Calculate the number of moles in 2.46×10^{21} molecules of CO_2.

a. 1.66×10^{-20}

(b.) 4.09×10^{-3}

c. 2.00×10^{4}

d. 1.45×10^{9}

$= \frac{2.46 \times 10^{21}}{6.02 \times 10^{23}} = \boxed{4.09 \times 10^{-3}}$

What is the total number of atoms of all the elements in 2.50 moles of $Al_2(SO_4)_3$?

a. 1.02×10^{24} atoms

(c.) 2.56×10^{24} atoms

b. 1.51×10^{24} atoms

d. 5.20×10^{24} atoms

atoms = 2Al + 3S + 12O

= 17 atoms

$\text{total atoms} = 2.50 \text{ mol} \times \frac{6.02 \times 10^{23} \text{ unit}}{\text{mol}} \times \frac{17 \text{ atoms}}{1 \text{ unit}} = \boxed{2.56 \times 10^{25}}$

Calculate the molar mass of $(NH_4)_2C_2O_4$.

a. 100.00 g/mol

(b.) 124.10 g/mol

c. 240.78 g/mol

d. 316.20 g/mol

$\text{molar mass} = 2(14) + 8(1) + 2(12) + 4(16)$

$= \boxed{124.1 \text{ g/mol}}$

Calculate the number of moles of each element. Please round your answer to three significant digits.

5.73×10^{24} carbon atoms

9.52 mol

$= \frac{5.73 \times 10^{24}}{6.02 \times 10^{23}} = \boxed{9.52 \text{ mol}}$

2.06×10^{24} copper atoms

3.42 mol

$= \frac{2.06 \times 10^{24}}{6.02 \times 10^{23}} = \boxed{3.42 \text{ mol}}$

9.32×10^{24} sulfur atoms

15.5 mol

$= \frac{9.32 \times 10^{24}}{6.02 \times 10^{23}} = \boxed{15.5 \text{ mol}}$

Which of the following is the correct molar mass of N_2O_5?

a. 76.0 g/mol

(c.) 108.0 g/mol

b. 98.0 g/mol

d. 132.0 g/mol

$\text{molar mass} = 2(14.0) + 5(16.0) = \boxed{108.0 \text{ g/mol}}$

Which of the following is the correct mass of 1.64 mol of $NaNO_2$?

molar mass = 22.99 + 14.01 + 2(15.99)

= 68.98 g $NaNO_2$

a. 28.0 g

b. 58.4 g

$1.64\ mol \times \frac{68.98\ g}{1\ mol} = \boxed{113.2\ g}$

c. 85.1 g

(d.) 113.2 g

A balloon is filled with 6.0 g of helium. What is the number of moles of helium in the balloon at STP?

(a.) 1.5 mol

$6.0\ g\ He \times \frac{1\ mol}{4.0\ g\ He} = \boxed{1.5\ mol\ He}$

b. 3.0 mol

c. 4.5 mol

d. 6.0 mol

Which of the following is the correct mass of 78.0 L of SO_3 at STP?

molar mass = 80.07 g/mol

a. 111.4 g

$78.0\ L \times \frac{mol}{22.4\ L} \times \frac{80.07\ g}{mol} = \boxed{278.8\ g}$

(b.) 278.8 g

c. 348.2 g

d. 376.0 g

A gaseous hydrocarbon has a density of 2.59 g/L at STP. What is the identity of the hydrocarbon?

(a.) butane, C_4H_{10}

molar mass = (2.59 g/L)(22.4 L)

= 58.0 g

b. ethane, C_2H_6

c. methane, CH_4

d. propane, C_3H_8

Calculate the densities of the following gases at STP. For all elements, use a molar mass with three significant digits.

density = mass / volume

Fill in the blanks as you answer the question.

NH_3 [0.760] g/L = $\frac{17}{22.4}$

O_2 [1.43] g/L = $\frac{32}{22.4}$

He [0.179] g/L = $\frac{4}{22.4}$

The air we breathe is approximately 21% oxygen. A typical breath has a volume of about 450 mL. How many grams of O_2 are in a breath of air?

volume = (0.21)(450) = 95 mL

Fill in the blanks as you answer the question. Round to two significant digits.

Volume of O_2 in a breath of air: [95] ml

moles = $\frac{(95\text{ mL})}{1000}$ / 22.4L = $\frac{0.095}{22.4}$ = 0.0042 mol

Moles of O_2: [0.0042] mol

molar mass O_2 = 16×2 = 32 g/mol

Grams of O_2: [0.13] g

grams = (mass)(moles) = (32)(0.0042) = 0.13 g

What is the percent composition of PbO_2?

a. 50% Pb, 50% O_2

b. 86.6% Pb, 13.4% O_2

c. 43.3% Pb, 56.6% O_2

d. 33.3% Pb, 66.6% O_2

Magnesium oxide can be synthesized by heating magnesium metal so that it reacts with the oxygen in the air. The following data were obtained when magnesium oxide was prepared in this way. Assume all the magnesium reacted. Use this data to calculate the percent composition of the magnesium oxide produced.

mass of oxygen = 2.62 − 1.58 = 1.04 g

Starting mass of magnesium: 1.58 g
Mass of magnesium oxide produced: 2.62 g

a. 60.3% Mg, 39.7% O

b. 37.6% Mg, 62.4% O

c. 50% Mg, 50% O

d. 33.3% Mg, 66.6% O

%Mg = $\frac{1.58}{2.62}$ × 100 = 60.3 %Mg

%O = $\frac{1.04}{2.62}$ × 100 = 39.7% O

%Pb = $\frac{\text{mass Pb}}{\text{molar mass } PbO_2}$ = $\frac{207.2\text{ g}}{239.2}$ ×100 = 86.6% Pb

%O_2 = $\frac{\text{mass } O_2}{\text{molar mass } PbO_2}$ = $\frac{32\text{ g}}{239.2}$ ×100 = 13.4% O_2

Water is 11% hydrogen and 89% oxygen by mass. How many grams of oxygen are in a 250 g glass of water?

L = 0.89

a. 27.5 g

b. 89.0 g

c. 222.5 g

d. 240.0 g

mass = (0.89)(250g) = 222.5 g

Which of these are empirical formulas? Select all that apply.

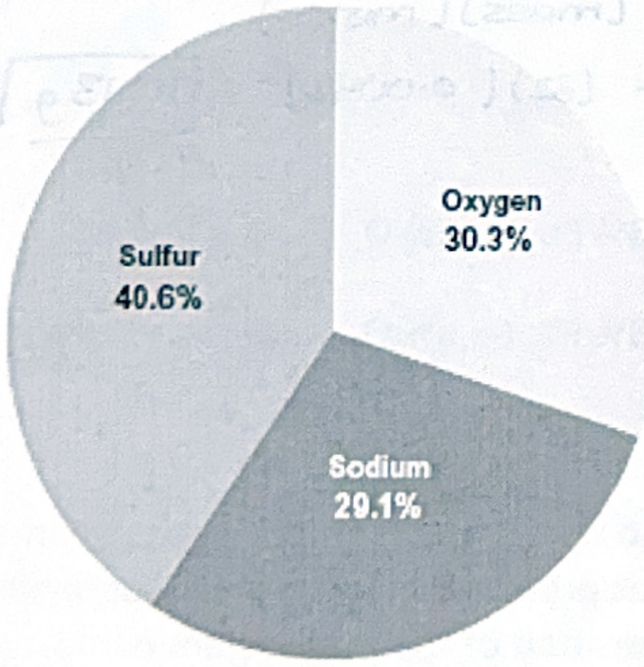
a. $C_2H_4(OH)_2$

b. $C_6H_4Cl_2$

c. $Al_2(SO_4)_3$

d. $Kr_2Cr_2O_7$

A compound is analyzed and found to have the percent composition shown in the pie chart. What is the empirical formula for this compound?



oxygen: $30.3\,g\,O \times \frac{1\,mol}{16.0\,g\,O} = \frac{1.89\,mol\,O}{1.26}$

sodium: $29.1\,g\,Na \times \frac{1\,mol}{23.0\,g\,Na} = \frac{1.27\,mol\,Na}{1.26}$

sulfur: $40.6\,g\,S \times \frac{1\,mol}{32.1\,g\,S} = \frac{1.26\,mol\,S}{1.26}$

O = 1.5 (2) : 3

Na = 1 (2) : 2

S = 1 (2) : 2

- A. $Na_2S_2O_3$
- B. $Na_2S_3O_2$
- C. Na_1SO_4
- D. Na_2SO_2

$Na_2S_2O_3$

β-carotene, a compound found in carrots, has the empirical formula C_5H_7. The molar mass of β-carotene is 536 g/mol. What is its molecular formula?

- A. C_5H_7
- B. $C_{10}H_{14}$
- C. $C_{20}H_{28}$
- D. $C_{40}H_{56}$

EFM = 5(12.0 g/mol) + 7(1.0 g/mol)

= 67.0 g/mol

$\frac{\text{molar mass}}{\text{EFM}} = \frac{536 \text{ g/mol}}{67 \text{ g/mol}} = 8$

$8(C_5H_7) = C_{40}H_{56}$

Linoleic acid ($C_{18}H_{32}O_2$), which has a molar mass of 280.0 g/mol, is found in many vegetable oils. Determine the percent composition of this compound.

Carbon ____ %

Hydrogen ____ %

Oxygen ____ %

mass of Carbon = 18 mol (12.0 g/mol) = 216 g C

mass of hydrogen = 32 mol (1.0 g/mol) = 32 g H

mass of oxygen = 2 mol (16.0 g/mol) = 32 g H

% C = $\frac{216}{280} \times 100 = 77.1$

% H = $\frac{32}{280} \times 100 = 11.4\%$

% O = $\frac{32}{280} \times 100 = 11.4\%$