CHEM 20 REVIEW:

- Practice using Worksheet 1.3 in your work booklets.
- Lab 1.2 (pgs 13-15) is also about reactions
- Finish science 10 review booklet

Types of Chemical Reactions & Predicting the products

Type of reactions	Predict products
1) Formation A + B → AB a) Hydrogen and oxygen → makes water **2** $H_{2(g)}$ + $O_{2(g)}$ → 2 $H_2O_{(g)}$ H = 2x2 (H=2, O=1)**x2** O =2 b) Sodium + chlorine → sodium chlor**ide** 2 $Na_{(s)}$ + $Cl_{2(g)}$ → 2 $Na^{1+}Cl^{1-}{}_{(s)}$ Na = 1x2 (Na=1;Cl =1)x2 Cl = 2	Metal + non-metal → ionic compound Key words: make, adding elements
2) Decomposition ABC → A + B + C a) Sodium sulfate → **8** Na_2^{1+} $SO_4^{2}{}_{(s)}$ → 16 $Na_{(s)}$ + $S_{8(s)}$ + 16 $O_{2(g)}$ b) sucrose breaks up $C_{12}H_{22}O_{11(s)}$ → 12 $C_{(s)}$ + 11 $H_{2(g)}$ + 5.5 $O_{2(g)}$ 2 $C_{12}H_{22}O_{11(s)}$ → 24 $C_{(s)}$ + 22 $H_{2(g)}$ + 11 $O_{2(g)}$	ONE SOLID Compound → elements (not ions) Key words: break up, heat up Allowed to use 0.5 when balancing.

3a) Single replacement with a metal A + BC → B + AC Metal Sodium reacts with water → $2\ Na_{(s)} + 2HOH_{(l)} \rightarrow H_{2(g)} + 2\ NaOH_{(aq)}$ (base) Na =1 x2 H =2 (H = 1; OH=1)x2 (Na=1;OH=1)x2	Metal switching with an cation found in a compound (H is a metal for acids) Keys: look for element & compound. Water is written as H(OH).
3b) Single replacement with a non-metal A + BC → C + BA Chlorine reacts with sodium bromide → $Cl_2 + 2NaBr_{(s)} \rightarrow Br_{2(l)} + 2NaCl_{(s)}$	Non-metal switching with an anion in an ionic compound. Keys Same as 3a)
4) double replacement AB + CD → CB + AD Lead (II) nitrate reacts with potassium chloride → potassium nitrate and lead(II) chloride $Pb(NO_3)_{2(aq)} + 2KCl_{(aq)} \rightarrow 2\ KNO_{3(aq)} + PbCl_{2(s)}$ Pb = 1 NO3 = 2 (K = 1 NO3 =1) x2 (K =1 Cl =1) x2 Pb =1 Cl = 2 sulfuric acid+sodium hydroxide $H_2SO_{4(aq)} + 2NaOH(aq) \rightarrow Na_2SO_{4(aq)} + 2HOH(l)$	The cations switch between two ionic compound (solutions=disolved in water (aq)) CHECK solubility table for products.
5) Hydrocarbon Combustion $CxHy + O_{2(g)} \rightarrow CO_{2(g)} + H_2O_{(g)}$ Methane burns $CH_{4(g)} + \underline{2}\ O_{2(g)} \rightarrow CO_{2(g)} + \underline{2}\ H_2O_{(g)}$ 2 ox = 2 oxy + 2 oxy	Burning with oxygen making water and carbon dioxide KEY: hydrocarbon C_xH_y

Warnings:

1) Diatomic elements (rule of 7 + 1)
2) Polyatomic elements → $P_{4(s)}$ and $S_{8(s)}$
3) Balance the charges for ionic compounds first & separately
4) Write water as HOH in SR and DR reactions
5) Complex/polyatomic ions don't break apart in SR & DR reactions
6) Compounds only have one state of matter. Ionic compounds (metal + non-metal ions) are solid unless water is present. Molecular compounds (non-metals) are gases except memorized ones

Balancing Chemical Reactions
Conservation of atoms & mass(we do not conserve moles)
ATOMS IN (reactants) = ATOMS OUT(products)

1) Inventory method = make two lists and try to balance/equal by multiply with a number.

2) Head method = multiply by numbers until all the atoms balance

5 chemical properties of a reaction.

1) Change in color
2) Change of state - gas (vapour)
3) Change of state - solid (precipitate)

4) Change in odor (smell)
5) Change in energy → exothermic (heat is leaving); endothermic (heat is entering/colder)

MYTH: chemical reactions can be reversed.