSTION

1. Write a note on Biogas

- Biogas is a type of biofuel that is naturally produced from the decomposition of organic waste in the absence of oxygen
- When organic matter, such as food scraps and animal waste, breakdown in an Anaerobic environment (an environment absent of oxygen) they release a blend of gases called biogas.
- It is a renewable energy source

2. What is Carbonization?

The process of preparing coke from coal is known as carbonization of coal. When bituminous coal is heated strongly in the absence of air, the dense strong, porous mass obtained is called metallurgical coke.

3. List out composition of CNG.

The average composition of CNG is as follows:

Constituents	Percentage%
Methane	88.5
Ethane	5.5
Propane	3.7
Butane	1.8
Pentane	0.5

4. List out composition of LPG.

The average composition of LPG is as follows:



Constituents	Percentage %
n-Butane	38.5
Iso Butane	36.7
Propane	24.7
Others	0.1

5. Write a note on Biodiesel.

A fuel derived from organic oils, such as vegetable oil, rather than petroleum. Biodiesel's use and production are increasing. It's typically used for aircraft, vehicles and as heating oil. It involves treatment of vegetable oil (sunflower oil, palm oil, soya bean oil, mustard oil, etc.) with excess of methanol in the presence of catalyst to give mono ethyl esters of long chain fatty acid (Bio diesel) and glycerin.

6. Define calorific value

The efficiency of a fuel is determined by its calorific value. The calorific value of a fuel is defined as "the total amount of heat liberated by the complete combustion of a unit mass of fuel".

7. Define Gross calorific value

Gross or higher calorific value is defined as the total amount of heat produced, when a unit mass of the fuel is completely burnt and the products of combustion are cooled to room temperature.

8. Define Net calorific value

The net calorific value is defined as the net heat produced, when a unit mass of the fuel is completely burnt and the products of combustion are allowed to escape.

Net calorific value = Gross calorific value - Latent heat of condensation of water vapour produced



UNIT IV – WATER TECHNOLOGY

Two Marks Questions & Answers

1. Define boiler feed water.

The water fed into a boiler for the production of steam is known as boiler feed water.

2. What are the disadvantages of using hard water in boiler?

i) Scale and sludge formation, ii) priming and foaming, iii) caustic embrittlement and iv) boiler corrosion.

3. Name the gases dissolved in water that cause boiler corrosion.

The gases dissolved in water that cause boiler corrosion are O_2 and CO_2 .

4. What do you mean by hardness of water? How is it classified?

Hardness is the characteristic property of water which prevents lather formation with soap solution. They are classified into permanent hardness and temporary hardness.

5. What are the salts responsible for Permanent Hardness and Temporary Hardness

Permanent Hardness Producing Salts: $CaCl_2$, $CaSO_4$, $MgCl_2$ and $MgSO_4$

Temporary Hardness Producing Salts: $Ca(HCO_3)_2$ and $Mg(HCO_3)_2$

6. What is meant by soft water and hard water?

Water readily produces lather with soap solution is called soft water.

Water that do not produce lather readily with soap solution is called hard water.

7. Distinguish between hard water and soft water.

S. No.	Soft water	Hard water
1.	produce lather readily with soap solution	does not produce lather with soap solution
2.	does not produce white precipitate with soap solution	produce white precipitate with soap solution
3.	can be used for drinking, washing, etc.	cannot be used for drinking, washing, etc.

8. What is reverse osmosis?

Reverse Osmosis (RO) is a water purification process in which water is forced through a semipermeable membrane from a region of higher concentration to a region of lower concentration by applying external pressure.



9. List out the types of impurities present in water.

Chemical impurities, Physical impurities and Bacterial impurities.

10. What is desalination?

A Process in which removal of common salt occurs, is known as Desalination

Unit V-ALLOYS AND ENGINEERING MATERIALS

1. What is an alloy?

A: An alloy is a homogeneous mixture of two or more elements, at least one being a metal, made to enhance mechanical, thermal, or chemical properties.

2. What are the two main types of alloys?

A: Alloys are classified as **ferrous** (contain iron) and **non-ferrous** (do not contain iron).

3. What are the components of Nichrome?

A: Nichrome is an alloy of **nickel (Ni)**, **chromium (Cr)**, and **iron (Fe)**.

4. State one use of stainless steel.

A: Stainless steel is used in **kitchen utensils** and **surgical instruments** due to its corrosion resistance.

5. Non-Ferrous Alloys (Brass and Bronze)

6. What is brass made of?

A: Brass is an alloy of **copper (Cu)** and **zinc (Zn)**.

7. What are the constituents of bronze?

A: Bronze is an alloy of **copper (Cu)** and **tin (Sn)**.

8. What is heat treatment of steel?

A: It is the process of heating and cooling steel under controlled conditions to alter its mechanical properties.

9. What are light metals?

A: Light metals are metals with **low density**, such as **aluminium**, **magnesium**, and **titanium**.

10. Mention one application of aluminium.

A: Aluminium is used in **aircraft frames** due to its low weight and high strength.

**11. What are super alloys?**

A: Super alloys are high-performance alloys that maintain strength and resist oxidation at high temperatures.

12. Where are super alloys used?

A: They are used in **jet engines, gas turbines, and nuclear reactors.**

13. Name two solid lubricants.

A: **Graphite and molybdenum disulphide (MoS_2).**

14. What is Portland cement?

A: Portland cement is hydraulic cement made by heating **limestone and clay** to form clinker, then grinding it with gypsum.

15. What is the composition of Portland cement?

Oxide	Appx Weight %
Lime (CaO)	30 to 45 percent
Silica (SiO_2)	10 to 20 percent
Aluminium Oxide (Al_2O_3)	2 to 7 percent
Iron Oxide	1 to 3 percent
Magnesium Oxide	0.5 to 3 percent
Sulphur trioxide (SO_3)	1 to 3 percent
Soda and/or Potash ($\text{Na}_2\text{O}+\text{K}_2\text{O}$)	0.5 to 1.3 percent