**Reaction Type Flowchart: Question 4**

After the reaction is complete, ionize only if the reaction has water in it (solutions/aqueous phases). Only strong acids (HCl, HBr, HI, HClO4, HNO3, H2SO4, H3PO4), strong bases (LiOH, NaOH, KOH, RbOH, CsOH, Ca(OH)2, Ba(OH)2) and soluble salts (refer to solubility rules). Acids only ionize once! (One H+ comes off even if it is di or triprotic).

**Organic Reactions**: **Draw them out on scrap paper!!!**

1. ***Combustion***: “burns in oxygen” hydrocarbons always produce H2O and CO2. Other compounds will just form oxides of their elements.

C2H4 + 3O2 🡪 2CO2 + 2H2O S + O2 🡪 SO2

2. ***Addition***: look for hydrocarbons with double or triple bonds that can be broken to literally add in hydrogen or halogens. One product is formed. (Syn)

C2H4 + Br2 🡪 C2H4Br2 C3H6 + H2 🡪 C3H8

3. ***Substitution***: look for hydrocarbons with only single bonds, where one hydrogen will switch with one halogen. Two products are formed.(SR)

C2H6 + Br2 🡪 C2H5Br+ HBr

4. ***Esterification***: organic acids (-COOH) react with alcohols (-OH) to form esters (-COO-). H from acid and OH from alcohol form water.

CH3COOH + C2H5OH 🡪 CH3COOC2H5 + H2O

5. ***Fermentation***: Glucose (sugar) decomposes in the presence of a catalyst (yeast) to form alcohols (ethanol) and CO2 (decomposition reactions always form gases). This reaction always looks the same.

C6H12O6 🡪 CO2 + C2H5OH

**Solubility Rules: Memorize!!! Time is running out…**

***Always soluble***: alkali metal ions (Li+, Na+, K+, Rb+, Cs+), NH4+, NO3–, ClO3–, ClO4–, C2H3O2–

***Generally soluble***:Cl–, Br–, I– Soluble except Ag+, Pb2+, Hg22+

F– Soluble except Ca2+, Sr2+, Ba2+, Pb2+ , Mg2+

SO42– Soluble except Ca2+, Sr2+, Ba2+, Pb2+

***Generally insoluble*:** O2–, OH– Insoluble except alkali metals, NH4+, Ca2+, Sr2+, Ba2+

CO32–, PO43–, S2–, SO32–, C2O42–, CrO42– Insoluble except alkali metals, NH4+