

### AP Chemistry Summer Assignment (Semester-Long)

The following assignment will not be collected. These topics and others, however, will be tested in the first unit of the semester. You will have a markedly sharper recall of chemistry topics and a distinctly lower workload for Unit 1 if you complete this assignment before the first day of school. Questions about the assignment may be directed to [cwayand@wcpss.net](mailto:cwayand@wcpss.net).

#### Nomenclature

1. Name these binary compounds of two nonmetals.

$\text{IF}_7$  \_\_\_\_\_

$\text{As}_4\text{O}_{10}$  \_\_\_\_\_

$\text{N}_2\text{O}_5$  \_\_\_\_\_

$\text{SF}_6$  \_\_\_\_\_

$\text{XeF}_2$  \_\_\_\_\_

$\text{PCl}_3$  \_\_\_\_\_

$\text{N}_2\text{O}$  \_\_\_\_\_

$\text{SCl}_2$  \_\_\_\_\_

2. Name these binary compounds with cations of a fixed charge.

$\text{CsCl}$  \_\_\_\_\_

$\text{SrBr}_2$  \_\_\_\_\_

$\text{MgO}$  \_\_\_\_\_

$\text{Na}_2\text{S}$  \_\_\_\_\_

$\text{BaI}_2$  \_\_\_\_\_

$\text{CaF}_2$  \_\_\_\_\_

$\text{K}_3\text{N}$  \_\_\_\_\_

$\text{Al}_2\text{O}_3$  \_\_\_\_\_

3. Name these binary compounds with cations of variable charge.

$\text{CuCl}_2$  \_\_\_\_\_

$\text{Cu}_2\text{S}$  \_\_\_\_\_

$\text{Fe}_2\text{O}_3$  \_\_\_\_\_

$\text{HgS}$  \_\_\_\_\_

$\text{SnO}$  \_\_\_\_\_

$\text{AuI}_3$  \_\_\_\_\_

$\text{PbCl}_4$  \_\_\_\_\_

$\text{CoP}$  \_\_\_\_\_

4. Name these compounds with polyatomic ions. Follow rules for cations.

$\text{Fe}(\text{NO}_3)_3$  \_\_\_\_\_

$\text{K}_2\text{SO}_2$  \_\_\_\_\_

$\text{NaOH}$  \_\_\_\_\_

$\text{NaHCO}_3$  \_\_\_\_\_

$\text{Cu}_2\text{SO}_4$  \_\_\_\_\_

$\text{NH}_4\text{NO}_2$  \_\_\_\_\_

$\text{Ca}(\text{ClO}_3)_2$  \_\_\_\_\_

$\text{Cu}_2\text{Cr}_2\text{O}_7$  \_\_\_\_\_

5. Name these binary acids.

HCl \_\_\_\_\_

HI \_\_\_\_\_

6. Name these oxoacids (acids with polyatomic ions).

HClO<sub>4</sub> \_\_\_\_\_

HNO<sub>2</sub> \_\_\_\_\_

H<sub>2</sub>SO<sub>4</sub> \_\_\_\_\_

H<sub>2</sub>CrO<sub>4</sub> \_\_\_\_\_

HC<sub>2</sub>H<sub>3</sub>O<sub>2</sub> \_\_\_\_\_

H<sub>2</sub>C<sub>2</sub>O<sub>4</sub> \_\_\_\_\_

H<sub>3</sub>PO<sub>4</sub> \_\_\_\_\_

H<sub>2</sub>CO<sub>3</sub> \_\_\_\_\_

7. Name these compounds appropriately. Apply the correct naming convention.

CO \_\_\_\_\_

HF \_\_\_\_\_

NH<sub>4</sub>CN \_\_\_\_\_

SO<sub>2</sub> \_\_\_\_\_

HIO<sub>3</sub> \_\_\_\_\_

CuCr<sub>2</sub>O<sub>7</sub> \_\_\_\_\_

NI<sub>3</sub> \_\_\_\_\_

K<sub>2</sub>O \_\_\_\_\_

AlP \_\_\_\_\_

FeF<sub>3</sub> \_\_\_\_\_

OF<sub>2</sub> \_\_\_\_\_

PbSO<sub>4</sub> \_\_\_\_\_

LiMnO<sub>4</sub> \_\_\_\_\_

KC<sub>2</sub>H<sub>3</sub>O<sub>2</sub> \_\_\_\_\_

HClO \_\_\_\_\_

MnS \_\_\_\_\_

8. Write the formulas for these compounds.

tin (IV) phosphide \_\_\_\_\_

potassium nitride \_\_\_\_\_

copper (II) cyanide \_\_\_\_\_

chromium (III) carbonate \_\_\_\_\_

magnesium hydroxide \_\_\_\_\_

gallium arsenide \_\_\_\_\_

sodium peroxide \_\_\_\_\_

cobalt (II) chromate \_\_\_\_\_

sulfurous acid \_\_\_\_\_

zinc fluoride \_\_\_\_\_

lithium silicate \_\_\_\_\_

dichromic acid \_\_\_\_\_

### Solubility rules

9. Review solubility rules and identify the following compounds as soluble (aq) or insoluble (s) in water.

$\text{Na}_2\text{CO}_3$  \_\_\_\_\_

$\text{FeS}$  \_\_\_\_\_

$\text{CoCO}_3$  \_\_\_\_\_

$\text{PbCl}_2$  \_\_\_\_\_

$\text{Pb}(\text{NO}_3)_2$  \_\_\_\_\_

$\text{CuSO}_4$  \_\_\_\_\_

$\text{K}_2\text{S}$  \_\_\_\_\_

$\text{Li}_2\text{O}$  \_\_\_\_\_

$\text{BaSO}_4$  \_\_\_\_\_

$\text{Mn}(\text{C}_2\text{H}_3\text{O}_2)_2$  \_\_\_\_\_

$(\text{NH}_4)_2\text{S}$  \_\_\_\_\_

$\text{Cr}(\text{OH})_3$  \_\_\_\_\_

$\text{AgI}$  \_\_\_\_\_

$\text{AgClO}_3$  \_\_\_\_\_

$\text{Ni}(\text{NO}_3)_2$  \_\_\_\_\_

$\text{Sn}(\text{SO}_3)_4$  \_\_\_\_\_

10. Predict whether each of these double replacement reactions will produce a precipitate or not based on the solubility of the products. If yes, identify the precipitate.

silver nitrate and potassium chloride \_\_\_\_\_

\_\_\_\_\_

magnesium nitrate and sodium carbonate \_\_\_\_\_

\_\_\_\_\_

strontium bromide and potassium sulfate \_\_\_\_\_

\_\_\_\_\_

cobalt (III) bromide and potassium sulfide \_\_\_\_\_

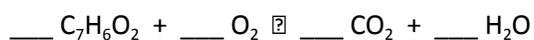
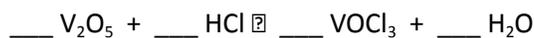
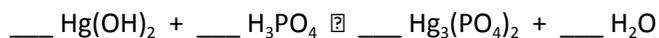
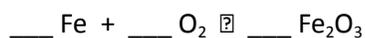
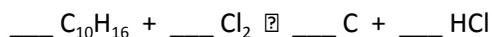
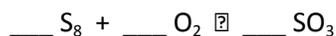
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ammonium hydroxide and copper (II) acetate \_\_\_\_\_

\_\_\_\_\_

### Balancing Equations

11. Balance the following equations with the lowest whole number coefficients.



## Writing Reactions

12. Write a **balanced equation with physical states** for the following:

- a. Reaction of boron trifluoride gas with water to yield aqueous hydrofluoric acid and solid boric acid.
- b. Reduction of iron (III) oxide by magnesium to form magnesium oxide and iron.
- c. The decomposition of dinitrogen oxide gas into its elements.
- d. Solid calcium carbide reacts with water to form calcium hydroxide and acetylene ( $C_2H_2$ ) gas.
- e. Solid calcium cyanamide ( $CaCN_2$ ) reacts with water to form calcium carbonate and ammonia gas.
- f. Ethane burns in air (oxygen).
- g. Sodium reacts with iodine gas to form sodium iodide.
- h. Carbon dioxide combines with water to form carbonic acid.
- i. Magnesium and nitrogen gas combine to form magnesium nitride.

## Quantitative Relationships in Chemistry

13. How many **significant figures** are in each of the following?

- |                                 |       |                             |       |
|---------------------------------|-------|-----------------------------|-------|
| a. 1.9200 mm                    | _____ | e. 0.000036 cm <sup>3</sup> | _____ |
| b. 0.0301001 kJ                 | _____ | f. 10000 J                  | _____ |
| c. $6.022 \times 10^{23}$ atoms | _____ | g. 110. mL                  | _____ |
| d. 460.000 L                    | _____ | h. 0.001345 g               | _____ |

14. Record the following in correct **scientific notation**:

- a. 4050,000,000 cal \_\_\_\_\_
- b. 0.000123 mol \_\_\_\_\_
- c. 0.00345 g \_\_\_\_\_
- d. 700,000,000 atoms \_\_\_\_\_

15. Calculate the following to the **correct number** of significant figures. Maintain units where appropriate.

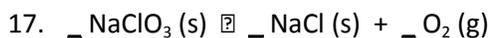
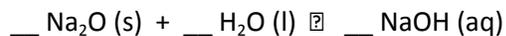
- a.  $1.270 \text{ g} / 5.296 \text{ cm}^3 =$  \_\_\_\_\_
- b.  $12.235 \text{ g} / 1.010 \text{ L} =$  \_\_\_\_\_
- c.  $12 \text{ g} + 0.38 \text{ g} =$  \_\_\_\_\_
- d.  $170 \text{ g} + 2.785 \text{ g} =$  \_\_\_\_\_
- e.  $2.100 \text{ cm} \times 3.2102 \text{ cm} =$  \_\_\_\_\_
- f.  $2.35 \text{ mL} - 0.4 \text{ mL} - 1.23 \text{ mL} =$  \_\_\_\_\_

16. Calculate the number of moles of the following: (SHOW YOUR WORK!)

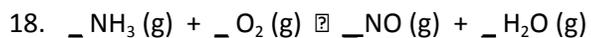
- a. 42.8 g of  $\text{KNO}_3$
- b.  $9.25 \times 10^{26}$  formula units of  $\text{CaCl}_2$
- c. 155.7 L of  $\text{CO}_2$  at STP

### **Stoichiometry and Limiting Reactants**

16. Given the equation below, what mass of water would be needed to completely react with 10.0 g of sodium oxide?

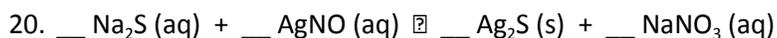


What mass of sodium chloride is formed along with 45.0 g of oxygen gas?



What mass of water vapor will be produced when 100.0 g of ammonia is reacted with excess oxygen?

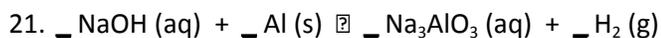
19. If the reaction in #18 is performed with 25.0 g of each reactant, which would be the limiting factor?



If the above reaction is carried out with 50.0 g of sodium sulfide and 35.0 g of silver nitrate, which is the limiting factor?

What mass of the excess reactant remains?

What mass of silver sulfide would precipitate?



What volume of hydrogen gas (measured at STP) would result from reacting 75.0 g of sodium hydroxide with 50.0 g of aluminum?