

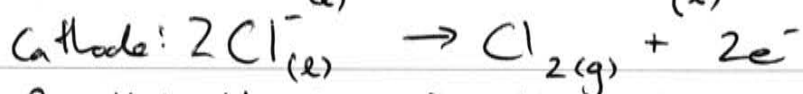
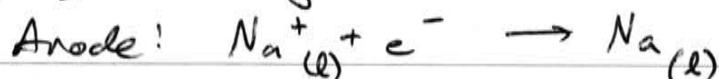
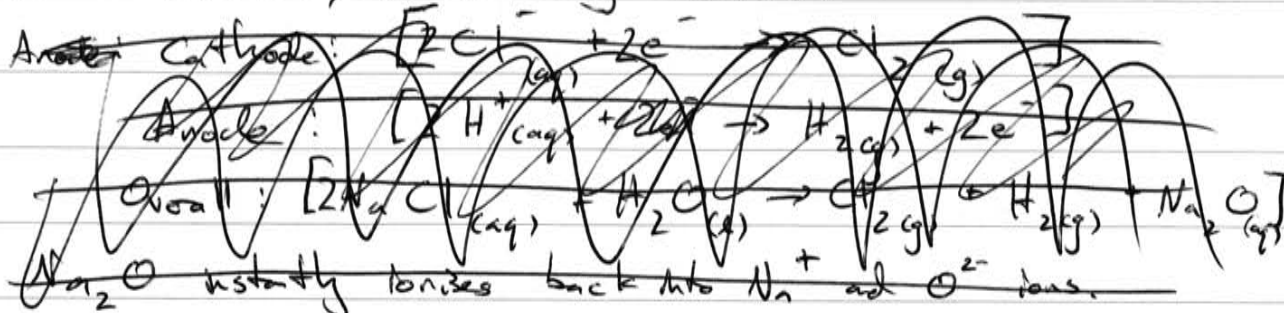
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Mercury Process of extracting NaOH

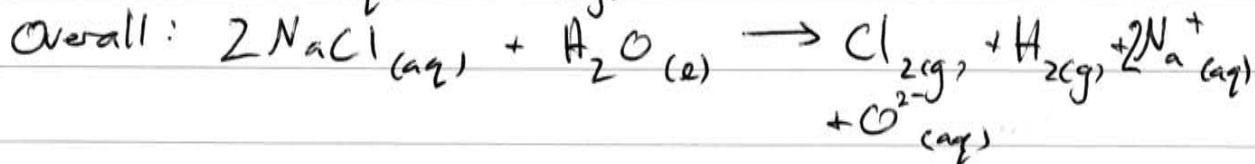
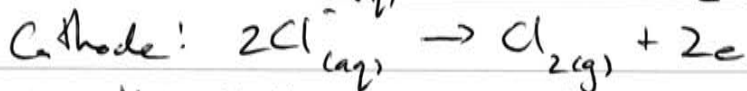
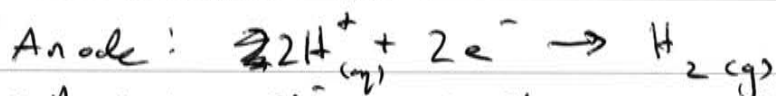
a) It is an electrolytic cell, with a ^{liquid} mercury anode and an inert cathode (possibly titanium). Sodium chloride is electrolysed in the cell, with Cl^- being attracted to the positive cathode and being converted into Cl_2 gas, while ~~sodium~~ Na^+ ions are attracted to the negative anode, where they form an amalgam of sodium metal in mercury.

This amalgam is pumped into a decomposition chamber, where it comes into contact with water. The mercury does not react, while the sodium reacts like so: $[2\text{Na}_{(s)} + 2\text{H}_2\text{O}_{(l)} \rightarrow 2\text{NaOH}_{(aq)} + \text{H}_2(g)]$. Sodium hydroxide is removed, while the mercury is recycled through a cooler and back into the electrolysis cell.

b) The electrolysis of molten sodium chloride and aqueous sodium chloride are slightly different. When electrolysis molten sodium chloride, the following occurs:



Electrolysis of sodium chloride in water, however, yields different results. Instead of electrolysis of NaCl, it ~~actually~~ electrolyses H_2O . The reactions are:



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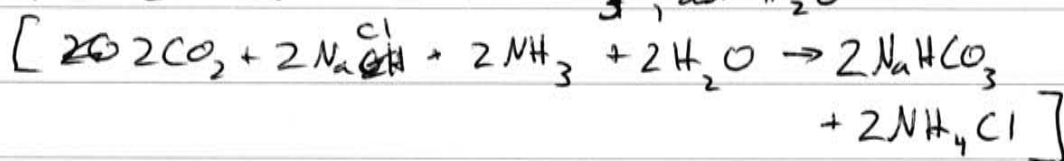
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c) Limestone is incredibly important to the Solvay process, as it is an incredibly common and efficient source of carbon dioxide for the synthesis of sodium carbonate. While there are other sources of carbon dioxide available, most of them would be very impure and require ^{extensive} purification, or appear in quantities so low as to be commercially infeasible. Limestone (CaCO_3), on the other hand, is readily available from mining and is relatively pure. At the very least, it is very easy to purify it to an adequate degree. Limestone's role in the solvay process is as follows:

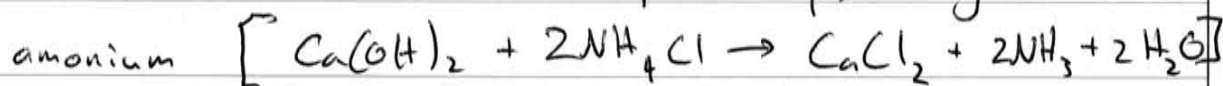
CaCO_3 is baked in a kiln to produce CaO and CO_2

CaO is slaked (reacted with water) to produce Ca(OH)_2

CO_2 is reacted with NaCl and NH_3 , and H_2O



Ca(OH)_2 is reacted with NH_4Cl to ~~produce~~ recycle the



It can be seen that calcium carbonate (limestone) is incredibly important to the solvay process.

The environmental impacts, however, are quite severe. Limestone quarries often take the form of ~~still~~ huge, shallow bites out of the earth's surface, destroying a large surface area of ~~plants~~ and wildlife habitats. However, limestone often coincides with the presence of lime, a highly dangerous and corrosive material, which limits the amount of ~~attractive~~ flora and fauna that would live in the area, and thus the amount of affected wildlife.

The dumping of the waste product CaCl_2 is also an environmental

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d) i) It is a saponification reaction, where A is potassium hydroxide (KOH)

ii) Oil (i.e. coconut oil) is placed in a beaker, and then potassium hydroxide is added. The mixture is stirred, then left in a fume ~~cup~~ cupboard for several days to react. After the time has elapsed, there are two distinguishable layers - one of a clear liquid, the other an opaque solid with a creamy colour. The former is glycerol, the latter soap.

Safety precautions include wearing safety goggles, glasses and lab coats while working with KOH , as it is highly corrosive. The reaction is allowed to take place in a fume cupboard for the same reason, and to prevent accidental contact between soap and students, who can have allergies thereto.

concern. However, as AD is largely unreactive, it does not ~~pose~~ pose a threat to the environment.

Therefore, it can be seen that the ~~importance~~ importance of limestone to the ~~process~~ Solway process outweighs the detrimental effect its ~~use~~ use has on the environment.

You may ask for an extra Writing Booklet if you need more space.