Percent Composition Practice

Name/Period: Key

Guided Notes:

1. Define percent composition.

   % of each element in a compound

2. What is the general equation used to solve for percent composition?

   $\%\text{Comp} = \frac{\text{mass element}}{\text{mass compound}} \times 100$

3. What do the percentages of the elements in a compound need to add up to?

   100

4. Find the percent by mass of *each* element in $NaNO_3$ using the equation in #2. **SHOW YOUR WORK!!!**

   $22.98977+14.0067+3(15.9994)=84.99467$

   $\%Na = \frac{22.98977}{84.99467} \times 100 = 27.0\%Na$

   $\%N = \frac{14.0067}{84.99467} \times 100 = 16.5\%N$

   $\%O = \frac{47.9982}{84.99467} \times 100 = 56.5\%O$

Complete the following percent composition practice problems. Show *all* of your work!

1. Determine the percent composition of calcium in calcium chloride ($CaCl_2$).

   $\%Ca = \frac{40.08}{40.08+2(35.453)} = \frac{40.08}{110.986} \times 100 = 36.1\%Ca$

2. Calculate the percent composition of sodium sulfate (Na_2SO_4).

   $\%Na = \frac{2(22.98977)}{2(22.98977)+32.06+4(15.9994)} = \frac{45.97954}{142.03714} \times 100 = 32.4\%Na$

   $\%S = \frac{32.06}{142.03714} \times 100 = 22.6\%S$

   $\%O = \frac{63.9976}{142.03714} \times 100 = 45.1\%O$

3. Which has the larger percent by mass of sulfur, H_2SO_3 or $H_2S_2O_8$?

   $\%S = \frac{32.06}{2(1.00794)+32.06+3(15.9994)} = \frac{32.06}{82.07408} \times 100 = 39.1\%S$

   * H_2SO_3 has larger %S

   $\%S = \frac{2(32.06)}{2(1.00794)+2(32.06)+8(15.9994)} = \frac{64.12}{194.13108} \times 100 = 33.0\%S$

4. Which has the higher percent hydrogen- phosphoric acid (H_3PO_4) or hydrochloric acid (HCl)?

   $\%H = \frac{3(1.00794)}{3(1.00794)+30.97376+4(15.9994)} = \frac{3.02382}{97.99518} \times 100 = 3.09\%H$

   H_3PO_4

   $\%H = \frac{1.00794}{36.46094} \times 100 = 2.76\%H$

Mole Conversion Practice:

5. How many grams are in 8.23 moles of sodium carbonate?

$Na_2CO_3 = 2(22.98977) + 12.0111 + 3(15.9994) = 105.98884$

$$8.23 \text{ mol } Na_2CO_3 \left| \frac{105.98884 \text{ g } Na_2CO_3}{1 \text{ mol } Na_2CO_3} \right. = 872 \text{ g } Na_2CO_3$$

6. How many grams are in 7.23×10^{24} molecules of carbon dioxide?

$CO_2 = 12.0111 + 2(15.9994) = 44.0099$

$$7.23 \times 10^{24} \text{ molecules } CO_2 \left| \frac{1 \text{ mol } CO_2}{6.02 \times 10^{23} \text{ molecules } CO_2} \right| \frac{44.0099 \text{ g } CO_2}{1 \text{ mol } CO_2} = 529 \text{ g } CO_2$$

7. How many moles are in 45.8 grams of copper?

$$45.8 \text{ g Cu} \left| \frac{1 \text{ mol Cu}}{63.546 \text{ g Cu}} \right. = .721 \text{ mol Cu}$$

8. How many moles are in 7.8×10^{23} ions of Ca^{2+}?

$$7.8 \times 10^{23} \text{ ions } Ca^{2+} \left| \frac{1 \text{ mol } Ca^{2+}}{6.02 \times 10^{23} \text{ ions } Ca^{2+}} \right. = 1.3 \text{ mol } Ca^{2+}$$

9. How many grams are in 2.3×10^{23} formula units of $Al_2(CO_3)_3$?

$2(26.98154) + 3(12.0111) + 9(15.9994) = 233.99098$

$$2.3 \times 10^{23} \text{ fu } Al_2(CO_3)_3 \left| \frac{1 \text{ mol } Al_2(CO_3)_3}{6.02 \times 10^{23} \text{ fu } Al_2(CO_3)_3} \right| \frac{233.99098 \text{ g } Al_2(CO_3)_3}{1 \text{ mol } Al_2(CO_3)_3} = 89 \text{ g } Al_2(CO_3)_3$$

10. How many ions are in 50.1 grams of NH_4^+?

14.0067

$$50.1 \text{ g } NH_4^+ \left| \frac{1 \text{ mol } NH_4^+}{18.03846 \text{ g } NH_4^+} \right| \frac{6.02 \times 10^{23} \text{ ions } NH_4^+}{1 \text{ mol } NH_4^+} = 1.67 \times 10^{24} \text{ ions } NH_4^+$$