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a). It is an electrolysis cell. By performing an electrolysis reaction on brine (concentrated salt water) sodium & chlorine ions are released.



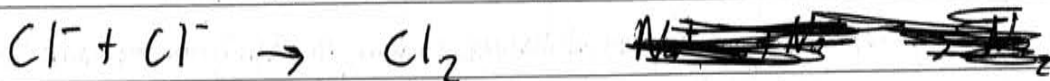
The sodium then reacts with water to produce sodium hydroxide.



The hydrogen & chlorine are pumped out so only NaOH remains and it can thus be collected.

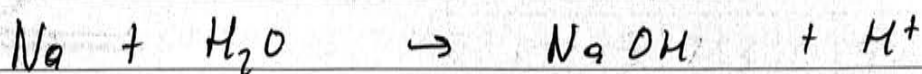
(Also sodium ions gather at the cathode (negative) terminal, and chlorine at the anode (positive) terminal.)

b). Molten sodium chloride electrolysis only has sodium & chlorine present so it is easier to control what the sodium & chlorine react with & thus is best used for the collection of elemental sodium & chloride ions.



Aqueous sodium chloride electrolysis is more suitable for NaOH production as the sodium ions separate from

the chlorine can react instantly with water to produce sodium hydroxide

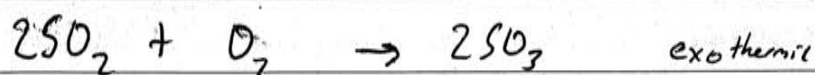


It also provides chloride & hydrogen ions which are soluble ions in other productions e.g. HCl production.

So molten sodium chloride electrolysis achieves elemental sodium & chlorine &

Aq. Aqueous sodium chloride provides sodium hydroxide & chloride & hydrogen ions.

$$c).1. \quad K = \frac{[\text{SO}_3]^2}{[\text{SO}_2]^2 [\text{O}_2]} \quad K = \frac{[0.3]^2}{[0.8]^2 [0.4]}$$



$$K = 0.35 \quad (2 \text{ dec places})$$

11. The system had a change imposed (possibly more reactants & pressure or removal of  $\text{SO}_3$  as examples) which resulted in  $\text{SO}_3$  being more heavily produced so a change (lowering) in temperature or increase in pressure could have resulted and this new equilibrium is the system following Le Chatliers ~~principle~~ principle pto

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and has attempted to control  
the change.

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d) i. It is an emulsification reaction  
where  $A = KC_2H_3O_2$

ii. Simply by mixing oil & acid  
e.g. Acetic acid & olive oil.

iii. Pour oil & acid into a beaker  
in small amounts constantly &  
strongly mixing (electric mixer). Once  
it has a smooth consistency  
you have an emulsification. The main  
precautions are dependant on how  
volatile the oil is, so keep  
away from heat, and how  
corrosive the acid is, so flame hood  
with eye & skin protection.

e) Limestone is critical to the  
Solway process it provides the  
carbonate ion to Sodium carbonate  
thus without it the entire system  
would fail. It is readily  
found (dug) and is very common  
while containing the carbonate ion.  
But the ~~the~~ limestone environmental  
impact is also great. First to  
extract it requires machinery which

release green house gases, also erosion may (not necessarily) occur if limestone is removed from supporting earth above it. Also limestone itself releases  $\text{CO}_2$  which can add to any acid rain & green house effect issues but realistically the ends justify the means as it ~~is~~ is cheap, readily found and easy to work with despite the minor emissions of  $\text{CO}_2$  that could still occur if a substitute is found.

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