SAMPLE PLANNING AND DESIGN LAB

Conditions Necessary for Rusting

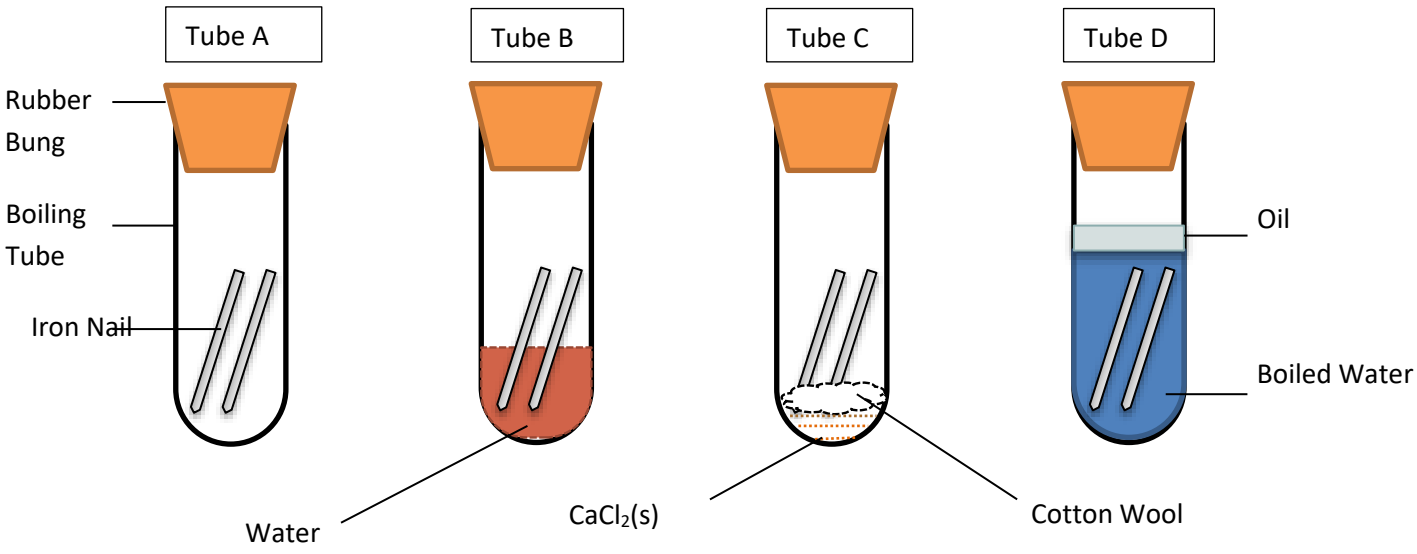
Aim: To determine if both water and oxygen are necessary for rusting.

Hypothesis: Both water and oxygen is necessary for rusting to occur.

Apparatus: 4 boiling tubes
8 3" nails (untarnished)
Distilled water
Oil
Bunsen burner
Tripod
Gauze
250mL beaker
10cm^3 measuring cylinder
4 rubber bungs
Cotton wool
Anhydrous calcium chloride ($CaCl_2$)

Method:

1. Set up four tubes as shown below:



2. Leave the tubes for a period of 24-48 hours.
3. Record you observations.
4. Repeat the experiment to verify your results.

Results:

Tube	Conditions Present	Observation
A	Control	
B	Air and Water	
C	Air only	
D	Water only	

Controlled Variables:

Number and Size of nails

Boiling Tubes

Rubber Bung

Manipulated Variables:

Water, Oxygen

Responding Variable(s):

Formation of Rust

Expected Results: The tube(s) that show the greatest signs of rusting has the conditions necessary for rusting to take place.

Discussion:

If tube B shows the greatest signs of rusting, and tube C and D shows little to no rusting, then both water and oxygen is needed for rusting to take place.

A precaution that should be taken in this experiment is to ensure that the nails are rust-free before use.

One possible source of error could have occurred in tube D. During cooling, oxygen may have re-dissolved in the water. This means that the tube may not have contained only water.

One limitation in this experiment is that air contains a very small percentage of water vapour.

Conclusion: If both water and oxygen are needed for rusting to take place, then the hypothesis is true.