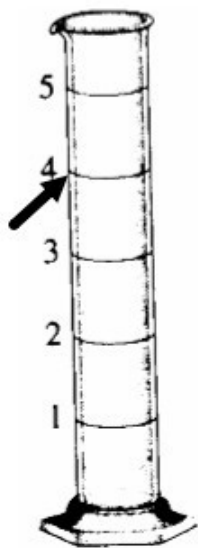


## Summer Packet – Some Chem Review

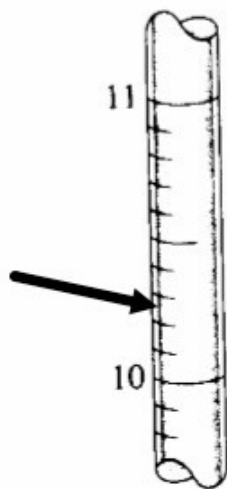
### A. Matter and Measurement

– Know the rules for significant figures.

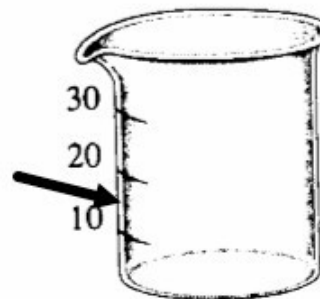
1. For each of the following pieces of glassware, provide a sample measurement at arrow and discuss the number of significant figures and uncertainty.



a.



b.



c.

2. A student performed an analysis of a sample for its calcium content and got the following results: 14.92%, 14.91%, 14.88%, and 14.91%. The actual amount of calcium in the sample is 15.70%. What conclusion can you draw about the **accuracy and precision** of these results?
3. Calculate the percent error for the following measurements.
- The density of an aluminum block determined in an experiment was 2.64 g/cm<sup>3</sup>. (Accepted value = 2.70 g/cm<sup>3</sup>)
  - The experimental determination of iron in ore was 16.48%. (Accepted value was 16.12%)
4. How many significant figures are in each of the following?
- |          |                            |                           |
|----------|----------------------------|---------------------------|
| a. 12    | d. 2.001 x 10 <sup>3</sup> | g. 1000.                  |
| b. 1.098 | e. 100                     | h. 22.04030               |
| c. 2001  | f. 0.0000101               | i. 1.00 x 10 <sup>3</sup> |
5. Round each of the following numbers to two significant figures, and write the answers in scientific notation.
- |               |               |
|---------------|---------------|
| a. 0.00031254 | c. 35,900     |
| b. 31,254,000 | d. 0.00000399 |
6. Use scientific notation to express the number 480 to
- One significant figure
  - Two significant figures
  - Three significant figures

7. Perform the following mathematical operations, and express each result to the correct number of significant figures.
- a.  $97.381 + 4.2502 + 0.99195$   
 b.  $171.5 + 72.915 - 8.23$   
 c.  $0.102 \times 0.0821 \times 273.5$   
 d.  $(9.04 - 8.23 + 21.954 + 81.0) / 3.1416$

### B. Dimensional Analysis

8. Precious metals and gems are measured in troy weights in the English system:

24 grains = 1 pennyweight

20 pennyweights = 1 troy ounce

12 troy ounces = 1 troy pound

1 grain = 0.0648 gram

1 carat = 0.200 gram

- a. Diamonds are measured in carats. If a lucky girl receives a 5 carat diamond how many pennyweights is it?
- b. What is the mass of 2.3 troy ounces of gold in grams?
- c. The density of gold is  $19.3 \text{ g/cm}^3$ . What is the volume of a troy pound of gold?

9. Apothecaries (druggists) use the following set of measures: 20

grains ap = 1 scruple

3 scruples = 1 dram ap

8 dram ap = 1 oz. ap

1 dram ap = 3.888 g

- a. An aspirin tablet contains  $5.00 \times 10^2 \text{ mg}$  of active ingredient. How many grains ap of active ingredient does it contain?
- b. From (a) how many scruples?
- c. What is the mass of 1.00 scruple in grams?

10. The world record for the hundred meter dash is 9.79 s.

- a. At this speed how long would it take to run a mile (5,280 ft)?

11. You're planning to buy a new car. One model that you're considering gets 32 miles per gallon of gasoline in highway travel. The one that your spouse likes gets 14 kilometers to the liter. Which car has the better gas mileage? (1 gal = 4 qt., 1.057 qt = 1 L)

12. You pass a road sign saying "New York – 112 km".
- If you drive at a constant speed of 65 mi/hr., how long should it take you to reach New York?
  - If your car gets 28 miles to the gallon, how many liters of gasoline are necessary to travel 112 km?

### C. Classifying Matter Basics

13. What are some of the differences between a solid, a liquid, and a gas? Draw particle diagrams of each.
14. What is the difference between homogeneous and heterogeneous matter?
15. Classify each of the following as homogeneous or heterogeneous.
- |                            |                                    |
|----------------------------|------------------------------------|
| a. soil                    | d. gasoline                        |
| b. the atmosphere          | e. gold                            |
| c. a carbonated soft drink | f. a solution of ethanol and water |
16. Classify each of the following as a mixture or a pure substance. Of the pure substances, which are elements and which are compounds?
- |               |            |
|---------------|------------|
| a. Water      | d. Iron    |
| b. Blood      | e. Brass   |
| c. The oceans | f. Uranium |
17. Distinguish between physical and chemical changes.
18. List four indications that a chemical change (reaction) has occurred.
19. If you place a glass rod over a burning candle, the glass appears to turn black. What is happening to each of the following (physical change, chemical change, both, or neither) as the candle burns? Explain each answer
- |            |             |                  |
|------------|-------------|------------------|
| a. the wax | b. the wick | c. the glass rod |
|------------|-------------|------------------|

**D. Writing Formulas and Naming Compounds** – On the AP Exam you won't have an ion chart – so you will have to know all ions by heart! I don't think it's worth memorizing them up front (unless you want to), over the course of the year you will use them so much that I think you will know them by heart by then anyway! For now use the periodic table from regular chem to help you.

20. Name each of the following compounds:

- a. NaCl
- b. Rb<sub>2</sub>O
- c. FeBr<sub>3</sub>
- d. Cr<sub>2</sub>O<sub>3</sub>
- e. CaBr<sub>2</sub>
- f. CsF
- g. CaS

- h. AlI<sub>3</sub>
- i. Al<sub>2</sub>O<sub>3</sub>
- j. ZnCl<sub>2</sub>
- k. Li<sub>3</sub>N
- l. Ag<sub>2</sub>S
- m. KClO<sub>4</sub>
- n. Al<sub>2</sub>(SO<sub>4</sub>)<sub>3</sub>

- o. BaSO<sub>3</sub>
- p. KMnO<sub>4</sub>
- q. Sr<sub>3</sub>P<sub>2</sub>
- r. Ca<sub>3</sub>(PO<sub>4</sub>)<sub>2</sub>
- s. Pb(NO<sub>3</sub>)<sub>2</sub>
- t. NaNO<sub>2</sub>
- u. K<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub>

21. Name each of the following molecules:

- a. NI<sub>3</sub>
- b. PCl<sub>3</sub>
- c. SO<sub>2</sub>
- d. N<sub>2</sub>O<sub>4</sub>
- e. ICl<sub>3</sub>
- f. SF<sub>2</sub>
- g. N<sub>2</sub>F<sub>4</sub>
- h. P<sub>2</sub>S<sub>5</sub>

22. Name each of the following acids:

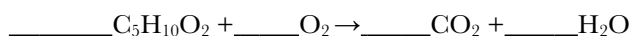
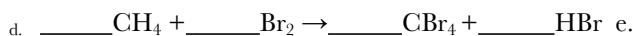
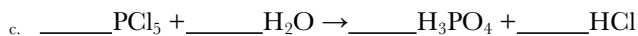
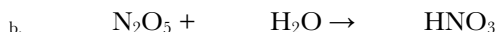
- a. HCl
- b. H<sub>3</sub>PO<sub>4</sub>
- c. H<sub>2</sub>SO<sub>3</sub>
- d. HC<sub>2</sub>H<sub>3</sub>O<sub>2</sub>
- e. H<sub>2</sub>SO<sub>4</sub>

23. Write the formula for each of the following compounds/molecules and acids:

- |                          |                                 |                               |
|--------------------------|---------------------------------|-------------------------------|
| a. Cesium bromide        | h. Sulfur difluoride            | o. Ammonium acetate           |
| b. Barium sulfate        | i. Sulfur hexafluoride          | p. Ammonium hydrogen sulfate  |
| c. Chlorine trifluoride  | j. Sodium dihydrogen phosphate  | q. Cobalt (III) nitrate       |
| d. Ammonium chloride     | k. Silicon tetrachloride        | r. Copper (I) sulfide         |
| e. Beryllium oxide       | l. Lithium nitride              | s. Potassium chlorate         |
| f. Chlorine monoxide     | m. Chromium (III) carbonate     | t. Lithium tartrate           |
| g. Magnesium fluoride    | n. Tin (II) fluoride            |                               |
| u. sodium oxide          | aa. Lead (IV) sulfide           | ff. Hydrobromic acid          |
| v. Sodium peroxide       | bb. Copper (I) chloride         | gg. Bromous acid              |
| w. Potassium cyanide     | cc. Cadmium selenide            | hh. Perchloric acid           |
| x. Copper (II) nitrate   | dd. Zinc sulfide                | ii. Silicon dioxide           |
| y. Silicon tetrafluoride | ee. Ammonium hydrogen phosphate | jj. Sodium sulfate            |
| z. Lead (II) sulfide     |                                 | kk. Aluminum hydrogen sulfate |

### E. Equations & Reactions Types

24. Balance the following equations:



- f.  $\underline{\hspace{1cm}} \text{Cr}(\text{OH})_3 + \underline{\hspace{1cm}} \text{HClO}_4 \rightarrow \underline{\hspace{1cm}} \text{Cr}(\text{ClO}_4)_3 + \underline{\hspace{1cm}} \text{H}_2\text{O}$
- g.  $\underline{\hspace{1cm}} \text{KNO}_3 \rightarrow \underline{\hspace{1cm}} \text{KNO}_2 + \underline{\hspace{1cm}} \text{O}_2$
- h.  $\underline{\hspace{1cm}} \text{La}_2\text{O}_3 + \underline{\hspace{1cm}} \text{H}_2\text{O} \rightarrow \underline{\hspace{1cm}} \text{La}(\text{OH})_3$
- i.  $\underline{\hspace{1cm}} \text{NCl}_3 + \underline{\hspace{1cm}} \text{H}_2\text{O} \rightarrow \underline{\hspace{1cm}} \text{NH}_3 + \underline{\hspace{1cm}} \text{HOCl}$
- j.  $\underline{\hspace{1cm}} \text{Mg}_3\text{N}_2 + \underline{\hspace{1cm}} \text{HCl} \rightarrow \underline{\hspace{1cm}} \text{MgCl}_2 + \underline{\hspace{1cm}} \text{NH}_4\text{Cl}$
- k.  $\underline{\hspace{1cm}} \text{AgNO}_3 + \underline{\hspace{1cm}} \text{K}_2\text{SO}_4 \rightarrow \underline{\hspace{1cm}} \text{Ag}_2\text{SO}_4 + \underline{\hspace{1cm}} \text{KNO}_3$
- l.  $\underline{\hspace{1cm}} \text{Al}(\text{OH})_3 + \underline{\hspace{1cm}} \text{H}_2\text{SO}_4 \rightarrow \underline{\hspace{1cm}} \text{Al}_2(\text{SO}_4)_3 + \underline{\hspace{1cm}} \text{H}_2\text{O}$
- m.  $\underline{\hspace{1cm}} \text{CH}_3\text{NH}_2 + \underline{\hspace{1cm}} \text{O}_2 \rightarrow \underline{\hspace{1cm}} \text{CO}_2 + \underline{\hspace{1cm}} \text{H}_2\text{O} + \underline{\hspace{1cm}} \text{N}_2$
- n.  $\underline{\hspace{1cm}} (\text{NH}_4)_2\text{Cr}_2\text{O}_7 \rightarrow \underline{\hspace{1cm}} \text{Cr}_2\text{O}_3 + \underline{\hspace{1cm}} \text{N}_2 + \underline{\hspace{1cm}} \text{H}_2\text{O}$

25. Write balanced chemical equations to correspond to each of the following descriptions.

- a. When solid potassium chlorate is heated it decomposes to form solid potassium chloride and oxygen.
- b. Solid zinc metal reacts with sulfuric acid to form hydrogen gas and an aqueous solution of zinc sulfate.
- c. When liquid phosphorous trichloride is added to water, it reacts to form aqueous phosphorous acid, and hydrochloric acid.
- d. When hydrogen sulfide gas is passed over solid hot iron (III) hydroxide, the resultant reaction produces solid iron (III) sulfide and water vapor.

26. Indicate what type of reaction is represented in the following equations.

A. Synthesis    B. Decomposition    C. Single replacement    D. Double replacement    E. Combustion

- a.  $\underline{\hspace{1cm}} \text{H}_2 + \text{I}_2 \rightarrow 2 \text{HI}$
- b.  $\underline{\hspace{1cm}} \text{Aluminum} + \text{iron (III) oxide} \rightarrow \text{aluminum oxide} + \text{iron}$
- c.  $\underline{\hspace{1cm}} 2 \text{C}_2\text{H}_6 + 7 \text{O}_2 \rightarrow 4 \text{CO}_2 + 6 \text{H}_2\text{O}$
- d.  $\underline{\hspace{1cm}} \text{AgNO}_3 + \text{NaCl} \rightarrow \text{AgCl} + \text{NaNO}_3$
- e.  $\underline{\hspace{1cm}} \text{Hydrochloric acid} + \text{ammonia} \rightarrow \text{ammonium chloride}$
- f.  $\underline{\hspace{1cm}} 2 \text{NaClO}_3 \rightarrow 2 \text{NaCl} + 3 \text{O}_2$
- g.  $\underline{\hspace{1cm}} 2 \text{Na} + 2 \text{H}_2\text{O} \rightarrow 2 \text{NaOH} + \text{H}_2$
- h.  $\underline{\hspace{1cm}} \text{Methane} + \text{oxygen} \rightarrow \text{carbon dioxide} + \text{water}$

**F. Mole Conversions** – use dimensional analysis to solve.

27. The molecular formula of aspartame, the artificial sweetener marketed as NutraSweet, is  $C_{14}H_{18}N_2O_5$ .

- a. What is the molar mass of aspartame?
  
  
  
  
  
  
  
  
  
  
- b. How many moles of aspartame are present in 3769.4 grams of aspartame?
  
  
  
  
  
  
  
  
  
  
- c. How many molecules of aspartame are present in 345.9 grams of aspartame?
  
  
  
  
  
  
  
  
  
  
- d. How many oxygen atoms are present in 23.6 grams of aspartame?

28. How many moles of ammonium ions are in 0.557 g of ammonium carbonate?

29. What is the mass, in grams, of 0.0438 moles of iron (III) phosphate?

30. What is the mass, in grams, of  $2.69 \times 10^{23}$  molecules of aspirin,  $C_9H_8O_4$ ?

31. What is the molar mass of diazepam (Valium) if 0.05570 mol has a mass of 15.86 g?

CONGRATULATIONS, you have made it! Be proud of yourself, and get ready for a fun-filled, challenging year which will push you to your limits, make you a better student, get you very prepared for college, and prove to yourself how brilliant you really are! Remember, I'm here to support you and help you succeed! If you need anything, please do not hesitate to email me or come see me! Don't be a stranger!