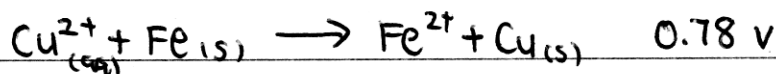
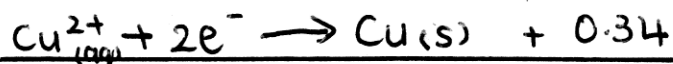
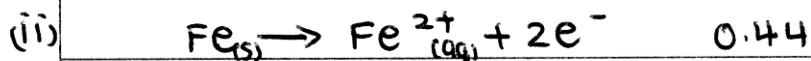




a (i) galvanic cell

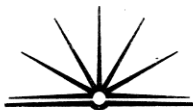


∴ The voltage required is 0.78 V

b. Galvani is the first scientist to generate electricity by connecting two wires, one end from each wire to a freshly extracted frog leg. He ~~thought~~ ^{thought} wrongly the frog leg was generating electricity. He created a starting point for other scientist to investigate electron transfer reactions.

Davy discovered electrolysis. He was able to separate substances chemically. The two substances that he was able to separate are Sodium and Potassium and ~~that~~ he certainly increased our understanding of electron transfer reactions.

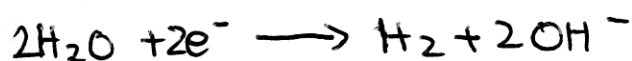
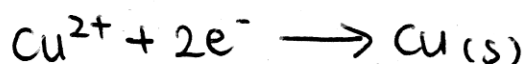
Faraday was able to use his laws and to show that the amount of substance produced is directly proportional to the electrical charge passing



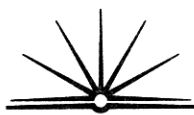
through the circuit. And from his law, we are then able to get a better understanding of electron transfer reactions.

(c) Electrolysis

(i) A copper coin, for example, is extracted from sea. It contains large amount of chloride ions due to the coin being trapped in the sea for hundreds of years. Therefore when extracted, chemical procedures are to be done to remove the water and sodium chloride from the copper. One method used to remove these is the electrolysis where copper is made the ~~anode~~ cathode in the cell. Under electrolysis, the copper is being reduced to ^{pure} copper, while water is being oxidised



The artefact (the copper coin) is then placed in an environment where water is absent and oxygen gas is at low concentrations.



d (i)

Prepare 6 iron nails.

2 iron nails are to be placed in ² ~~empty~~ test tubes.

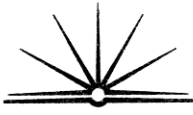
2 iron nails are to be placed in ² test tubes containing hydrochloric acid.

2 iron nails are to be placed in 2 test tubes containing water.

Leave ~~Place~~ all the test tubes for a few days and observe the results.

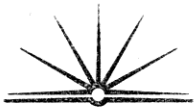
(ii)

The data obtained from the above experiment shows that the 2 iron nails in ~~acid~~ hydrochloric acid have a greater degree of rust than the nails in empty test tubes and in water. This is reflected by the fact that the mass of the rust from the two iron nails in hydrochloric acid ~~is~~ is greater than the masses of rust ~~from the~~ on the nails from the empty test tubes and nails in water. Therefore the data obtained does support this hypothesis, that acidic environment does accelerate rusting.



e.

~~At depth~~ As the depth of the ocean increases, temperature decreases ~~and~~ ^{and} according to Le Chatelier's principle, decrease in temperature leads to increase in solubility of gases. Therefore as temperature decreases, more oxygen are dissolved. However, this is not the case in reality. The concentration of oxygen dissolved decreases as oxygen is being consumed by bacteria living deep down the sea. Therefore it is obvious that the rate of corrosion will decrease since there is not enough oxygen and temperature is low, slowing the reaction rate of corrosion of metallic objects. ~~However~~ Although the ~~the~~ rate of corrosion is slow, but there are anaerobic bacteria deep down in the sea producing hydrogen sulfide, HS^- , which is acidic and thus speed up the rate of corrosion of metallic objects. The HS^- produced will cause the metallic objects to rust or ~~the~~ the bacteria will distort the shape



of the metallic objects. Therefore we see that corrosion of metallic objects still occur at great ocean depth and causing devastating effects to the metallic objects