

## AP Chemistry 1<sup>st</sup> Term Assignment

*As always, let me know if you find a mistake! I also have my work written out. Come talk to me in the VPA office during either lunch.*

### **Significant Figures (Sig Figs)**

1. How many sig figs are in the following numbers?

a) 0.0450 3

b) 790 2

c) 32.10 4

2. Solve the following problems. Round your answer to the correct number of sig figs and use the correct unit on your answer.

a)  $825 \text{ cm} \times 32 \text{ cm} \times 0.248 \text{ cm}$   $6500 \text{ cm}^3$

b)  $\frac{15.68 \text{ g}}{2.885 \text{ mL}}$   $5.435 \text{ g/mL}$

### **Conversions** (round answers correctly and show work with units)

3. Make the following conversions:

a) 16.2 m to km  $0.0162 \text{ km}$

b) 5.44 nL to mL  $5.44 \times 10^{-6} \text{ mL}$

c) 45.7 mm/s to km/hr  $0.165 \text{ km/hr}$

### **Density** (round your answers to correct number of sig figs and show all work with units)

4. A cube of ruthenium metal 1.5 cm on a side has a mass of 42.0 g. What is the density in  $\text{g/cm}^3$ ? Will ruthenium metal float on water?  $12 \text{ g/cm}^3$ , sink

5. The density of bismuth metal is  $9.8 \text{ g/cm}^3$ . What is the mass of a sample of bismuth that displaces 65.8 mL of water?  $640 \text{ g}$

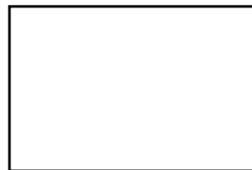
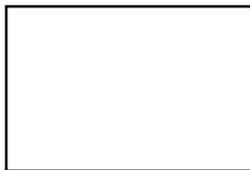
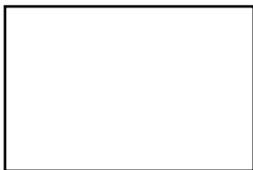
6. Two spheres have the same mass. One floats on water, the other sinks. Which sphere has the greater diameter? Explain your answer.

The sphere that floats has a larger diameter. Make sure you thoroughly explain your answer.

### Classification of Matter, Properties, and Changes

7. Define physical change and chemical change. Label each of the following as either physical or chemical: **Feel free to come check your answers with me during lunch!**
- Cutting a piece of aluminum metal
  - Melting wax
  - Pulverizing ice
  - Frying a potato
  - Explosion of nitroglycerin
  - Electrolysis of water
8. Define element, compound, and mixture. Draw pictures showing the particles in each type.

**Feel free to come check your answers with me during lunch!**



9. Name some common separation methods for pure substances and mixtures? Describe how they work.

**Feel free to come check your answers with me during lunch!**

### Atoms and Average Atomic Mass

10. Write the isotopic symbol (showing both mass number and atomic number) for each of the isotopes below:
- Atomic number = 8, number of neutrons = 9  $^{17}_8\text{O}$
  - The isotope of chlorine where the mass number = 37  $^{37}_{18}\text{Cl}$
  - Atomic number = 27, mass number = 60  $^{60}_{27}\text{Co}$
  - The isotope of iodine with a mass number of 131  $^{131}_{53}\text{I}$

11. Would you expect each of the following atoms to gain or lose electrons when forming ions? What charge is most likely in each case?

- |                          |                          |                          |
|--------------------------|--------------------------|--------------------------|
| a) Na <sup>+</sup> lose  | d) Ba <sup>2+</sup> lose | g) Al <sup>3+</sup> gain |
| b) Sr <sup>2+</sup> lose | e) I <sup>-</sup> gain   | h) S <sup>2-</sup> lose  |
| c) P <sup>3-</sup> gain  | f) O <sup>-2</sup> gain  |                          |

12. For each of the following ions, indicate the number of protons and electrons.

- |                           |                          |                          |
|---------------------------|--------------------------|--------------------------|
| a) Fe <sup>2+</sup> 26,24 | d) Cs <sup>+</sup> 55,54 | g) Br <sup>-</sup> 35,36 |
| b) Fe <sup>3+</sup> 26,23 | e) S <sup>2-</sup> 16,18 | h) N <sup>3-</sup> 7,10  |
| c) Ba <sup>2+</sup> 56,54 | f) P <sup>3-</sup> 15,18 |                          |

13. Write the full and noble gas shortcut electron configurations for the following elements:

- |             |  |  |
|-------------|--|--|
| a) Bromine  | 1s <sup>2</sup> 2s <sup>2</sup> 2p <sup>6</sup> 3s <sup>2</sup> 3p <sup>6</sup> 4s <sup>2</sup> 3d <sup>10</sup> 4p <sup>5</sup> | [Ar]4s <sup>2</sup> 3d <sup>10</sup> 4p <sup>5</sup> |
| b) Chromium | 1s <sup>2</sup> 2s <sup>2</sup> 2p <sup>6</sup> 3s <sup>2</sup> 3p <sup>6</sup> 4s <sup>2</sup> 3d <sup>10</sup> 4p <sup>5</sup> | [Ar]4s <sup>2</sup> 3d <sup>4</sup>                  |
|             | OR 1s <sup>2</sup> 2s <sup>2</sup> 2p <sup>6</sup> 3s <sup>2</sup> 3p <sup>6</sup> 4s <sup>1</sup> 3d <sup>5</sup>               | [Ar]4s <sup>1</sup> 3d <sup>5</sup>                  |
| c) Iron     | 1s <sup>2</sup> 2s <sup>2</sup> 2p <sup>6</sup> 3s <sup>2</sup> 3p <sup>6</sup> 4s <sup>2</sup> 3d <sup>6</sup>                  | [Ar]4s <sup>2</sup> 3d <sup>6</sup>                  |
| d) Sulfur   | 1s <sup>2</sup> 2s <sup>2</sup> 2p <sup>6</sup> 3s <sup>2</sup> 3p <sup>4</sup>  | [Ne]3s <sup>2</sup> 3p <sup>4</sup>                  |

14. Magnesium consists of 3 naturally occurring isotopes with the masses 23.98504 amu, 24.98584 amu, and 25.98259 amu. The relative abundances of these three isotopes are 78.70%, 10.13 %, and 11.17% respectively. Calculate the average atomic mass.

24.31 amu

### Moles

15. Calculate the number of moles of the following: (SHOW WORK)

- |                                      |           |
|--------------------------------------|-----------|
| a. 42.8 g of KNO <sub>3</sub>        | 0.423 mol |
| b. 155.7 L of CO <sub>2</sub> at STP | 6.95 mol  |

c.  $9.25 \times 10^{26}$  molecules of  $\text{CaCl}_2$  1540 mol

### Percent Composition and Empirical Formula

16. Calculate the percent composition of  $\text{C}_{12}\text{H}_{22}\text{O}_{11}$  (sugar). (Give the percent of each element.) Show all work.

42.10% C, 6.479% H, 51.42% O

17. A 0.941 g piece of magnesium metal is heated and reacts with oxygen. The resulting magnesium oxide weighs 1.560 g. Determine the percent composition of each element in the compound.

60.3 % Mg, 39.7% O

18. A compound contains 21.6% sodium, 33.0% chlorine, and 41.5% oxygen. Determine the empirical formula of the compound.

$\text{NaClO}_3$

**Nomenclature** Feel free to come check your answers with me during lunch!

19. Name or write the formula for these binary compounds of two nonmetals:
- a)  $\text{IF}_7$  \_\_\_\_\_
  - b)  $\text{N}_2\text{O}_4$  \_\_\_\_\_
  - c)  $\text{PCl}_3$  \_\_\_\_\_
  - d) Dinitrogen pentoxide \_\_\_\_\_
  - e) Tetrarsenic decoxide \_\_\_\_\_
  - f) Disulfur dichloride \_\_\_\_\_
20. Name these binary ionic compounds:
- a)  $\text{AlCl}_3$  \_\_\_\_\_
  - b)  $\text{KI}$  \_\_\_\_\_
  - c)  $\text{CaF}_2$  \_\_\_\_\_
  - d) Magnesium oxide \_\_\_\_\_
  - e) Strontium bromide \_\_\_\_\_
  - f) Aluminum oxide \_\_\_\_\_
21. Name or write the formula for these binary compounds with transition metals of variable charges (use roman numerals):
- a)  $\text{CuCl}_2$  \_\_\_\_\_
  - b)  $\text{PbCl}_4$  \_\_\_\_\_
  - c)  $\text{AuI}_3$  \_\_\_\_\_
  - d) Iron (III) oxide \_\_\_\_\_
  - e) Copper (II) sulfide \_\_\_\_\_
  - f) Cobalt (III) phosphide \_\_\_\_\_
22. Name or write the formula for these compounds with polyatomic ions:
- a)  $\text{Fe}(\text{NO}_3)_3$  \_\_\_\_\_
  - b)  $\text{Ca}(\text{ClO}_3)_2$  \_\_\_\_\_
  - c)  $\text{KNO}_2$  \_\_\_\_\_
  - d) Copper (I) dichromate \_\_\_\_\_
  - e) Copper (I) sulfate \_\_\_\_\_
  - f) Sodium hydrogen carbonate \_\_\_\_\_
23. Name or write the formula for these acids using the correct naming rules:
- a)  $\text{HCl}$  \_\_\_\_\_
  - b)  $\text{HI}$  \_\_\_\_\_
  - c)  $\text{H}_2\text{S}$  \_\_\_\_\_
  - d)  $\text{HF}$  \_\_\_\_\_
  - e)  $\text{HClO}_4$  \_\_\_\_\_
  - f)  $\text{H}_3\text{PO}_4$  \_\_\_\_\_
  - g) Oxalic acid \_\_\_\_\_
  - h) Sulfuric acid \_\_\_\_\_
  - i) Nitrous acid \_\_\_\_\_
  - j) Carbonic acid \_\_\_\_\_
  - k) Acetic acid \_\_\_\_\_
  - l) Chromic acid \_\_\_\_\_
24. Name these compounds appropriately:
- a)  $\text{CO}$  \_\_\_\_\_
  - b)  $\text{NI}_3$  \_\_\_\_\_
  - c)  $\text{LiMnO}_4$  \_\_\_\_\_
  - d)  $\text{CuCr}_2\text{O}_7$  \_\_\_\_\_
  - e)  $\text{FeF}_3$  \_\_\_\_\_
  - f)  $\text{NH}_4\text{CN}$  \_\_\_\_\_
  - g)  $\text{HClO}$  \_\_\_\_\_
  - h)  $\text{KC}_2\text{H}_3\text{O}_2$  \_\_\_\_\_
  - i)  $\text{HIO}_3$  \_\_\_\_\_
  - j)  $\text{OF}_2$  \_\_\_\_\_
  - k)  $\text{SO}_2$  \_\_\_\_\_
  - l)  $\text{HF}$  \_\_\_\_\_
  - m)  $\text{MnS}$  \_\_\_\_\_

25. Write the chemical formulas for these compounds:

- |                             |                                  |
|-----------------------------|----------------------------------|
| a) Tin (IV) phosphide_____  | g) Copper (II) cyanide_____      |
| b) Magnesium hydroxide_____ | h) Sodium peroxide_____          |
| c) Sulfurous acid_____      | i) Lithium silicate_____         |
| d) Potassium nitride_____   | j) Chromium (III) carbonate_____ |
| e) Gallium arsenide_____    | k) Dichromic acid_____           |
| f) Zinc fluoride_____       |                                  |

### Reactions

26. Balance the following and equations and tell what type of reaction it is (combination/synthesis, decomposition, single replacement, double replacement, or combustion)

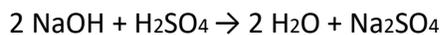
- |   |                             |
|---|-----------------------------|
| a) $2 \text{KNO}_3 \rightarrow 2 \text{KNO}_2 + \text{O}_2$   | Type: <b>Decomp</b>         |
| b) $2 \text{AgNO}_3 + \text{K}_2\text{SO}_4 \rightarrow \text{Ag}_2\text{SO}_4 + 2 \text{KNO}_3$              | Type: <b>DR</b>             |
| c) $4 \text{CH}_3\text{NH}_2 + 9 \text{O}_2 \rightarrow 4 \text{CO}_2 + 10 \text{H}_2\text{O} + 2 \text{N}_2$ | Type: <b>Combustion (?)</b> |
| d) $\text{N}_2\text{O}_5 + \text{H}_2\text{O} \rightarrow 2 \text{HNO}_3$                                     | Type: <b>Combination</b>    |
| e) $2 \text{Na} + \text{Zn}(\text{NO}_3)_2 \rightarrow \text{Zn} + 2 \text{NaNO}_3$                           | Type: <b>SR</b>             |

27. What are diatomic elements? List the 7.

**BrINClHOF**

### Stoichiometry, Limiting Reagent, and Percent Yield

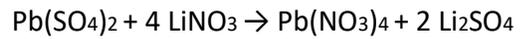
28. Using the following equation:



How many grams of sodium sulfate will be formed if you start with 200 grams of sodium hydroxide and you have an excess of sulfuric acid?

**400 g Na<sub>2</sub>SO<sub>4</sub>**

29. Using the following equation:



How many grams of lithium nitrate will be needed to make 250 grams of lithium sulfate, assuming that you have an adequate amount of lead (IV) sulfate to do the reaction?

310 g  $\text{LiNO}_3$

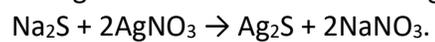
30. Determine the grams of sodium chloride produced when 10.0 g of sodium react with 10.0 g of chlorine gas according to the equation:  $2 \text{Na} + \text{Cl}_2 \rightarrow 2 \text{NaCl}$

16.5 g  $\text{NaCl}$

31. Determine the mass of lithium hydroxide produced when 50.0g of lithium are reacted with 45.0g of water according to the equation:  $2 \text{Li} + 2 \text{H}_2\text{O} \rightarrow 2 \text{LiOH} + \text{H}_2$

59.8 g  $\text{LiOH}$

32. 50.0 g of sodium sulfide and 35.0 g of silver nitrate react according the equation



a) Which is the limiting reagent?

$\text{AgNO}_3$

b) What mass of the excess reagent remains?

41.9 g  $\text{Na}_2\text{S}$

c) What mass of silver sulfide would precipitate?

25.5 g  $\text{Ag}_2\text{S}$

33. Determine the percent yield of water produced when 68.3 g of hydrogen reacts with 85.4g of oxygen and 86.4g of water are collected.  $2 \text{H}_2 + \text{O}_2 \rightarrow 2 \text{H}_2\text{O}$

89.8%