

Rusting is a specific term for the corrosion of iron or iron-based alloys, such as steel.

But what causes iron to rust?

To investigate the causes of corrosion you will need:

A test tube rack.

And five test tubes, labelled A to E.

Five iron nails.

Ferroxyl indicator.

This turns from yellow to blue in the presence of iron 2 positive ions.

You will also need, boiled water and oil.

Calcium chloride granules.

Distilled water.

Acid rain.

And salt water.

Each test tube has different contents.

Test tube A contains water that has been boiled to remove oxygen plus ferroxyl indicator.

It also contains a layer of oil to prevent oxygen from returning back into the water.

Test tube B contains calcium chloride granules that will absorb any water that is present.

Test tube C contains distilled water plus ferroxyl indicator.

Test tube D contains acid rain plus ferroxyl indicator.

And test tube E contains salt water plus ferroxyl indicator.

Place an iron nail in each test tube and then leave the samples for a few days to allow any reaction to take place.

After a few days, we can see there is no corrosion on the nail in test tube A and the ferroxyl indicator remains yellow.

And there is no corrosion on the nail in tube B.

In test tubes C, D and E, we can see the ferroxyl indicator has turned from yellow to blue.

This shows that iron 2 positive ions have formed.

Iron 2 positive ions did not form in test tube A where there was water but no oxygen.

Iron 2 positive ions didn't form in test tube B either, where there was oxygen but the calcium chloride removed any water.

This shows that both water and oxygen must be present for the corrosion of iron to take place.

Both water and oxygen are present in test tubes C, D and E, so each of these nails has corroded.

We can write up the results in a table with a column for each test tube and rows to show if oxygen is present, if water is present and if rusting has taken place.

Looking more closely at the nails we can see the nails in test tubes D and E are more corroded.

This shows that acid rain and salt water increase the rate of corrosion.