

Reactions and Balancing

**Key**

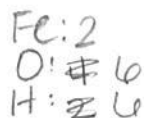
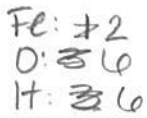
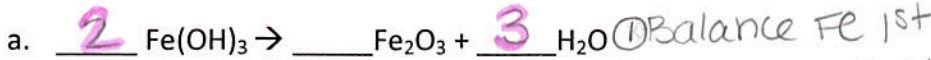
1. What are the 3 things conserved during a chemical reaction?

mass, charge, & energy

2. How would you identify if something is a physical or a chemical change from a chemical equation?

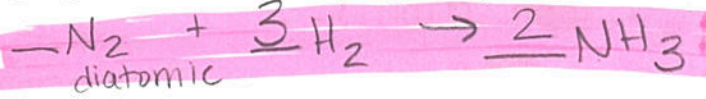
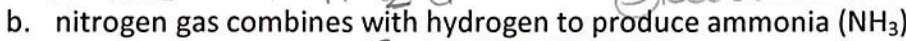
formulas of reactants & products are different in chem. change

3. Balance each of the following chemical equations and identify the type of reaction:

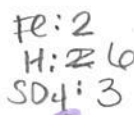
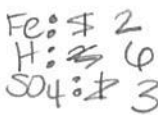
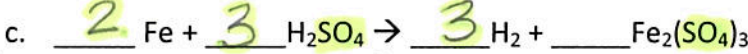


② Balance H b/c only in 1 product  
③ Balance O.

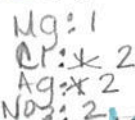
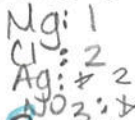
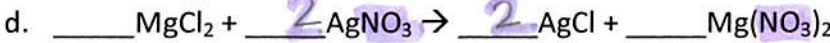
-type: decomp.



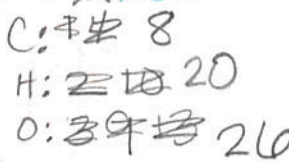
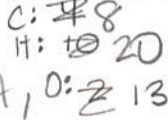
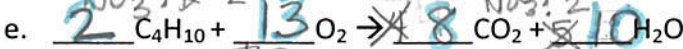
-type: synth.



-type: single replace.



-type: double replace.



-type: combustion

⊗ Don't forget about diatomic elements  
⊗ Keep polyatomic ions together.

⊗ For combustion, balance C, then H, O, then double products & balance O.  
Moles

4. Calculate the percent composition of oxygen in C<sub>4</sub>H<sub>8</sub>O<sub>4</sub>. (gfm = 120.0 g/mol)

$4 \times 16.0 = 64.0 \text{g}$

$\% \text{O} = \frac{\text{mass O in compound}}{\text{gfm compound}} \times 100\% = \frac{64.0}{120.0} \times 100 = 53.3\%$

5. What is the mass of 5.00 moles of Fe<sub>2</sub>O<sub>3</sub>? (gfm = 159.6 g/mol)

moles → mass  
1 mol = gfm  
1 mol = 159.6g

$5.00 \text{ mol} \times \frac{159.6 \text{g}}{1 \text{ mol}} = 798 \text{g}$

⊗ For x or ÷, round answer to # of s.f. as the value w/ fewest s.f.

6. How many moles of argon gas are present in 11.2 L? (gfm = 39.9 g/mol)

L → mol

$$22.4 \text{ L} = 1 \text{ mol}$$

$$11.2 \text{ L} \times \frac{1 \text{ mol}}{22.4 \text{ L}} = 0.500 \text{ mol}$$

3 sf

7. How many molecules are present in 4.00 moles of glucose, C<sub>6</sub>H<sub>12</sub>O<sub>6</sub> (gfm = 180.0 g/mol)

mol → molecules

$$1 \text{ mol} = 6.02 \times 10^{23} \text{ molecules}$$

$$4.00 \text{ mol} \times (6.02 \times 10^{23} \text{ molecules}) = 2.408 \times 10^{24} = 2.41 \times 10^{24} \text{ molecules}$$

3 sf

a. How many atoms of carbon?

1 molecule of C<sub>6</sub>H<sub>12</sub>O<sub>6</sub> = 6 C atoms

$$(2.41 \times 10^{24}) \text{ molecules of C}_6\text{H}_{12}\text{O}_6 \times \frac{6 \text{ C atoms}}{1 \text{ molecule}} = 1.45 \times 10^{26} \text{ C atoms}$$

3 sf

8. How many molecules of CCl<sub>4</sub> are there in 16.8 grams of CCl<sub>4</sub>? (gfm = 154 g/mol)

grams → moles → molecules

$$154 \text{ g} = 1 \text{ mol} \quad 1 \text{ mol} = 6.02 \times 10^{23} \text{ molecules}$$

$$16.8 \text{ g} \times \frac{1 \text{ mol}}{154 \text{ g}} \times (6.02 \times 10^{23} \text{ molecules}) = 6.57 \times 10^{22} \text{ molecules}$$

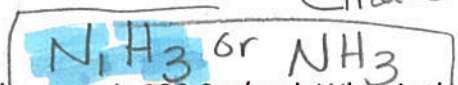
9. A gaseous compound has a percent composition of 83.4% nitrogen and 17.6% hydrogen. What is the empirical formula of the gas?

① Divide % by gfm of element, keep decimals

② Divide each answer by the smaller of the #s

③ Round to nearest whole # & make subscripts in empirical formula

$\begin{aligned} & \div 14.0 \\ & = 5.95714 \\ & \approx 5.95714 \\ & = 1 \end{aligned}$	$\begin{aligned} & \div 1 \\ & = 17.6 \\ & \approx 5.95714 \\ & = 2.95 \\ & \text{make whole \#} \end{aligned}$
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10. A compound has an empirical formula of CH<sub>2</sub>O. Its molecular mass is 180.0 g/mol. What is the molecular formula?

30: molecular mass

empirical mass

to find factor by which to multiply all subscripts

$$\frac{180.0}{30.0} = 6$$

$$\text{C}_1\text{H}_2\text{O}_1 \times 6 \rightarrow \text{C}_6\text{H}_{12}\text{O}_6$$