

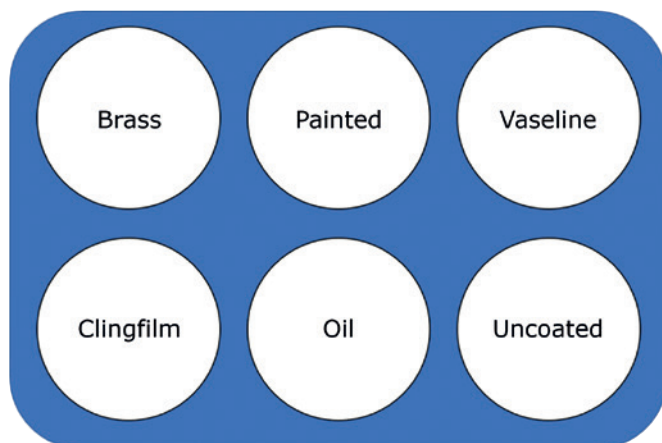


# Preventing rusting

## You will need:

- Paperclips – 5 standard metal paperclips
- 1 brass or brass-plated paperclip
- Plate/container/paint palette – we used a set of paint pots in a tray from Baker Ross, to keep them all together, but a standard paint palette, or small individual plastic tubs, such as clean yogurt pots, would also be fine
- Acrylic or oil-based paint, or nail polish
- Cooking oil
- Water
- Vaseline
- Cling wrap
- Table salt
- Spray bottle

- 1 Label your pots, or draw a diagram to show which pot will contain which substance:



- 2 In a spray bottle, dissolve salt and water so you have a salt water solution ready.

- 3 Place one brass or brass plated paperclip in the first labelled pot.

- 4 Using acrylic or oil-based paint, or nail polish, cover one paperclip, and when it is dry, place it in the pot labelled 'painted'.

- 5 Cover one paperclip in Vaseline, and place in the correct pot.

- 6 Wrap a 4th paperclip in clingfilm and then place in the pot.

- 7 Coat another paperclip in oil (any kind, standard vegetable cooking oil is suitable) and then place in the pot.

- 8 Finally, place the 6th paperclip in the remaining empty container as it is.

- 9 Using the salt solution you made earlier, lightly spray the paperclips, just enough so they are damp.

- 10 Place all 6 containers together to one side, where they can be left undisturbed for a few days or so. You may find you need to return to the experiment sooner, depending on the temperature and humidity of the location.

- 11 What happened to the paperclips?



# Challenge task sheet

**Introduction:** You are a team of engineers and need to work in a way that brings out the best in each other.

## What, who and why:

A local bridge used by pedestrians and vehicles has a problem.

The bridge has metal arches underneath the bridge to support the deck.

The bridge crosses an estuary which is tidal.

When the river rises it lifts boats up and sometimes lifts them so high the boats are hitting the underside of the bridge.



## Design Brief:

Design and model changes to the current bridge.

The new bridge designs must allow boats to pass underneath even if the tide is high and must provide the best value for money solution in the long term.

## Design Specification:

- To design and model one solution for the bridge problem.
- The design must allow for boats even at high tide.
- The design needs to be high quality then best value for money.
- The design needs to offer the least disruptive solution, allowing the river still to be crossed as much as possible.

Your first step is to consider how you can meet your clients' needs.

Think about your designs using these themes ready to present your model:

- quality
- time the bridge would be disrupted
- cost
- aesthetics and
- environmental impact