

Corrosion: All at Sea: Technical Notes

Equipment and materials

- Four 150 mL beakers per group of students. Four 150 mL beakers for the teacher. Twenty eight (28) 150 mL beakers per class of 24 students.
- 40 g cooking salt per group of students 40 g cooking salt for the teacher. 280 g cooking salt per class of 24 students. These quantities assume that there is no spillage and that 20 g of salt is used in each test solution. In practice, the groups might vary the mass of salt used to use smaller quantities.
- Plastic spoons or glass stirring rods
- Demineralised water. Approximately 500 mL per group of students Approximately 500 mL for the teacher. Approximately 3.5 L per class of 24 students.
- Paper clips, hair pins (or ‘bobby pins’), metal washers, aluminium foil (1cm strips), iron nails, galvanised nails, etc.
- Plastic tweezers or tongs
- 100 mL measuring cylinders. One measuring cylinder per group of students. One measuring cylinder for the teacher. Seven measuring cylinders per class of 24 students.
- Sticky labels or marker pens.
- Safety glasses/goggles and gloves. One pair of safety glasses/goggles per person. Twenty five (25) pairs of safety glasses/goggles per class of 24 students.

Optional

- Other metal samples, such as metal coins, stainless steel cutlery, etc
- Carbonated mineral water or soda water or soft drink. Approximately 500 mL per group of students. Approximately 500 mL for the teacher. Approximately 3.5 L per class of 24 students.
- Hot water bath

- Thermometer. One thermometer per group of students. One thermometer for the teacher. Seven thermometers per class of 24 students.
- Scissors. Seven pairs of scissors per class of 24 students.
- Steel Wool
- Emery paper or sandpaper
- Electronic balances or scales. To minimise waiting time, it is recommended that there one electronic balance per group of students. Six (6) measuring electronic balances per class of 24 students.
- Timer or stopwatch. This might not be needed if students have watches, or if there is clock in the room.

Hazards

- Nails, aluminium foil pieces, emery paper and steel wool may cause cuts and/or lacerations to skin if not handled correctly.
- Water that is used in corrosion experiments may contained dissolved ions, and should not be consumed.

Sourcing materials

This laboratory learning activity uses metal samples from around the home. It is recommended that a variety of metal samples be used: some that corrode and some that do not. Most metals are either alloys or have been treated/coated to minimise corrosion. The advice in this section focuses on sources of metal that will corrode easily.

In our testing, it has been found that “bright iron” corrodes reliably every time, even in room temperature deionised water.

It is best to have metal nails and washers that are marked for internal use as these are more likely to corrode. Zinc plated washers usually have a thin zinc coating over low-grade carbon steel (essentially iron). Bright nails are usually low-grade carbon steel (essentially iron). Galvanised nails and washers usually have a thick zinc oxide coating over low-grade carbon steel (essentially iron).

Suppliers

We have found that **Paslode Bright Nails** corrode very easily. **Paslode Bright Nails** can be sourced from Bunnings (Note ¹⁶).

Pinnacle Yellow Zinc Washers can be sourced from Bunnings.

Zenith Zinc Plated Flat Washers can be sourced from Bunnings.

We have found that **J.Burrows Paper Clips** have a protective layer that is effective at minimising corrosion. When this layer is removed by a metal file, the paper clips corrode very easily. **J.Burrows Paper Clips** can be sourced from Officeworks (Note ¹⁷).

Aluminium foil, demineralised water, large paper clips, plastic spoons, hair pins (or 'bobby pins'), carbonated mineral water or soda water, steel wool and cooking salt can be sourced from any supermarket.

Metal nails, metal washers, and metal files or emery paper or sand paper can be sourced from hardware suppliers e.g. Bunnings, Home Timber and Hardware stores.

Suggestions:

Suggestions for improvements of these activities should be sent to Linda Lawrie, ACA Foundation, foundation@corrosion.com.au, or Kieran Lim, ASELL for Schools (Victoria), kieran.lim@deakin.edu.au.

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¹⁶ Bunnings (2017). Bunnings Stores <<https://www.bunnings.com.au/stores>>. Accessed 18 September 2017.

¹⁷ Officeworks (2017). Officeworks <<https://www.officeworks.com.au/>>. Accessed 27 September 2017.

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