Start here.

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

$$NaCl \rightarrow Na^+ + Cl^-$$

The sodium then reacts with water to produce sodium hydroxide.

$$Na^+ + H_2O \rightarrow NaOH + H^+$$

The hydrogen + chlorine are pumped out so only NaOH remains and it can then 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.

$$NaCl \rightarrow Na^+ + Cl^-$$

$$Cl^- + Cl^- \rightarrow Cl_2$$
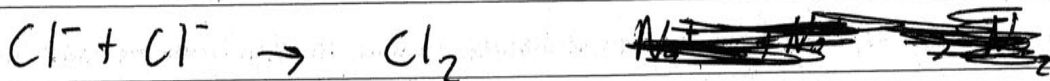
Aqueous sodium chloride electrolysis is more suitable for NaOH production as the sodium ions separate from

the chlorine can react instantly with water to produce Sodium hydroxide.

$$NaCl \rightarrow Na^+ + Cl^-$$

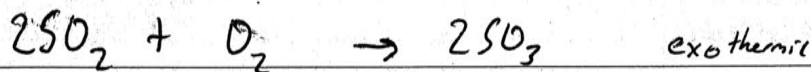$$Na + H_2O \rightarrow NaOH + H^+$$
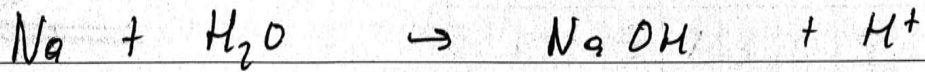
It also provides chloride & hydrogen ions which are soluble ions in other productions e.g. HCl production.

So molten Sodium chloride electrolysis achieves elemental Sodium & Chlorine & Aqu Aqueous Sodium Chloride provides Sodium hydroxide & chloride & hydrogen ions.

c).1. $$K = \frac{[SO_3]^2}{[SO_2]^2[O_2]} \qquad K = \frac{[0.3]^2}{[0.8]^2[0.4]}$$

$$2SO_2 + O_2 \rightarrow 2SO_3 \qquad \text{exothermic}$$

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

II. The system had a change imposed (possibly more reactants & pressure or removal of SO_3 as examples) which resulted in SO_3 being more heavily produced so a change in (lowering) in temperature or increase in pressure could have resulted and this new equilibrium is the system following Le Chatiliers principle p.t.o

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and has attempted to control

the change.

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d.) i. It is an emulsification reaction where $A = KC_2H_3O=O$

ii. Simply by mixing oil + acid e.g. Acetic acid + olive oil.
¼. 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 corrossive the acid is, so fume hood with eye + skin protection.

e) Limestone is crutial to the solvay 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 limestone environmental impact is also great. First to extract it requires machinery which

release green house gasses, also erosion may (not nessicarly) occur if limestone is removed from supporting earth above it. Also limestone itself releases CO_2 which can add to ~~any~~ acid rain + green house effect ~~issues~~ but realistically the ends justify the means as it ~~the~~ is cheap, readily found and easy to work with despite the minor emmissions of CO_2 that could still occur if a substitute is found.

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