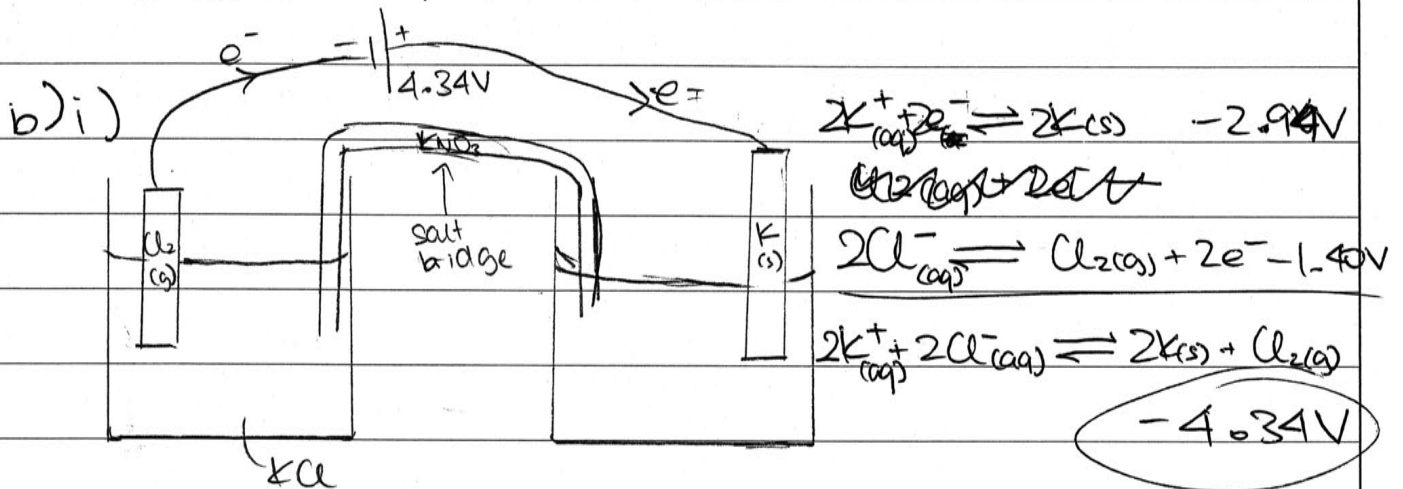


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30. a) The wooden artefact would be saturated with salt solution and physically damaged by marine worms that dig deep into the wooden structure to feed on it, hence making the wood more brittle. Concretions would have formed on the artefact, along with rusticles formed by anaerobic, sulfate reducing bacteria in deep oceans.



ii) Cathode is the more reactive element

c) Steel 1: low amt of carbon allows for greater malleability that is required for ~~some~~ materials that need to be moulded e.g. ~~structural steel~~, car body metals (steel), steel pipes.

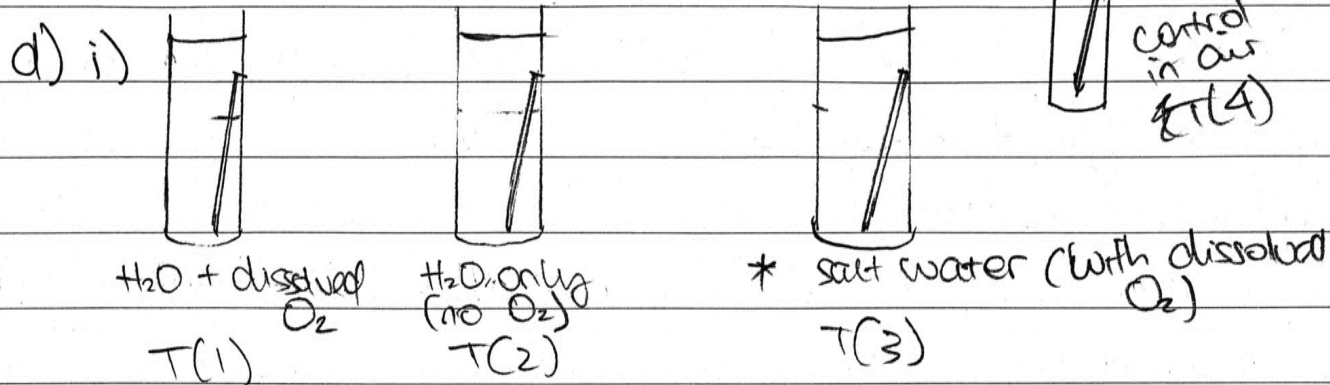
Steel 2: higher percentage of carbon ^{hardens} ~~makes~~ the steel, but also makes it more brittle. This is usually used for iron lace (decorations), structural support, fire hydrants. It is relatively soft but strong.

Steel 3: higher % of carbon makes steel very hard + brittle, ~~used for~~ but very strong. Used often for bridges (tension bridge).

Steel 4: Most often known as stainless steel with the Chromium component. The passivating metal in the alloy prevents corrosion effectively, ~~and~~ and hence can be used for many day to day tools eg. cutlery, scissors, etc. Nickel also prevents rusting, especially in marine env. where Cr cannot protect the steel from rust.

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Method

1. Take 3 test tubes and add ~~to~~ an iron nail that has been buffed with emery paper into each test tube, ~~as shown above~~.
2. Fill T(1) with water with dissolved O_2 in it, T(2) with boiled water (has no dissolved O_2), and T(3) with salt water, as shown above.
3. Ensure that the entire nail is covered with water.
4. Observe experimental results at the beginning, after 1 day, and after 1 week.
5. Keep a separate test tube with an iron nail in air, uncovered as a control: T(4).

(ii) ~~test~~ dissolved oxygen in water can vary in marine environments with depth of water. The deeper, the less available dissolved oxygen. Also, in stagnant waters, there is less oxygen available.

ii) effect of concentration of salt ~~is~~

- conc. of salt is ~~is~~ regulated by bacterial and ~~an animal~~ ~~process~~ biological processes in the water. The natural cycle of decomposition, photosynthesis and respiration constantly minimises changes of salt concentration, even with ext. factors such as runoff from towns + cities. The large volume of water present also helps to disperse the concentration to create a more homogeneous mixture.

e) Wooden artefacts when salvaged are saturated with salt solution, and may be covered with concretions, then diluted of the salt solution before restoration or conservation takes place. Similarly, Copper artefacts must be removed of concretions then electrolysed before conservation and restoration.

Disadvantages:

~~Advantages~~:- physical removal of concretions, crustaceans and other materials such as rust takes a long time and is a delicate process. Accidents may occur to damage the artefacts further

- electrolysis of copper takes a long time (years) and is very expensive

- diluting salt solution and removing salt from wooden structures take a long time (years)

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- if artefacts are restored by replacing new parts to it, it isn't the genuine object anymore
- although conservation may prolong the life of the artefact, it will still corrode, regardless of conditions/time
- consv. and restoration are expensive, may not be worth the money - money could be put into more essential needs e.g. hospitals
- even restoration cannot bring the artefact back into working order.
- conservation must be ongoing - painting with water and oxygen proof paints in wood, anti rust/corrosion paints in copper, some artefacts must be kept in cases forever

Advantages: - people can see what historic artefacts looked like through restoration

- removal of concretions on wooden & copper objects allow their true shape to be revealed.
- electrolytic cells for copper may restore some broken/fragmented pieces of copper, restoring its shape.
- diluting wooden objects remove salt, avoiding them to crystallise & break the object's structure
- spraying of wax (PEG) to wood fills the broken/fragmented wood structure. It retains the shape of the artefact.
- painting of waterproof + air proof paints prevent further corrosion for all artefacts.

You may ask for an extra Writing Booklet if you need more space.