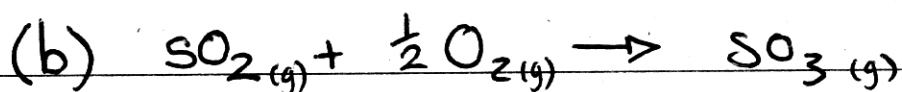




Question 28 - Industrial Chemistry

(a) (i) Saponification is the process of making soap by taking a fat/oil + glycerol and boiling.

(ii) ~~Soap~~ The soap molecule has a polar and a non polar end. The non polar end dissolves grease and dirt thus forming a lather while the polar end catches on to the running water. Therefore you get a rinsing action as the polar end pulls the non polar end with all its dirt and grease off into the drain leaving the subject clean.



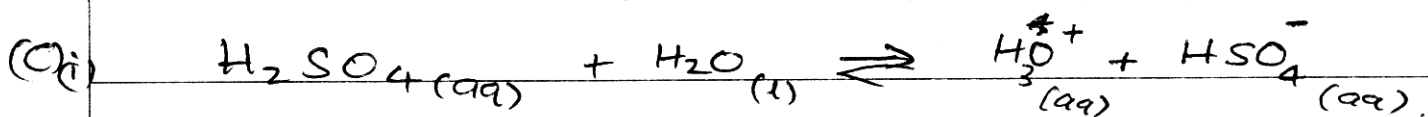
$$\frac{[\text{SO}_3]}{[\text{SO}_2][\text{O}_2]^{\frac{1}{2}}}$$

$$\frac{[0.04]}{[0.06][0.05]^{\frac{1}{2}}}$$

$$\frac{0.04}{0.06 \times 0.08}$$

$$0.0048$$

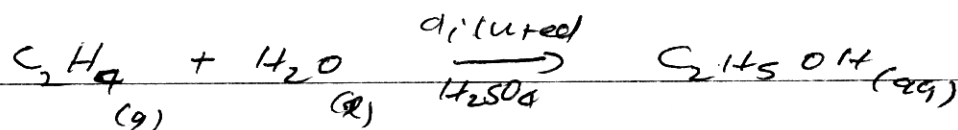
$$K = 8.3$$

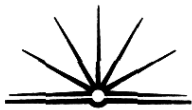


When H_2SO_4 is added to water it donates

an proton acting as an acid and to produce H^+ ions and HSO_4^-

(ii) as an oxidising agent Sulfuric acid used as a catalyst to speed up the rate of reaction. diluted H_2SO_4 used in the production of ethanol where

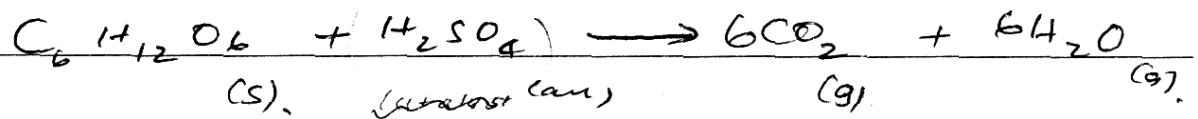




H_2SO_4 is a good dehydrating agent

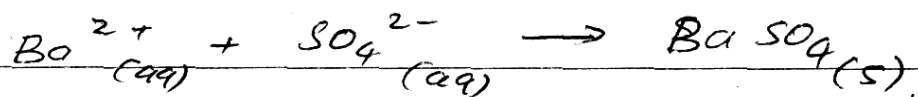
Since it is able to absorb moisture.

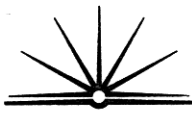
It can convert glucose into $CO_2 + H_2O$
by this property.



H_2SO_4 forms precipitate with Ba^{2+} and

Ca^{2+} so to help extraction of these
ions from the solution.





d) i) we did a chromate-dichromate equilibrium reaction.

A small amount of a base was added to the chromate solution making it basic and dichromate HCl was then added to move the reaction back.

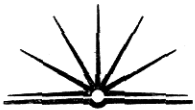
ii)

Before we started the reaction we made ~~sure~~ ^{sure} we had a constant. This was the ~~chromate~~ dichromate solution. Then we got a second beaker and ~~we~~ added chromate solution to it. Then we added a basic solution until a definite change was reached. Then we added the HCl to reverse the reaction using the constant as a guide. This was repeated several times recording the amount of acid and base used in each. Collaborating the results we found an average of both acids and base used to ~~complete~~ complete the reaction.

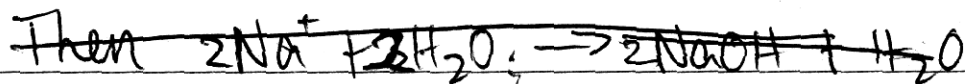
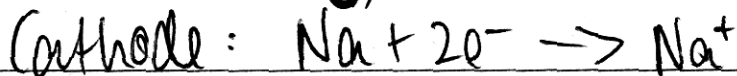
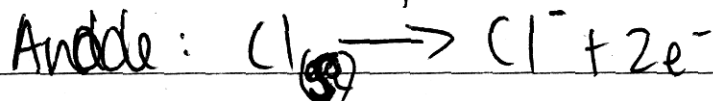


e) Sodium hydroxide can be manufactured in 3 different ways, by use of a mercury cell, diaphragm cell or a membrane cell.

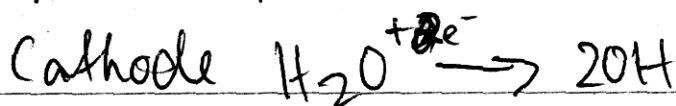
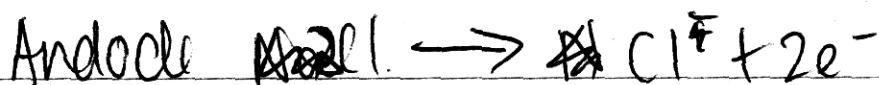
Mercury cell used to be the most common



method of the electrolysis of NaCl & water to form sodium hydroxide but environmental issues such as mercury being bad for the environment the merit that this process is largely not used any more & is being phased out. The mercury cell worked by oxidising the chlorine at the anode and reducing the sodium at the cathode, then the ~~anode~~ sodium reacts with H_2O to form sodium hydroxide.



In the diaphragm cell the anode oxidises chlorine while the cathode reduces water (chlorine sodium NaCl to give off Cl_2 gas & the cathode reduces water to give OH^- which reacts with the Na^+ . This cell doesn't give as pure a concentration of sodium hydroxide than the mercury cell, & doesn't use mercury, however it uses asbestos which can be just as bad.





The membrane cell uses membrane technology to allow certain cations or anions through its pores. It has a high sodium ~~concentr~~ hydroxide concentration but the product is still not as pure as the mercury cell, but is least harmful to the environment & is the most used current method.