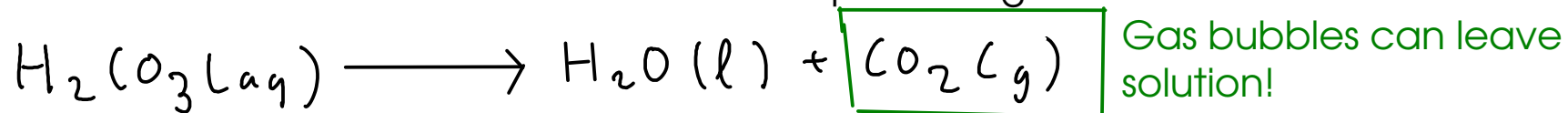


GAS FORMATION / OTHER MOLECULES

- There are a few other molecules that can be made with exchange-type chemistry.
- Most of these molecules are unstable and can break apart to form gases.

- Formation of a weak acid:

- The formation of ANY weak acid in an exchange-type reaction can be a driving force.
- Some weak acids are unstable and can break apart into gas molecules.

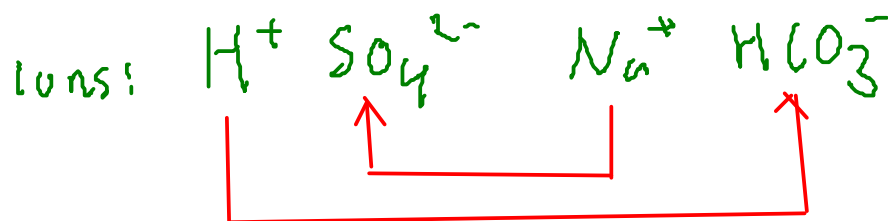
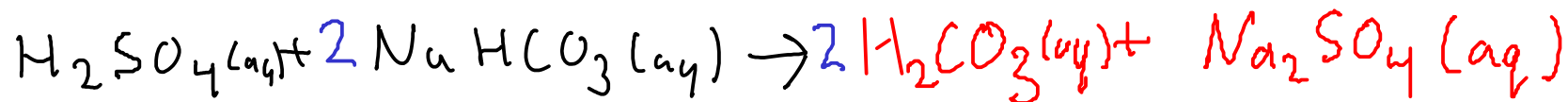


... but how would you form carbonic acid in an exchange-type reaction?

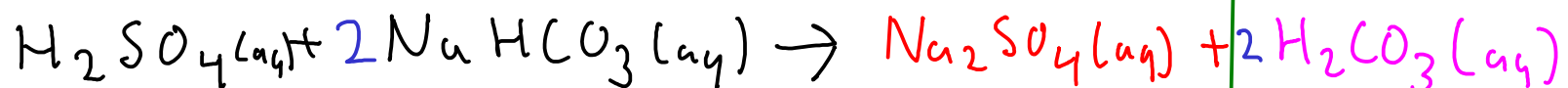
acid + carbonate CO_3^{2-}

OR

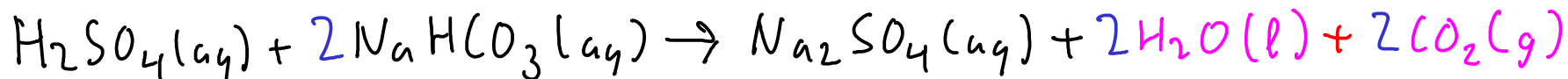
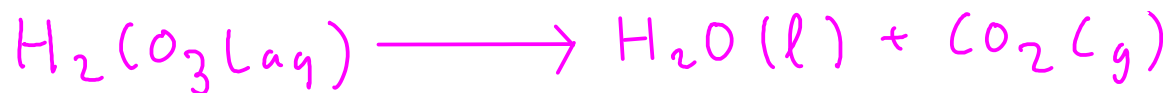
acid + bicarbonate HCO_3^-



Formation of carbonic acid drives the reaction ... BUT ...

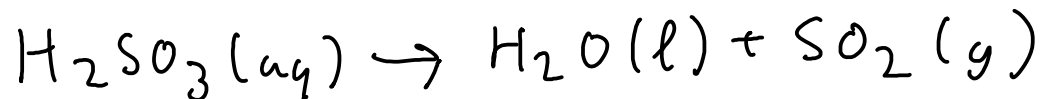


... but when we mix sulfuric acid and sodium bicarbonate, we observe BUBBLES. We need to write an equation that agrees with our observations. We know that carbonic acid decomposes, so we go ahead and put that into our equation.

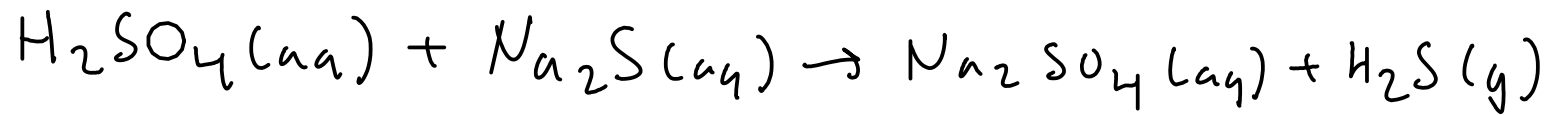


Other molecules of interest:

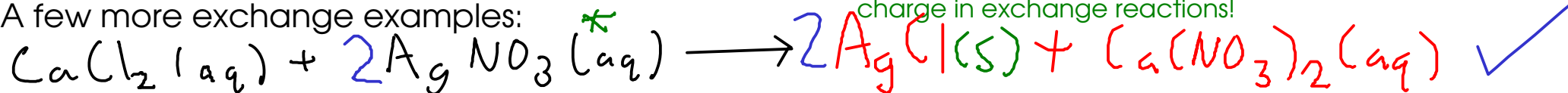
H_2SO_3 : sulfurous acid - React an ACID with a SULFITE



H_2S : hydrogen sulfide (gas) - React an ACID with a SULFIDE

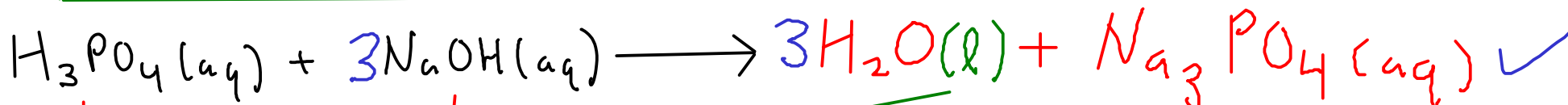


A few more exchange examples:

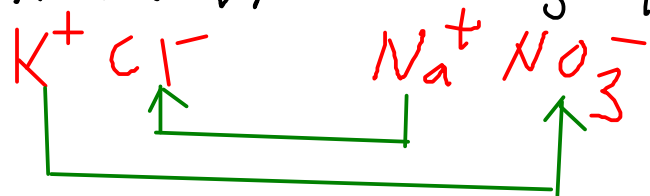
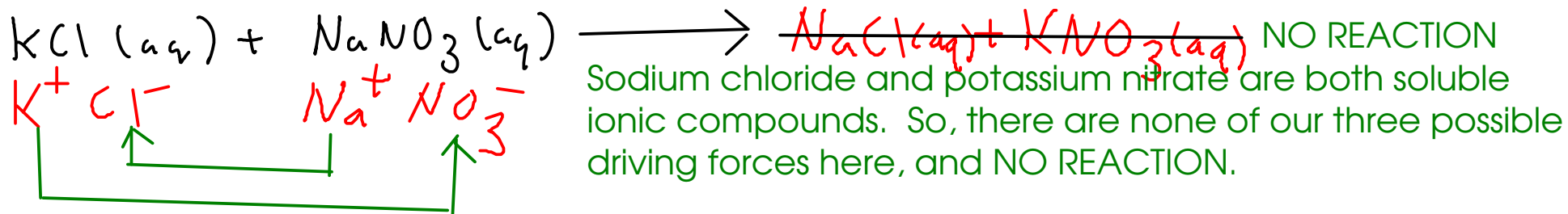


* Transition metals DO NOT change their charge in exchange reactions!

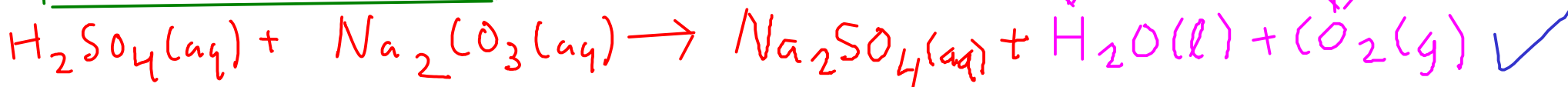
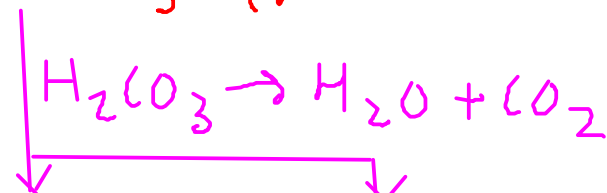
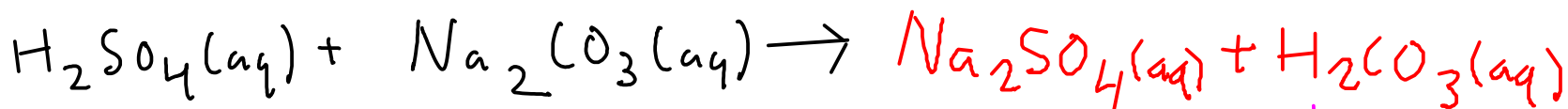
This reaction is driven by formation of SOLID AgCl. (Precipitation)



This reaction is driven by the formation of WATER MOLECULES (neutralization)



Sodium chloride and potassium nitrate are both soluble ionic compounds. So, there are none of our three possible driving forces here, and NO REACTION.



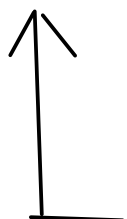
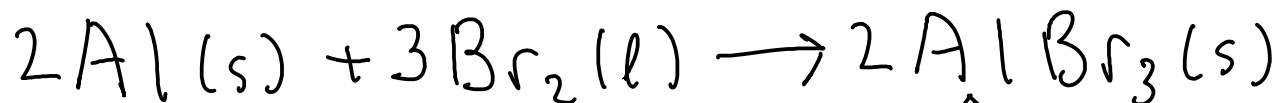
This reaction is driven by formation of carbonic acid and its decomposition into water and carbon dioxide gas.

125 OXIDATION / REDUCTION CHEMISTRY

- Exchange reactions involve ions pairing up, but the ions themselves are not formed in exchange reactions. Exchanges start with pre-existing ions.

... but the ions have to be produced somehow - through a chemistry that involves the transfer of electrons.

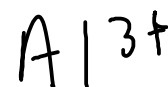
- oxidation / reduction chemistry ("redox" chemistry) involves transfer of electrons and can make ions.



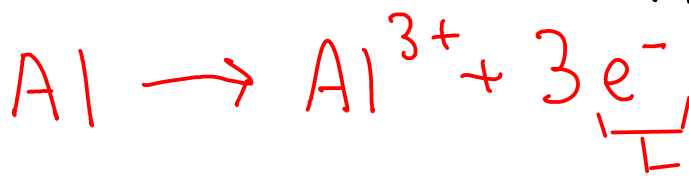
Elemental,
metallic
aluminum.
Uncharged!



Aluminum
cation



These are called
"half-reactions"



electron

oxidation: loss
of electrons



reduction: gain of
electrons

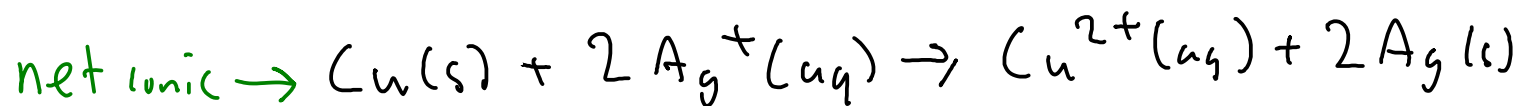
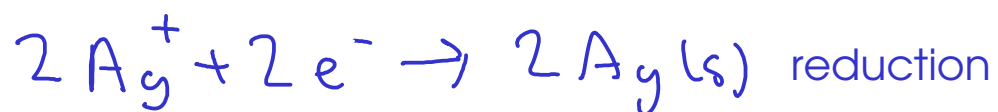
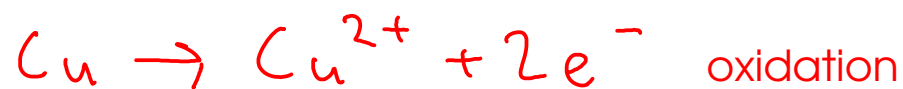
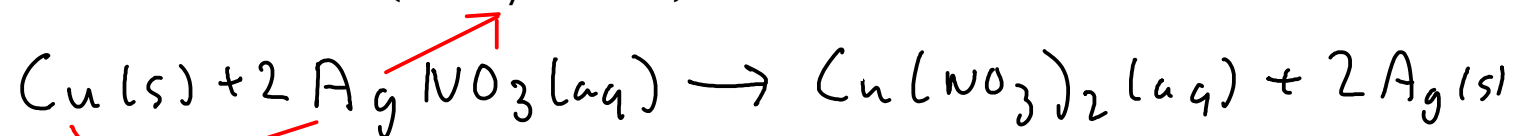
- oxidation and reduction always occur together. In other words, we can't just make free electrons using oxidation without giving them somewhere to go.

- Many of the types of reactions that we learned about in previous courses are redox reactions!

- COMBINATIONS (often but not always redox)

- DECOMPOSITIONS (often redox)

- SINGLE REPLACEMENT (always redox)



- COMBUSTION

