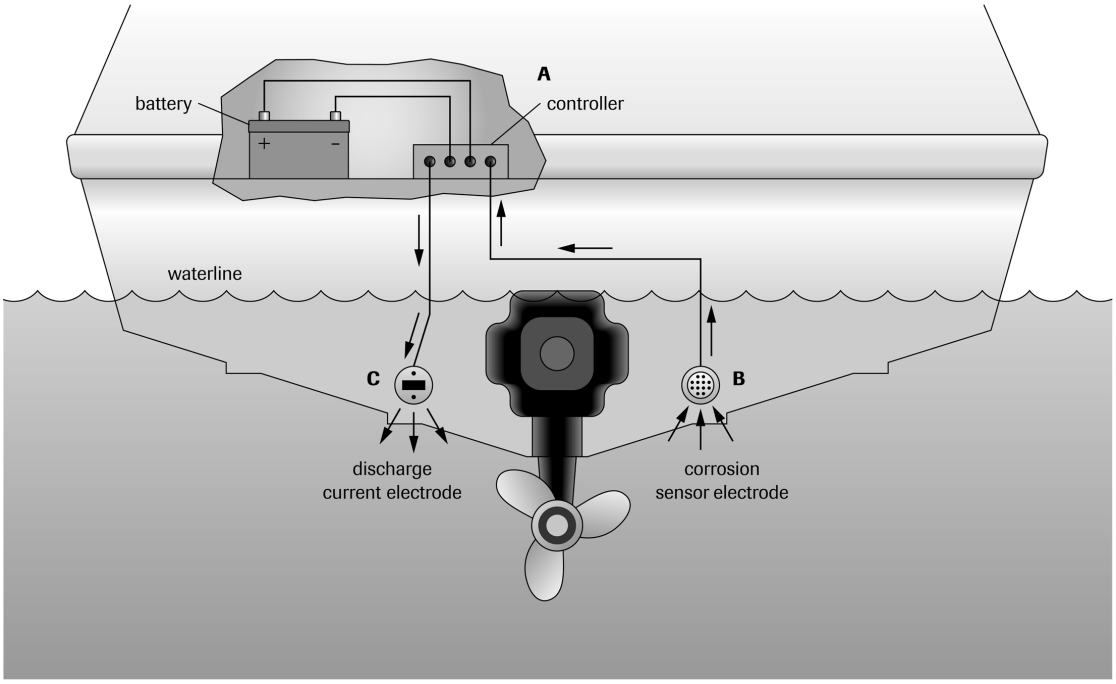


## 5.16 ACTIVITY: IMPRESSED CURRENT

**(Pages 427–428)**

### Observations

Control nail in test tube: The solution slowly turned pink.
U-tube: cathode: The solution around the nail became pink.
anode: Bubbles of gas were observed at the graphite surface. No colour changes were observed.

### Analysis

(a) Only the nail in the test tube showed any evidence of corrosion. The colour of the solution changed to blue (the colour of hexacyanoferrate(III) indicator with $Fe^{2+}_{(aq)}$ ions) around the nail. This indicates that the oxidation of iron was occurring.
(b) The nail in the cell could not corrode because electrons were being pumped into it, preventing the nail from being oxidized. The other nail had no such protection, so was free to corrode.
(c) The pink colour observed on the nail side of the U-tube is the characteristic colour of phenolphthalein in a base. Therefore, hydroxide ions were being produced and the second half-reaction probably occurred.

### Synthesis

(d) The reactions would occur very slowly or not at all. The presence of salt improves the electrical conductivity of the solution.
(e) Oxidation of iron would take place at the anode because electrons are being pulled out of the anode by the battery. Consequently, the solution should turn blue in colour as $Fe^{2+}_{(aq)}$ ions combine with the hexacyanoferrate(III) indicator.
(f) Without power protection, the nail would begin to corrode in the salt water. As a result, the solution should change colour to blue as $Fe^{2+}_{(aq)}$ ions combine with the hexacyanoferrate(III) indicator.
(g) If a steady, uninterrupted supply of current cannot be maintained, impressed current is not an effective method of corrosion protection.