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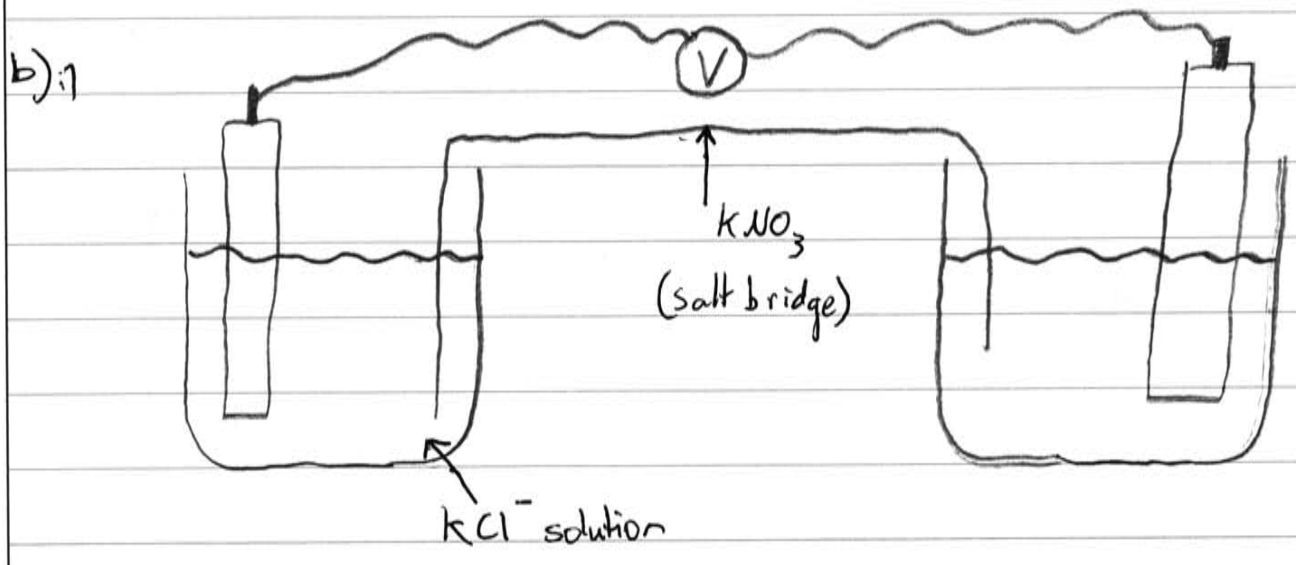
a) The artefact would have very high levels of corrosion on the iron band going around aswell as the iron nails that are used to fix it in place. The timber would have begun to rot and the whole artefact would be very fragile. The thickness of both the iron band and the timber would determine how much is left though severe oxidation would have occured.

b) i)



$K^+ + e^- \longrightarrow K_{(s)}$ 2.94v

$Cl^- \longrightarrow \frac{1}{2} Cl_{2(aq)} + e^-$ -1.40v

$KCl + e^- \longrightarrow \frac{1}{2} Cl_2 K + e^-$ 1.54 v

ii) By seeing the site of oxidation, as where mass from the solution has gone. Also a voltometer would show as electrons flow from the cathode.

c) steel 1 – ~~[illegible]~~. A low carbon content gives good
(iron) maleability and ductility, is strong but very prone to corrosion.

steel 2 – ~~[illegible]~~, Higher carbon content ~~[illegible]~~ makes ~~[illegible]~~
(structural stee) slighlty more brittle, though still good maleability and ductility. is strong for a variety of applications but is still ~~prop~~ prone to corrosion. weldable

steel 3 – A very high Carbon content makes a very strong
(cast iron) ~~[illegible]~~ result, but is also very brittle. low movement and vibration applications.

steel 4 – stainless steel. Very strong. Maleable, ductile. very resistant to corrosion, but very expensive.

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d) i) The rate of corrosion could simply be done with a series of iron nails in individual test tubes. Some of the test tubes could be filled with tap water, then blocked at the top with a cork, thus partially reducing oxygen which slows down corrosion. Other test tubes could be filled with sea water to see the effect of a catalyst such as KNO_3. Other test tubes could be filled with tap water, but a fish pump, constantly bubbles oxygen through the test tube. This increases the oxygen present and should have an increased corrosion rate. Also controls in air, open would also be needed, with many tests for each test for reliability. These test the effect of reduced oxygen, increased oxygen and a catalyst (KNO_3).

ii) The effect of the salt in the sea water could be reduced by galvanising the nails, this would mean the zinc coating corrodes and not the iron nail.

e) Techniques for wooden artefacts would be to keep the artefact wet as when it drys out the salt crystals expand and would break the artefact appart, so it needs to be left in a salt solution. Then it can be scanned (x-rays) to check the stability of it and the effect of concretions. Some of the concretions are chipped away or the artefact is placed in dilute acid. The artefact is then placed in fresh water as it leaches out the salt ~~and chlorides~~. The water is continually

changed until not salt remains. The artefact ~~$~~ can then dry out, but it is covered in wax or similar to stop oxygen or water getting to it.
For the copper artefact, it has to also be kept wet, in the sea water until scans are taken and the effect of concretions is analysed. The concretions are then chipped off or the artefact is placed in dilute acid. Next the artefact is placed in fresh water, and is electrolysed. Electrons are "put back" into the artefact and corrosion is reversed. After all the Cl^- ions are out of the artefact it can be dried out and covered in wax or similar to prevent oxygen or water getting to it.

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