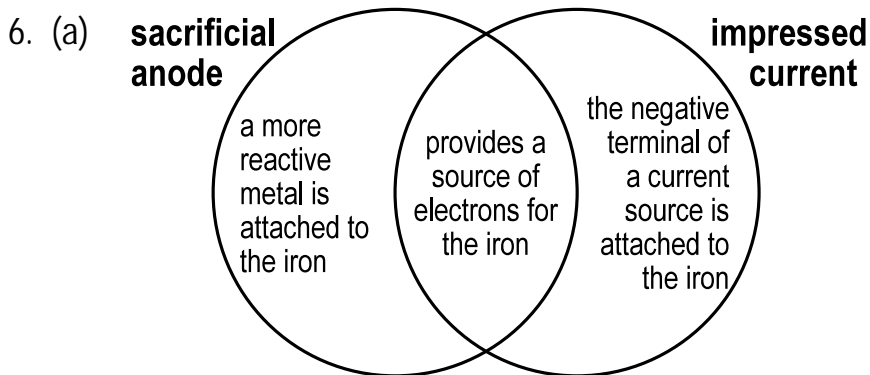


**ANSWERS**

- (a) Zinc protects iron against corrosion better than tin. Zinc is more reactive than iron and can act as a sacrificial anode whereas tin is less reactive than iron.

(b) The hydrogen ions in an acidic solution act as an oxidizing agent. Iron (the reducing agent) is lower in the redox table and, therefore, a spontaneous redox reaction occurs between hydrogen ions and iron (the iron corrodes). Both gold and silver are higher in the redox table than hydrogen ions and, therefore, no spontaneous reaction occurs.
- Oxygen and water must be present for the typical corrosion of iron.
- (b) Based on their position in the redox table, the order of the metals from highest tendency to oxidize to lowest tendency to oxidize is, magnesium, zinc, iron, gold (strongest reducing agent to weakest reducing agent).
- Salt water from road salt increases the rate of corrosion. The oil helps isolate the iron from the salt water.
- Nails used for exterior applications are often exposed to water and will rust if unprotected. The zinc coating on galvanized nails provides protection against corrosion (protective coating, cathodic protection).



- (b) Impressed current requires a constant current source which may be difficult for mobile structures.
- Test tube A: The nail corrodes because both water and oxygen are present.

Test tube B: No corrosion is evident because water is not present. The drying agent absorbs moisture.

Test tube C: No corrosion is evident because no oxygen is present. The oil floating on the water prevents oxygen from entering the system.

Test tube D: More corrosion is evident compared to test tube A because the presence of salt water (electrolyte) increases the rate of corrosion.