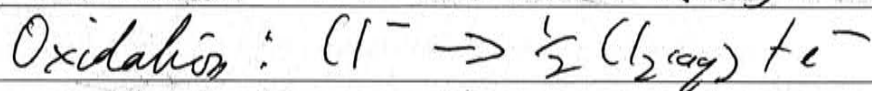
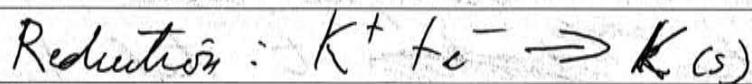
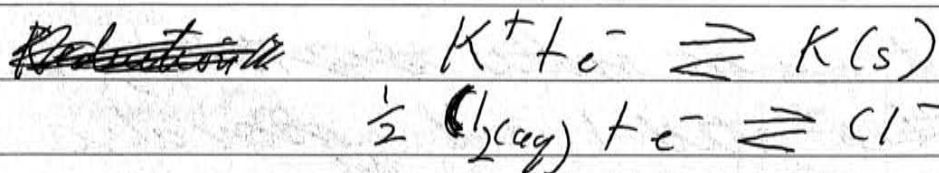
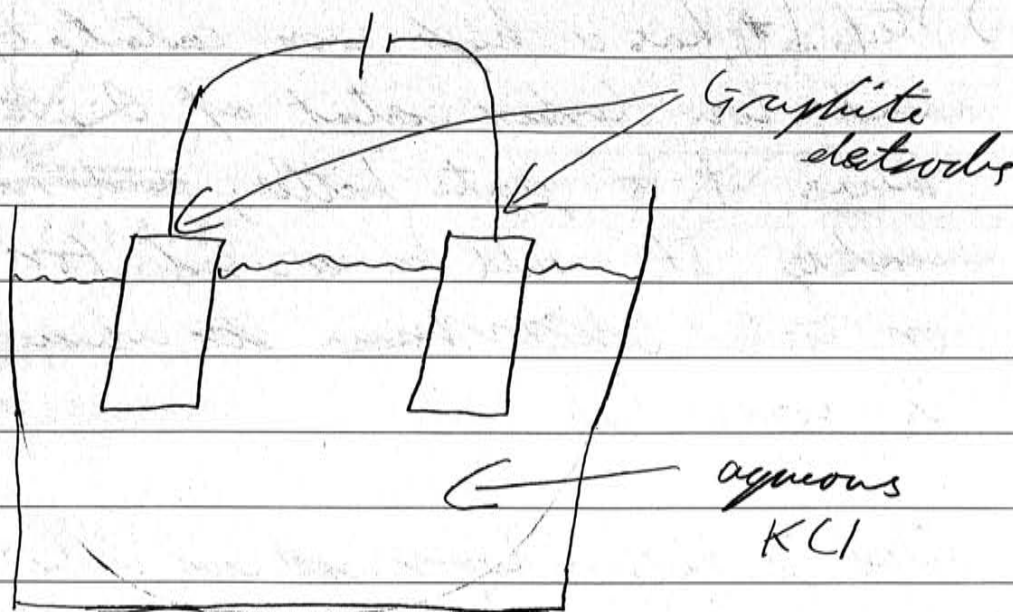


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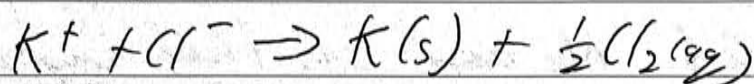
(9) The identified artefact is wood and thus the effect the marine environment would've had is quite large. The ship it belonged to sank 150 years ago. Because it ~~is~~ sank off the coast, it would also have been subject to atmospheric decomposition. This means most of the wood would have rotted away, and the metal fittings would have corroded.

Bsm

(b) (i)



$\therefore$  Overall reaction:



(ii) The cathode would be identified as having deposits of potassium forming on <sup>one of</sup> the graphite electrodes.

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(c) Steel 1 has a high iron content, of 99.8% and low carbon content of 0.2%. This means it is quite brittle, and rusts readily. It would be used for buildings or tools ~~where corrosion is low~~ where corrosion is low.

Steel 2 has a lower iron content of 98.5% and higher carbon content of 1.5%. This means it is more brittle ~~than steel 1~~, but stronger than steel 1, and ~~also~~ also rusts readily. It would <sup>also</sup> be used in similar ~~situations~~ <sup>ways</sup> to steel 1.

Steel 3 has the addition of <sup>other</sup> ~~passivating~~ passivating metals Mn and Si. This improves strength and makes it ~~slightly~~ <sup>more prone to</sup> ~~slightly~~ corrosion ~~resistant~~, and can be used <sup>in high</sup> ~~on~~ ~~high~~ tensile areas.

Steel 4 is known as stainless steel, and is corrosion proof due to the passivating metals Cr and Ni. This means it can be used on ships, and cars. It is very strong, ~~and~~ but very expensive and heavy.

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(d) (i) Such an investigation can be performed with ~~water~~ iron nails in test tubes where several are subjected to different conditions. Three environmental factors that can be tested are:

- temperature, which involves nails in different temperatures;
- acidic or basic environments, which involves nails in acidic, basic and neutral solutions;
- salty and fresh water, which involves nails in salt water ~~and~~ solutions and fresh water.

By experimental process, it would be found that acidic and salty solutions promote corrosion.

These 3 environmental factors vary throughout the world as so is an effective way of observing the relationship between rate of corrosion and environmental factors.

(ii) The factor of an acidic or basic environment is reduced in a marine environment as sea water is neutral, thus not affecting corrosion.



(e) Techniques used for conserving <sup>and restoring</sup> wooden and copper artefacts that have been immersed in salt water for at least 100 years have been quite successful. Many underwater artefacts have undertaken these processes and been preserved in their former state. However each process is very different. While wood is harder to restore as it rots underwater, copper is subject to oxidation. ~~and~~ Copper is restored by using electrolysis within a copper ion solution. This is similar to electro-plating where copper is added to the surface of the artefact. The restoration of wood is more complex, due to the organic nature of the material. The restoration of a wooden artefact involves rinsing it to ensure all ions are flushed out. From there, the wood is treated to ensure micro-organisms are killed, and ions are neutralised. The restoration of both materials also differs, but are also similar.

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Both materials can be covered in wax, to make them ~~air tight~~ ~~impermeable~~ ~~imperious~~ impermeable to water. Copper can also have a ~~sacrificial~~ sacrificial anode placed on the surface to prevent further corrosion.

Ultimately, ~~the~~ the varying ~~both~~ techniques for restoring and conserving wooden and copper artefacts ~~is~~ ~~are~~ sustainable, and can help preserve artefacts that have been immersed in salt water for at least 100 years.

These techniques will be used well into the future.

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