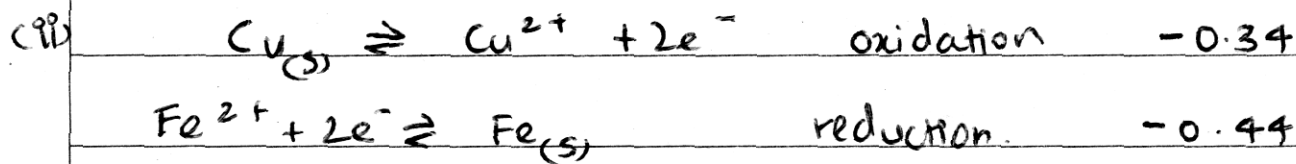


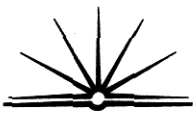
Question 29 - Shipwrecks and Salvage

a) galvanic cell.



$$\begin{aligned} \text{EMF} &= -0.34 - (-0.44) \\ &= -0.34 + 0.44 \\ &= 0.10 \text{ V} \end{aligned}$$

(b) Galvani, Volta, Davy and Faraday, the pur scientists have now increased our understanding of electron transfer reactions, Galvani first assumed that when he placed a brass wire through a spine of a dead frog to its legs muscle and passed current it contracted, this made Galvani assume that the muscle produce electricity, Volta further elaborated his experiment by using [Cu and Zn] soaked with NaCl solution and said that the wires soaked in the salt solution conducted electricity \therefore the muscle contracted due to friction between the brass wires, Davy further explained that these electrodes which they call wires conduct electricity in molten form or in solution of their pure metal, then came Faraday how explained that its the more reactive

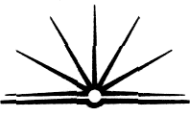


metals which react with the less reactive metals to form their metal ions and this is shown by the movement of electrons from one electrode to another.

(i) Phase Boiling ^(evaporation) of the ^{artefact} ~~wreck~~ in a water of distilled water.

(ii) Chemical procedures used to clean and preserve artefacts from wrecks are performed so as to keep the artefact from further corrosion and disintegration. For example, cleaning the artefact by boiling the artefact in a solution or rather distilled water, so as to evaporate the water, which leaves the salt and other organic compounds attached to the artefact, reweigh the artefact and keep it away from water and air ~~is~~ (oxygen) in order to prevent further or start a corrosion again. or also by electroplating.

Please turn over for (d)



(i) After having carefully worn safety glasses and gloves different materials i.e. different metals were placed in different solutions, each placed in an acidic and ~~at~~ neutral solution. Metals used were Iron, Copper, Zinc and aluminium. The masses were weighed before placing the metals in the solutions and were recorded, then the experiment was left for several weeks [4 weeks], after 4 weeks the masses were removed from the solutions cleaned and re-weighed and the results were observed and recorded.

(ii) With Iron it was seen that metal corroded significantly in the acidic solution, this is because of the availability of H^+ ions as acids dissociate in solution to give ~~most~~ ^{mainly} H^+ ions. This react with water to form more O_2 since oxygen increases the rate of corrosion \therefore this supported ^{the} hypothesis that acidic environments accelerate corrosion as similar results were obtained with Zinc.



(e) The greater the depth of the ocean, the greater the solubility of Oxygen as ^{water} currents bring in more oxygen levels to the bottom, this accelerates the rate of corrosion. It is often thought that corrosion would be least at the bottom as respiration from living organisms e.g. fish decrease the level of Oxygen and increase the level of Carbon dioxide but this is not so, as the solubility of oxygen increases as depth increases so the further down a ^{metallic object} ~~wreck~~ goes in an ocean the faster ~~the~~ the rate of corrosion, another ~~is~~ is the presence of more salt in the bottom of the ocean, as many living organisms and even amoeba diffuse salts out of their bodies in order to maintain a constant internal environment \therefore the amount of salt at the bottom is slightly greater to that at the top ~~as~~, this again accelerates ~~the~~ corrosion of ~~of~~ metallic objects. The low temperature is another cause of further acceleration of metallic objects as the depth increases. The salts act as an electrolyte which causes further deterioration of the ~~of~~ object.