Questions from the Homework

Quiz Topics

- Two-step Calculations
- Percent Composition
- Empirical and Molecular Formulas

Sample Problems

How many grams are in 9.80 x 10^{25} molecules of H_2O?

g = ?

molecules = 9.80×10^{25}

9.80×10^{25} molecules $\times \frac{1 \text{ mol}}{6.02 \times 10^{23} \text{ molecules}} \times \frac{18.02 \text{ g}}{1 \text{ mol}} = 2,930 \text{ g}$

H = 2 x 1.01 = 2.02

O = 1 x 16.00 = 16.00

18.02 g/mol

How many molecules are in 3.40 grams of CO_2?

$m = 3.40\,g$

molecules = ?

$C = 1 \times 12.01 = 12.01$

$O = 2 \times 16.00 = 32.00$

44.01

$$3.40\,g \times \frac{1\,mol}{44.0\,g} \times \frac{6.02 \times 10^{23}\ molecules}{1\,mol} = 4.65 \times 10^{22}\ molecules$$

How many litres are in 24.0 g of CH_4?

$g = 24.0\,g$

$L = ?$

$C = 1 \times 12.01 = 12.01$

$H = 4 \times 1.01 = 4.04$

$16.05\,g/mol$

$$24.0\,g \times \frac{1\,mol}{16.05\,g} \times \frac{22.4\,L}{1\,mol} = 33.5\,L$$

How many kilograms are in 1.08 L of O_2?

Calculate the percent composition of $C_{12}H_{22}O_{11}$.

$C = 12 \times 12.01 = 144.12$

$H = 22 \times 1.01 = 22.22$

$O = 11 \times 16.00 = 176.00$

$342.34\ g$

$C = \frac{144.12\ g}{342.34\ g} \times 100\% = 42.10\%$

$H = \frac{22.22\ g}{342.34\ g} \times 100\% = 6.49\%$

$O = \frac{176.00\ g}{342.34\ g} \times 100\% = 51.41\%$

100%

A compound is made up of 2.06% H, 32.69% S, and 65.25% O. The molar mass of the compound is 196.16 g/mol. What is the empirical formula and molecular formula for the compound?

assume 100g

2.06g H
32.69g S
65.25g O

$2.06g \times \frac{1mol}{1.01g} = 2.04mol$

$32.69g \times \frac{1mol}{32.06g} = 1.02mol$

$65.25gO \times \frac{1mol}{16.00g} = 4.08mol$

H = 2
S = 1
O = 4

H_2SO_4

molar mass Empirical = H - 2x1.01, S - 1x32.06, O - 4x16.00 = 98.08 g/mol

molecular Formula = $H_4S_2O_8$

Quiz - Tomorrow

Section 10.1

1. 342.3 g/mol
2. **a.** 208.2 g/mol **b.** 352.0 g/mol
3. **a.** 158.0 g/mol **b.** 310.2 g/mol
4. 5.85 mol H_2O
5. 3.6×10^{23} atoms
6. 32.0 g

Section 10.2

1. **a.** 180.2 g/mol **c.** 96.2 g/mol
   b. 84.0 g/mol **d.** 153.2 g/mol
2. **a.** 1.8×10^{3} g
   b. 26 g
   c. 3.20×10^{-2} g
   d. 0.480 g or 4.80×10^{-1} g
   e. 1.43×10^{2} g
3. 1.87×10^{2} g
4. 204.1 g
5. **a.** 4.9×10^{-3} mol **d.** 1.98×10^{-5} mol
   b. 9.10×10^{-2} mol **e.** 1.97×10^{-5} mol
   c. 1.08×10^{-2} mol
6. 5.43 mol
7. 15.1 g
8. 59.6 L CH_4
9. 6.03 mol NH_3

Section 10.3

1. $\text{Percent C} = \dfrac{5.34 \text{ g C}}{52.84 \text{ g cpd}} \times 100 = 10.1\% \text{ C}$

   $\text{Percent H} = \dfrac{0.42 \text{ g H}}{52.84 \text{ g cpd}} \times 100 = 0.79\% \text{ H}$

   $\text{Percent Cl} = \dfrac{47.08 \text{ g Cl}}{52.84 \text{ g cpd}} \times 100 = 89.1\% \text{ Cl}$

2. Mass of Cl
   = total mass of compound − mass of Sn
   = 18.35 g of compound − 5.74 g Sn
   = 12.61 g Cl

   $\text{Percent of Sn} = \dfrac{5.74 \text{ g Sn}}{18.35 \text{ g cpd}} \times 100$

   = 31.3% Sn

   $\text{Percent of Cl} = \dfrac{12.61 \text{ g Cl}}{18.35 \text{ g cpd}} \times 100$

   = 68.7% Cl

3. $\text{Percent C} = \dfrac{3.907 \text{ g C}}{4.781 \text{ g cpd}} \times 100 = 81.7\% \text{ C}$

   $\text{Percent H} = \dfrac{0.874 \text{ g H}}{4.781 \text{ g cpd}} \times 100 = 18.3\% \text{ H}$

4. $\text{Percent C} = \dfrac{48.0 \text{ g C}}{158.1 \text{ g } Ca(C_2H_3O_2)_2} \times 100$

   = 30.4% C

   Mass C = 30.4% C × 65.3 g = 19.8 g
5. 13.2 g Al
6. 15.11 g Fe
7. **a.** CCl_4
   b. $CHCl_3$