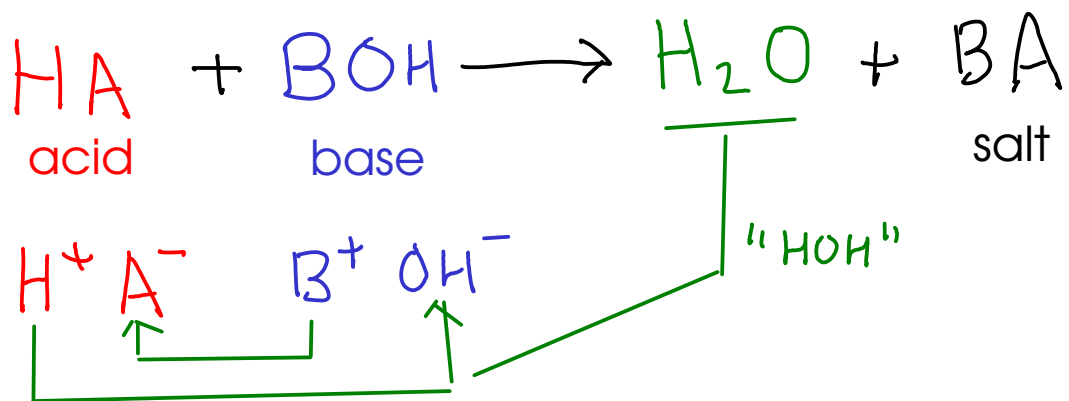


FORMATION OF STABLE MOLECULES

- There are several stable molecules that may be formed in double replacement reactions, but the most common is WATER!
- Double replacement reactions that form water are also called "neutralizations"



* To make water (H₂O), you need a source of hydrogen ion (H⁺) and hydroxide ion (OH⁻)

Chemically speaking, a SALT is an ionic compound that can be formed by the reaction of an acid and a base.

Practically speaking, all ionic compounds except hydroxides and oxides can be considered salts.

ACIDS

- compounds that release hydrogen ion (H^+), when dissolved in water.

Properties of acids:

- Corrosive: React with most metals to give off hydrogen gas
- Cause chemical burns on contact
- Taste sour (like citrus - citric acid!)
- Changes litmus indicator to RED

BASES

- Substances that release hydroxide ion (OH^-) when dissolved in water

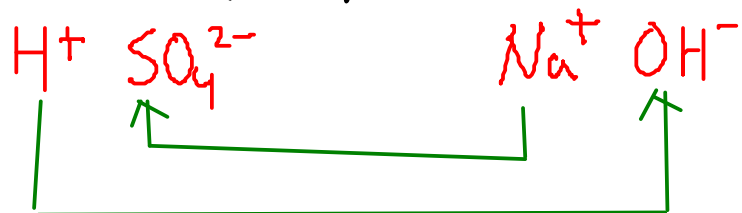
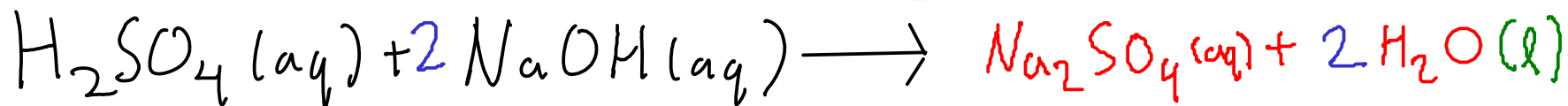
Properties of bases:

- Caustic: Attack and dissolve organic matter (think lye, which is NaOH)
- Cause skin/eye damage on contact
- Taste bitter
- changes litmus indicator to BLUE

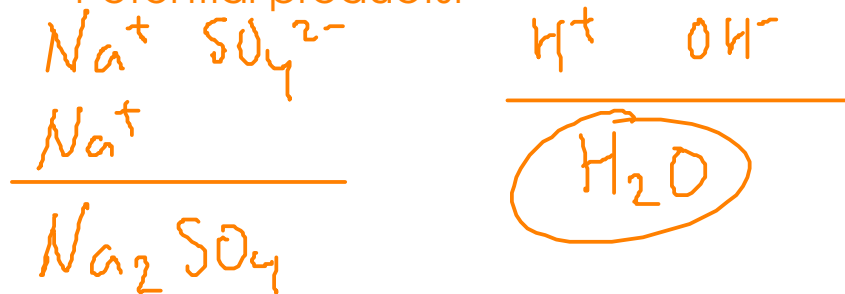
Due to the dissolving action of base on your skin, bases will feel "slippery". The base ITSELF is not particularly slippery, but what's left of your skin IS!

Examples of acid-base chemistry:

When a neutralization reaction occurs, energy is released. There will be a temperature increase!

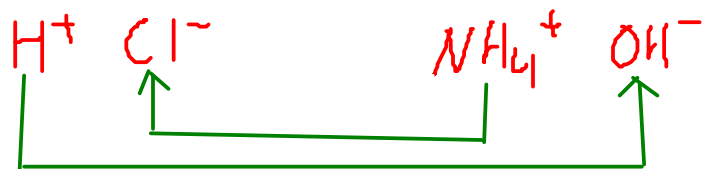
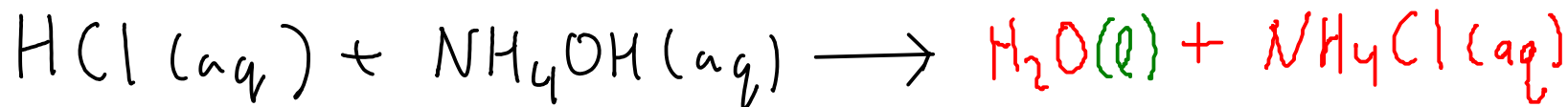


Potential products:



Why "neutralization"?

*The products of the reaction (water and a "salt") do not have any of the characteristic properties of acids and bases. These properties can be said to be "neutralized".



See solubility chart on p172 for information on phase labels

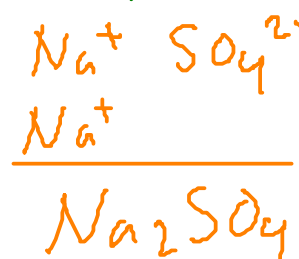
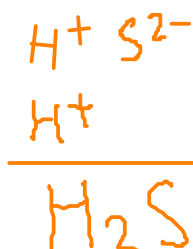
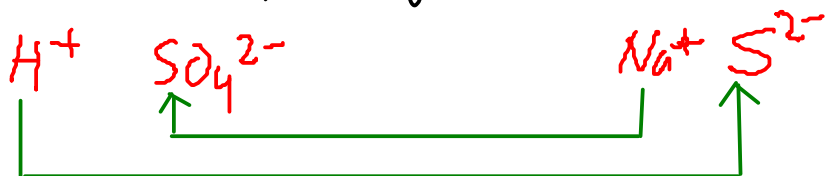
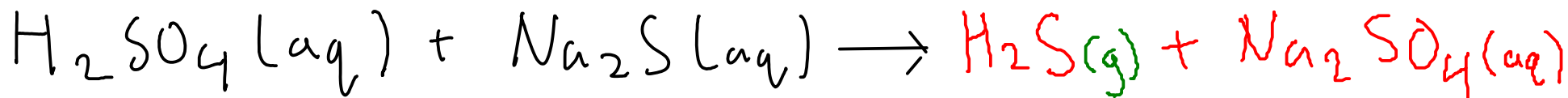
DOUBLE REPLACEMENTS THAT FORM GASES

① Formation of hydrogen sulfide: H_2S

- need an ACID (source of hydrogen ion) and a SULFIDE

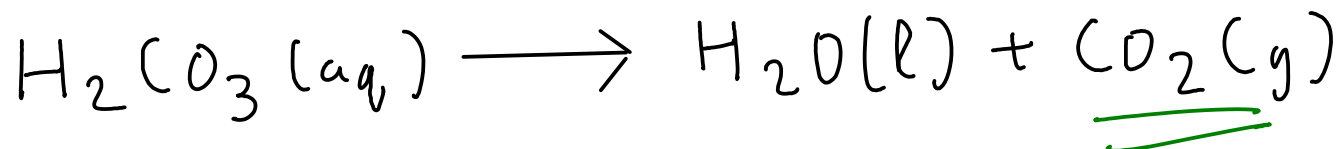
Observation:

- GAS BUBBLES
- ODOR



HYDROGEN
SULFIDE (common
name) is a gas
with a distinct
ROTTEN EGG
odor!

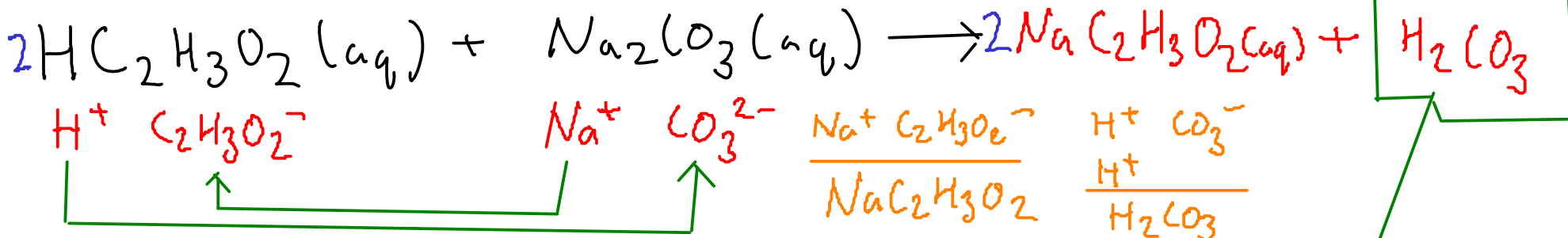
② Formation of carbonic acid and carbon dioxide:



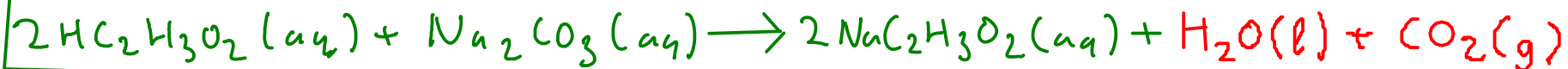
- to form carbonic acid by double replacement, you need a source of hydrogen ion (ACID) and a source of carbonate (can be CARBONATE or BICARBONATE)



Example of a reactions that forms carbonic acid, then gas:



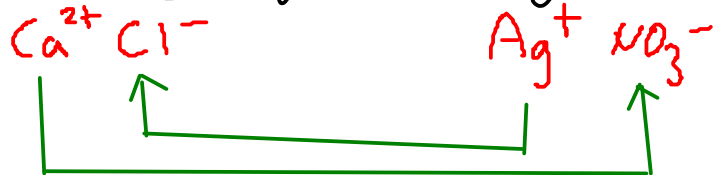
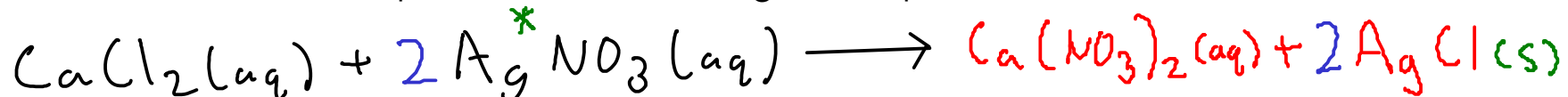
... but carbonic acid decomposes, and we get GAS BUBBLES



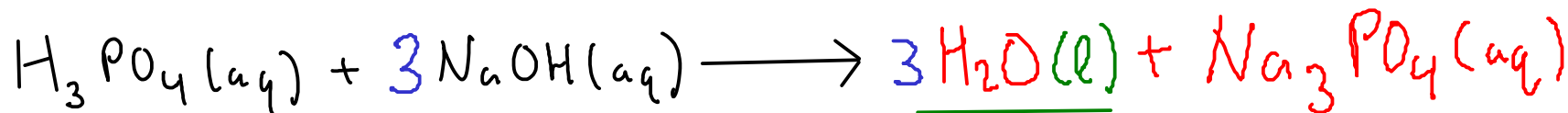
This is the overall process. We show carbon dioxide and water as products, since we want to show the reaction as it's actually observed -with carbonic acid broken down to water and (gaseous) carbon dioxide.

A few more double replacement / exchange examples:

See page 172 for a solubility chart

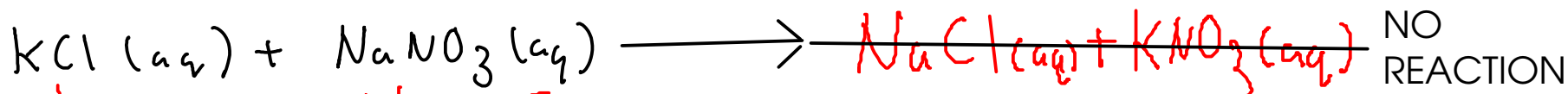


PRECIPITATION of AgCl
AgCl drives this reaction!

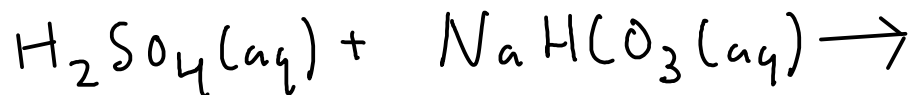


Formation of liquid WATER drives this neutralization reaction!

Detect this reaction by release of HEAT!



NO REACTION occurs. There's no DRIVING FORCE for reaction, since our potential products are soluble ionic compounds - which exist in solution as free ions. That's also how these ions existed before mixing!



* TRANSITION METALS do not change their charge in exchange reactions!