

Unit 1 Homework1.4

1. Calculate the percent error for a pencil whose actual length is 12.27 cm. Use significant figure rules and write an appropriate unit after every answer. Show your work.
- $(0.43) \downarrow$  Only sig to tenths because of 12.7
- a)  $11.95 \text{ cm} (-0.32)$
- $$\frac{11.95 - 12.27}{12.27} \times 100 = -2.69\%$$
- b) 12.7 cm
- $$\frac{12.7 - 12.27}{12.27} \times 100 = 4\%$$

2. Identify each error as systematic or random.

- a) The electronic balance you are using has been improperly tared. Systematic.
- b) Your cloth tape measure is stretched out from years of use. Random (did not know stretched out)
- c) You get 5.63 g, 5.57 g, and 5.59 g when measuring the same object on the same balance. Random
- d) You use different electronic balances throughout the course of a lab. Systematic.

3. For the following measurements, indicate how many significant figures (sf's) there are:

- a) 34 g 2 b) 56.4 L 3 c) 19.30 mm 4 d) 0.0001 mg 1 e) 101 km 3 f) 0.010100 L 5

4. Round off the following measurements to three significant figures:

a) 120000 cm <u><math>1.20 \times 10^5 \text{ cm}</math></u>	b) 4.53619 nm <u><math>4.54 \text{ nm}</math></u>
c) 0.0008769 mL <u><math>8.77 \times 10^{-4} \text{ mL}</math></u>	d) 876493 $\mu\text{m}$ <u><math>8.76 \times 10^5 \mu\text{m}</math></u>

5. Perform all calculations and express your answer with the appropriate sig figs & units and in scientific notation.

a) $0.034 \text{ g/L} \times 8.8 \text{ L} = \frac{3.0 \times 10^{-1} \text{ g}}{2 \quad 2}$	b) $5.79 \text{ m/hr} \times 2.34 \text{ hr} = \frac{1.35 \times 10^1 \text{ m}}{3 \quad 3} \times 2.34 \text{ hr}$	c) $1.405 \text{ m} \times 6.39 \text{ m} = \frac{8.98 \times 10^0 \text{ m}^2}{3 \quad 3}$
d) $67 \text{ cm} + 45 \text{ cm} = \frac{1.12 \times 10^2 \text{ cm}}{2 \quad 2}$	e) $4.29 \text{ m} + 9.8 \text{ m} = \frac{1.41 \times 10^1 \text{ m}}{2 \quad 2}$	f) $170 \text{ mm} + 250 \text{ mm} = \frac{4.2 \times 10^2 \text{ mm}}{2 \quad 2}$
(note: no decimal places)      least precise is ones.      Both tens so answer to tens.		

6. Record your answer to the correct number of sig figs. Figure out the last math operation you do according to PEDMAS and then follow that sig fig rule.

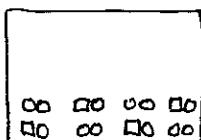
$$5.9851 \times 10^4 + 9.967 \times 10^6$$

$$\begin{array}{r}
 59851 \\
 + 9967000 \\
 \hline
 10026851 \\
 \uparrow \\
 1,0026 \times 10^7
 \end{array}$$

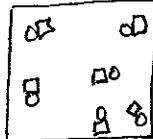
1.6

1. Draw a picture for each description that shows your understanding of the classification of matter.

a) a solid homogeneous mixture containing a compound and a diatomic element.



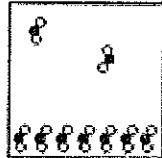
b) a gaseous pure substance comprised of a compound



c) a heterogeneous liquid mixture containing atoms of two different elements.



2. Describe this sample of



matter:

pure substance that is a compound & is sublimating  
(solid & gas)

3. Classify each as a Physical or Chemical property:

Chem a. odor due to rotting

Phy. b. red color of an apple

Chem c. flammability

Phy d. density

Chem e. reaction to acids

Phy f. melting point

4. Classify each as a Physical or Chemical change:

Chem a. rusting of iron

Chem e. digestion of food

Phy b. boiling of water

Phy f. sawing of wood

Chem c. burning of sulfur

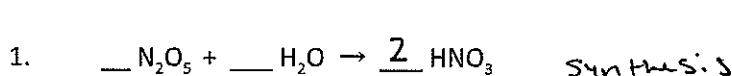
Phy g. melting of wax

Chem d. cooking an egg

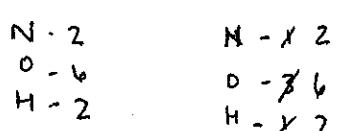
Phy h. dissolving salt in water

1.9

Balance each equation, then identify its type. If it fits in more than one category, mention them all.

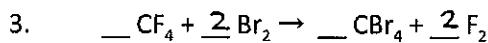


*Reaction Type*

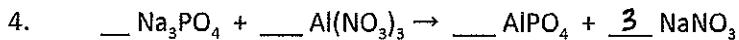




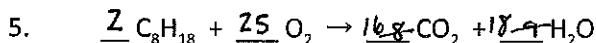
Decomp.



SINGLE Replacement.



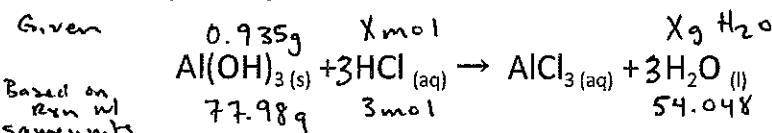
Double Replacement



Combustion

Bal C  $\rightarrow$  Bal H  $\rightarrow$  Bal O last.

1.12 Check the chemical equations first!



$$\text{MM}_{\text{H}_2\text{O}} = 18.016 \frac{\text{g}}{\text{mol}}$$

1. How many moles of HCl are required to react with 0.935 g of Al(OH)<sub>3</sub> in the above reaction?

$$\frac{0.935 \text{ g}}{77.98 \text{ g}} = \frac{\text{X mol HCl}}{3 \text{ mol HCl}} \quad \text{or} \quad 0.935 \text{ g } \text{Al(OH)}_3 \left| \begin{array}{c} 1 \text{ mol Al(OH)}_3 \\ 77.98 \text{ g} \end{array} \right| \left| \begin{array}{c} 3 \text{ mol HCl} \\ 1 \text{ mol Al(OH)}_3 \end{array} \right| = 0.0360 \frac{\text{mol HCl}}{\text{mol Al(OH)}_3}$$

$$\boxed{\text{X} = 0.0360 \text{ mol HCl}}$$

2. What is the theoretical yield of H<sub>2</sub>O if 0.935 g of Al(OH)<sub>3</sub> react with excess HCl?

$$\frac{0.935 \text{ g } \text{Al(OH)}_3}{77.98 \text{ g } \text{Al(OH)}_3} = \frac{\text{X g H}_2\text{O}}{54.048 \text{ g H}_2\text{O}}$$

$$\boxed{\text{X} = 0.648 \text{ g H}_2\text{O}}$$

$$\text{or.} \quad 0.935 \text{ g } \text{Al(OH)}_3 \left| \begin{array}{c} 1 \text{ mol Al(OH)}_3 \\ 77.98 \text{ g} \end{array} \right| \left| \begin{array}{c} 3 \text{ mol H}_2\text{O} \\ 1 \text{ mol Al(OH)}_3 \end{array} \right| \left| \begin{array}{c} 18.016 \text{ g H}_2\text{O} \\ 1 \text{ mol H}_2\text{O} \end{array} \right| = \boxed{0.648 \frac{\text{g H}_2\text{O}}{\text{g H}_2\text{O}}}$$

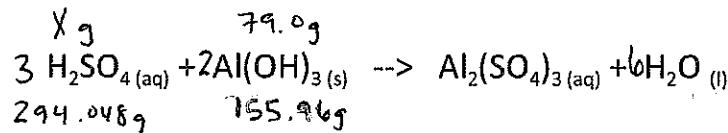
3. You do the experiment from #2 and find that the actual yield is 0.599 g. What is the percent yield?

$$\% \text{ Yield} = \frac{\text{actual (lab)}}{\text{theor. (book)}} \cdot 100$$

$$= \frac{0.599}{0.648} \cdot 100 = \boxed{92.49\%}$$

$$\text{MM}_{\text{Al(OH)}_3} = 72.98 \frac{\text{g}}{\text{mol}}$$

$$\text{MM}_{\text{H}_2\text{SO}_4} = 98.016 \frac{\text{g}}{\text{mol}}$$



4. How many grams of H<sub>2</sub>SO<sub>4</sub> are required to react with 79.0 grams of Al(OH)<sub>3</sub> in the above reaction?

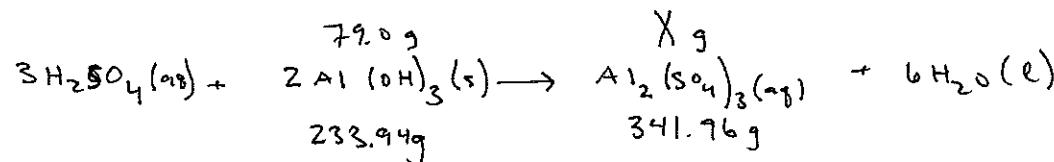
$$\frac{\text{X g H}_2\text{SO}_4}{294.048 \text{ g}} = \frac{79.0 \text{ g } \text{Al(OH)}_3}{155.96 \text{ g } (\text{Al(OH)}_3)} \quad \text{or}$$

$$\text{X} = 149.9 \text{ g H}_2\text{SO}_4$$

$$79.0 \text{ g } \text{Al(OH)}_3 \left| \begin{array}{c} 1 \text{ mol Al(OH)}_3 \\ 155.96 \text{ g} \end{array} \right| \left| \begin{array}{c} 3 \text{ mol H}_2\text{SO}_4 \\ 2 \text{ mol Al(OH)}_3 \end{array} \right| \left| \begin{array}{c} 98.016 \text{ g H}_2\text{SO}_4 \\ 1 \text{ mol H}_2\text{SO}_4 \end{array} \right| = \boxed{149.9 \text{ g H}_2\text{SO}_4}$$

5. A student performed this reaction in the lab and produced and calculated a percent yield of 94.7%. How much  $\text{Al}_2(\text{SO}_4)_3$  did the student produce?

Assume start with 79.0 g  $\text{Al(OH)}_3$



$$\frac{79.0 \text{ g} \quad \text{Al(OH)}_3}{233.94 \text{ g} \quad \text{Al(OH)}_3} = \frac{X \text{ g} \quad \text{Al}_2(\text{SO}_4)_3}{341.96 \text{ g} \quad \text{Al}_2(\text{SO}_4)_3}$$

$$X: 115.48 \text{ g } \text{Al}_2(\text{SO}_4)_3 \quad (\text{Theoretical})$$

$$\gamma_o = \frac{\text{Act}}{\text{Theor.}} \cdot 100$$

$$94.7 = \frac{X}{115.48} \cdot 100 = \boxed{109 \text{ g } \text{Al}_2(\text{SO}_4)_3}$$