BOARD OF STUDIES
NEW SOUTH WALES

Question 28 - Industrial Chemistry

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

(ii) 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.

(b) $SO_{2(g)} + \frac{1}{2}O_{2(g)} \rightarrow SO_{3(g)}$

$$\frac{[SO_3]}{[SO_2][O_2]^{\frac{1}{2}}}$$

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

0.06 0.08

0.0048

$X = 8.3$

(C)(i) $H_2SO_{4(aq)} + H_2O_{(l)} \rightleftharpoons H_3O^+_{(aq)} + HSO_4^-{}_{(aq)}$.

When H_2SO_4 is added to water it donates a 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

$$C_2H_{4(g)} + H_2O_{(g)} \xrightarrow[H_2SO_4]{\text{diluted}} C_2H_5OH_{(aq)}$$

BOARD OF STUDIES
NEW SOUTH WALES

H_2SO_4 is a good dehydrating agent since it is able to absorb moisture. It can converts glucose into $CO_2 + H_2O$ by this property.

$$C_6H_{12}O_6 \text{ (s)} + H_2SO_4 \text{ (conc)} \longrightarrow 6CO_2 \text{ (g)} + 6H_2O \text{ (g)}$$

H_2SO_4 forms presipitate with Ba^{2+} and Ca^{2+} so to help extraction of these ions from the solution.

$$Ba^{2+}_{(aq)} + SO_4^{2-}_{(aq)} \longrightarrow BaSO_{4(s)}$$

BOARD OF STUDIES
NEW SOUTH WALES

d) i) we did a cromate - dicromate equilibrium reaction.

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

ii)

Befor we started the reaction we made sure we had a constant. this was the chromate solution. then we got a second beaker and added chromate solution to it. Then we added a basic solution until a definate 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 the reaction.

BOARD OF STUDIES
NEW SOUTH WALES

e) Sodium hydroxide can be manufactured in 3 differant ways, by use of a mecury cell, diaphram cell or a membrane cell.
Mercury cell used to be the most common

BOARD OF STUDIES
NEW SOUTH WALES

method of the electrolysis of NaCl & water to form sodium hydroxide but environmental issues such as mercury being bad for the environment ~~the ment~~ 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 ~~cathode~~ sodium reacts with H_2O to form sodium hydroxide.

Anode: $Cl_{(g)} \longrightarrow Cl^- + 2e^-$

Cathode: $Na + 2e^- \longrightarrow Na^+$

~~Then $2Na^+ + 2H_2O \longrightarrow 2NaOH + H_2O$~~

In the diaphram cell the anode oxidises ~~Chlorine while the cathode reduces water~~ Chlor sodium NaCl to give off Cl gas & the cathode reduces water to give OH^- which reacts with the Na^+. This cell doesnt give as pure a concentration of sodium hydroxide than the mercury cell, & doesnt use mercury, however it uses asbestos which can be just as bad.

Anode ~~NaCl~~ $\longrightarrow$ ~~Na~~ $Cl^+ + 2e^-$

Cathode $H_2O + 2e^- \longrightarrow 2OH$

BOARD OF STUDIES
NEW SOUTH WALES

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.