

Home Assignment - 02

Q) Discuss the mechanism involved in the chemical and electrochemical theory of corrosion.

Ans) Mechanism of corrosion:

Corrosion is the deterioration of metals due to environmental reactions, primarily categorised into chemical (dry) and electrochemical (wet).

1) Chemical Theory of Corrosion (Dry Corrosion):

Chemical corrosion occurs through direct reaction between metals and gas (like oxygen or sulphur dioxide) without needing an electrolyte. This usually happens at high temperatures.

- Mechanism: Metal oxidizes, forming a metal oxide layer on the surface. For instance, Fe reacts with  $O_2$  at high temperatures to produce iron oxide ( $Fe_2O_3$ ).

- Protective Layer: In some metals, the oxide layer is stable and shields the surface. However, if the oxide layer is porous or non-adherent, as with rust on iron, corrosion progresses.

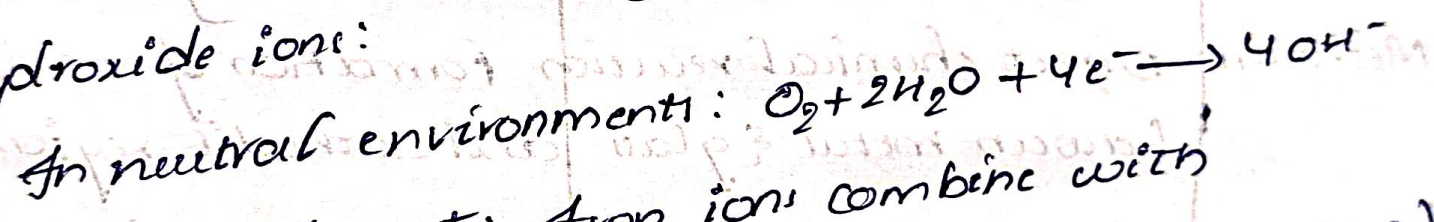
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2) Electrochemical Theory of Corrosion (wet corrosion):  
Electrochemical corrosion is more common and occurs in the presence of an electrolyte (water or moisture), forming anodic and cathodic regions on the metal surface.

• Anodic reaction (oxidation): Metal atoms at anodic sites release electrons and dissolve as ions. For example, iron oxidizes to  $\text{Fe}^{2+}$  ions.

• Cathodic reaction (Reduction): Electrons move to cathodic sites, where they reduce oxygen to form hydroxide ions:



• Formation of rust: Iron ions combine with hydroxide ions, eventually forming rust ( $\text{Fe}_2\text{O}_3 \cdot 2\text{H}_2\text{O}$ ).

Electrochemical corrosion results in surface pitting and structural weakening, especially in moist environments.