Corrosion Chemistry Questions with Solutions

Q1: Which of the following is an example of corrosion?
a) Rusting of iron
b) Tarnishing of silver
c) Liquefaction of ammonia
d) Rusting of iron and tarnishing of silver

Answer: d) Rusting of iron and tarnishing of silver

Explanation: Corrosion caused by the oxidation process includes rusting of iron and tarnishing of silver.

Q2: Metals do not exist in nature in the form of _____.
a) Nitrates
b) Sulphates
c) Carbonates
d) Oxides

Answer: a) Nitrates

Explanation: Metals are found in nature as oxides, sulphides, sulphates, and carbonates.

Q3: Due to corrosion, useful properties of metals such as malleability, ductility and electrical conductivity are lost.
a) True
b) False

Answer: a) True

Explanation: Metals lose useful properties including malleability, ductility, and electrical conductivity due to corrosion. Corrosion corrodes metals and alloys, affecting their characteristics and rendering them ineffective.

Q4: Select the incorrect statement from the following option.
a) Replacement of corroded equipment is time-consuming
b) Corrosion causes contamination of product
c) Corrosion increases the electrical conductivity of metals
d) Corrosion causes leakage of toxic liquid or gases

Answer: c) Corrosion increases the electrical conductivity of metals

Explanation: Metals' electrical conductivity is decreased by corrosion. All the other options are correct.

Q5: Leakage of inflammable gas from a corroded pipe can cause _____.
a) Acidity
b) Alkalinity
c) Turbidity
d) Fire hazards

Answer: d) Fire hazards

Explanation: A rusted pipe might leak flammable gas, creating a fire hazard. It won't make your water acidic, alkaline, or murky.

Q6: Corrosion is an example of
a) Oxidation
b) Reduction
c) Electrolysis
d) Erosion

Answer: a) Oxidation

Q7: Define the term corrosion and differentiate it from erosion.

Answer:

Corrosion is the term for the chemical reactions that cause materials to corrode. Erosion is a physical phenomenon that involves the movement of microscopic fragments of rock or dirt as a result of natural forces such as gravity, water, wind, and so on.

Difference Between Erosion and Corrosion	
Erosion	**Corrosion**
Erosion is a physical process.	Corrosion is a chemical process.
Occurs on the surface of the land.	Occurs on the surface of materials like polymers, ceramics or metals.
Erosion is caused by natural forces such as water, gravity, and wind.	Corrosion can be caused by corrosive substances such as oxygen and sulphates.

Transportation, weathering, and dissolution are all processes that contribute to erosion.	Pitting, galvanic, crevice, intergranular, and selective leaching are all kinds of corrosion.
Erosion can be prevented by land reform strategies such as terracing or tree planting.	The preventive measure involves applying a protective layer on the surface of the metals.

Q8: Discuss the different types of corrosion that we commonly come across.

Answer:

Corrosion is a sequence of usually complex chemical processes that can be caused by a variety of mechanisms that are influenced by the environment. This has resulted in the numerous corrosion categories.

Uniform Corrosion

The most common type of corrosion is uniform corrosion, which occurs when a corroding agent targets the entire surface area of metal. Chemical or electrochemical reactions consume the metal while generating oxides or other compounds over wide visible areas, resulting in this type of corrosion. These reactions lead the metal to thin out over time and can last until the metal is completely dissolved.

Galvanic/Bimetallic Corrosion

When two dissimilar metals come into direct or indirect contact with each other, bimetallic corrosion, also known as galvanic corrosion, occurs. This form of corrosion is visually distinguished by the rapid deterioration of one metal while the other remains unaffected.

Crevice Corrosion

Crevice corrosion is a type of highly penetrative localised corrosion that occurs in or near gaps or fissures on a metal's surface. The area around the crack deteriorates but the surrounding areas of the metal substrate remain unharmed by this form of corrosion.

Pitting Corrosion

Pitting corrosion, commonly known as pitting, is a type of corrosion that occurs on metal surfaces in small areas. This type of corrosion is also very penetrative, and it is regarded as one of the most dangerous types of corrosion since it is difficult to forecast and causes unexpected and extreme failures.

Erosion Corrosion

The accelerated deterioration of a metal caused by the relative movement between a corrosive liquid and the metal's surface is known as erosion-corrosion. The development of grooves, gullies, craters, and valleys in a directional pattern on the metal substrate indicates erosion-corrosion.

Selective Leaching

Some metal alloys can experience a type of corrosion where only one element of the alloy deteriorates and is eliminated by corrosion in specified corrosive situations. Selective leaching or dealloying is the process of selectively removing a single element.

Stress Corrosion Cracking

SCC is a type of corrosion characterised by the production of small cracks on particular portions of the metal surface while the metal remains unaffected over the majority of its surface area. The existence of tensile tensions in a corrosive environment is usually the cause of cracking.

Q9: Discuss about the use of inhibitors in corrosion control.

Answer:

A corrosion inhibitor is a chemical solvent that is used in a certain environment to slow down the corrosion of metals exposed to that environment, such as air or water. The corrosion inhibitor is referred to as CI.

A corrosion inhibitor is a chemical agent that can be added to liquids or gases and used to reduce the rate of corrosion of a certain material (typically a metal). Corrosion inhibitors are used in a variety of commercial, process, and industrial applications. The following are some of these applications.

- Corrosion Inhibitors are used to prevent metals from rusting and anodic corrosion. This is usually accomplished by applying a chromate layer to the metal surface.
- Oxygen scavengers can be employed as CIs to assist prevent cathodic corrosion by reacting with dissolved oxygen in the environment.
- The prevention of rusting and corrosion of fuel pipes is critical. As a result, CIs play a vital role in safeguarding these pipelines and lowering the likelihood of accidents.
- Corrosion is a problem with metal pipes in heating systems. Additionally, CIs play an essential role in safeguarding these pipelines.

Q10: What are the factors that affect the rate of corrosion?

Answer:

A few factors that influence corrosion rate are listed below.

- The stronger the metal's reactivity, the more likely it is to corrode.
- Corrosion is increased when electrolytes are present in water.
- The rate of corrosion increases as the temperature rises.
- Metals are exposed to CO_2, SO_2, and SO_3 in the air.
- Exposure of metals to moisture, particularly salt water (that increases the rate of corrosion)

Q11: Distinguish between Chemical corrosion and Electrochemical corrosion.

Answer:

Chemical Corrosion	**Electrochemical Corrosion**
It occurs in a dry state.	Wet state (i.e. moisture content).
Local attack to metal by environment.	Multiple cathodic and anodic zones.
Corrosion of a homogeneous metal surface.	Bimetallic contact (heterogeneous surface).
Corrosion products accumulate in the same spot where corrosion happens.	Corrosion takes place near the anode, while the products are created elsewhere.
Chemical corrosion is self-regulating.	It is an ongoing procedure.
It uses an adsorption method.	It happens after an electrochemical response.
Oxidation corrosion, Corrosion by other gases, and Liquid – Metal corrosion, are the 3 types.	Galvanic corrosion and Differential aeration corrosion are the 2 types.

Q12: Why does corrosion of water filled steel tanks occur below the water line?

Answer:

Since the area below the waterline is less oxygenated, corrosion of water-filled steel tanks occurs there.

- Corrosion of water tanks occurs below the water level because it is less oxygenated. The area below the water line has less oxygen content and is not exposed to the air; thus, it corrodes easily.

- The area below the water's surface serves as an anode, while the area above serves as a cathode. Aeration corrosion is another name for this phenomenon.

- As we all know, there are less water molecules above the water level; therefore, there is nothing that can cause corrosion, but there is still a danger due to moisture.

- Because there is water and dissolved air along the water's edge, corrosion takes place.

Q13: What is a Sacrificial Anode?

Answer:

The protection methods we need to use against corrosion are sacrificial anodes, also known as galvanic anodes. While they do not totally prevent corrosion, they do make themselves available to it.

A sacrificial anode, as the name implies, is a material that specialists use to sacrifice against corrosion in pipelines or tanks. In other words, because certain materials are easily corroded, they can protect the remainder of the system from corrosion.

As a result, corrosion in the pipe, tank, or other holding is minimal.

Q14: What is Electroplating? Give the uses of Electroplating.

Answer:

Electroplating is the process of chemically plating one metal onto another, usually to avoid metal corrosion or for ornamental purposes. An electric current is used to reduce dissolved metal cations, resulting in a thin, coherent metal coating on the electrode.

Electroplating is frequently used in the electrical oxidation of anions on a solid substrate, such as when silver chloride is formed on silver wire to make silver chloride electrodes.

When it comes to the applications of electroplating, it is employed for a variety of functions in addition to improving the aesthetic of the substrate. The most common application is to improve a material's corrosion resistance. The plated layer is frequently used as a sacrificial layer, revealing that it degrades before the base substance. Electroplating is also used in the following applications:

- Enhancing the wear resistance.
- Increasing the metal surface thickness.
- Plating a copper layer on an electrical component to improve electrical conductivity.
- Friction reduction.
- Surface uniformity improvement.

Q15: Distinguish between wet and dry corrosion.

Answer:

	Dry Corrosion	Wet Corrosion
1	It occurs in dry conditions.	It occurs in wet conditions.
2	Dry corrosion occurs when there is no moisture present and the corrosion is caused by direct chemical attack.	Wet corrosion occurs when corrosion occurs owing to electrochemical attack in the presence of moisture or a conducting media.
3	Explained by absorption mechanism	Explained by electrochemical mechanism
4	It occurs on both heterogeneous and homogeneous surfaces.	It occurs only on heterogeneous metal surfaces.
5	Corrosion is uniform.	Corrosion is not uniform.
6	It is a slow process.	It is a fast process.
7	Corrosion products accumulate at the place where corrosion occurs.	Corrosion take place at anode but products accumulate near the cathode.

Practise Questions on Corrosion

Q1: How much rust will be formed when 100kg of iron has completely rusted away?
a) 100 kg
b) 190 kg
c) 250 kg
d) 320 kg

Answer: b) 190 kg

Explanation: When 100kg of iron has rusted away completely, 190 kg of rust will form.

Q2: Which of the following is the most stable state of metal?
a) Ore of metal
b) Pure metal

c) Corroded metal
d) Metal ion

Answer: a) Ore of metal

Explanation: Metal ore is the most thermodynamically stable form of metal. It does not change its shape into ore without the use of external power.

Q3: What is cathodic protection?

Answer:

Cathodic protection is a method of protecting submerged and subsurface metallic structures against corrosion.

Ships, offshore floaters, subsea equipment, harbours, pipelines, tanks, and virtually all submerged or buried metal structures are all protected against corrosion with cathodic protection.

The method works by converting active areas on a metal surface to passive, effectively turning them into the cathode of an electrochemical cell.

Q4: Define Electrochemical corrosion. What are the types of Electrochemical corrosion?

Answer:

The presence of separate "anodic" and "cathodic" zones through which current flows via the conducting solution causes electrochemical corrosion. Oxidation takes place in the anodic area, destroying the metal's anodic component.

The types of Electrochemical corrosion are (i) Galvanic corrosion (ii) Differential aeration corrosion / Concentration cell.

Q5: What metal is corrosion resistant?

Answer:

Soft metals, often known as red metals, are corrosion-resistant metals including copper and its alloys, brass, and bronze. Copper is a malleable, ductile metal that conducts heat and electricity well. These metals can provide corrosion resistance over the life of a component.