

Mole Calculations - Answers

1. Determine the molar mass of the following compounds:

- a) nitrogen monoxide NO 30.0061 g/mol f) calcium hydroxide Ca(OH)_2 74.09468 g/mol
 b) ammonia NH_3 17.03052 g/mol g) ferric chloride FeCl_3 162.206 g/mol
 c) ammonium phosphate $(\text{NH}_4)_3\text{PO}_4$ 149.08674 g/mol h) silver nitrate AgNO_3 169.8731 g/mol
 d) aluminum nitrate $\text{Al(NO}_3)_3$ 212.99624 g/mol i) magnesium glutamate $\text{Mg}(\text{C}_5\text{H}_8\text{NO}_4)_2$ 316.55064 g/mol
 e) tin(II) oxalate SnC_2O_4 206.7296 g/mol

2. Calculate the mass of:

a) 1.00 mol of ammonium chloride
 $\text{NH}_4\text{Cl} \quad (1.00 \text{ mol})(53.49146 \text{ g/mol})$
 $= 53.5 \text{ g}$

f) 4.50 mol of carbon dioxide
 $\text{CO}_2 \quad (4.50 \text{ mol})(44.0098 \text{ g/mol})$
 $= 198 \text{ g}$

b) 3.50 mol of phosphorus trichloride
 $\text{PCl}_3 \quad (3.50 \text{ mol})(137.33276 \text{ g/mol})$
 $= 481 \text{ g}$

g) 1.00×10^{-3} mol of sodium hydroxide
 $\text{NaOH} \quad (1.00 \times 10^{-3} \text{ mol})(39.99711 \text{ g/mol})$
 $= 0.0400 \text{ g}$

c) 1.70×10^{-24} mol of iron
 $\text{Fe} \quad (1.70 \times 10^{-24} \text{ mol})(55.847 \text{ g/mol})$
 $= 9.49 \times 10^{-23} \text{ g}$

h) 2.65 mol of plumbic nitrate
 $\text{Pb(NO}_3)_4 \quad (2.65 \text{ mol})(455.2196 \text{ g/mol})$
 $= 1210 \text{ g}$

d) 3.25×10^2 mol of sodium hydrogen phosphate
 $\text{Na}_2\text{HPO}_4 \quad (3.25 \times 10^2 \text{ mol})(141.9613 \text{ g/mol})$
 $= 4.61 \times 10^4 \text{ g}$

i) 7.91×10^{-4} mol of sulphurous acid
 $\text{H}_2\text{SO}_3 \quad (7.91 \times 10^{-4} \text{ mol})(82.08008 \text{ g/mol})$
 $= 0.0649 \text{ g}$

e) 0.0035 mol of ammonia
 $\text{NH}_3 \quad (0.0035 \text{ mol})(17.03052 \text{ g/mol})$
 $= 0.060 \text{ g}$
 or $6.0 \times 10^{-2} \text{ g}$

j) 0.0125 mol of sodium tartrate
 $\text{Na}_2\text{C}_4\text{H}_4\text{O}_6 \quad (0.0125 \text{ mol})(194.0517 \text{ g/mol})$
 $= 2.43 \text{ g}$

3. How many moles of the following substances are contained in:

a) 17.0 g of sulfuric acid

$$\begin{aligned} \text{H}_2\text{SO}_4 & \quad \frac{17.0 \text{ g}}{98.07948 \text{ g/mol}} \\ & = 0.173 \text{ mol} \end{aligned}$$

f) 10.6 L of sulfur dioxide gas at STP

$$\begin{aligned} \text{SO}_2 & \quad \frac{10.6 \text{ L}}{22.4 \text{ L/mol}} \\ & = 0.473 \text{ mol} \end{aligned}$$

b) 4.00×10^{12} molecules of ferric oxide

$$\begin{aligned} \text{Fe}_2\text{O}_3 & \quad \frac{4.00 \times 10^{12} \text{ molecules}}{6.022 \times 10^{23} \text{ molecules/mol}} \\ & = 6.64 \times 10^{-12} \text{ mol} \end{aligned}$$

g) 0.120 L of nitrogen dioxide gas at STP

$$\begin{aligned} \text{NO}_2 & \quad \frac{0.120 \text{ L}}{22.4 \text{ L/mol}} \\ & = 0.00536 \text{ mol} \end{aligned}$$

c) 91.0 g of water

$$\begin{aligned} \text{H}_2\text{O} & \quad \frac{91.0 \text{ g}}{18.01528 \text{ g/mol}} \\ & = 5.05 \text{ mol} \end{aligned}$$

h) 53.0 g of carbon

$$\begin{aligned} \text{C} & \quad \frac{53.0 \text{ g}}{12.011 \text{ g/mol}} = 4.41 \text{ mol} \end{aligned}$$

d) 175 mL of chlorine gas at STP

$$\begin{aligned} \text{Cl}_2 & \quad \frac{0.175 \text{ L}}{22.4 \text{ L/mol}} \\ & = 0.00781 \text{ mol} \end{aligned}$$

i) 7.50×10^{21} molecules of nitric acid

$$\begin{aligned} \text{HNO}_3 & \quad \frac{7.50 \times 10^{21} \text{ molecules}}{6.022 \times 10^{23} \text{ molecules/mol}} \\ & = 0.0125 \text{ mol} \end{aligned}$$

e) 5.50×10^{25} molecules of carbon tetrachloride

$$\begin{aligned} \text{CCl}_4 & \quad \frac{5.50 \times 10^{25} \text{ molecules}}{6.022 \times 10^{23} \text{ molecules/mol}} \\ & = 91.3 \text{ mol} \end{aligned}$$

j) 25.0 mL of nitrogen gas at STP

$$\begin{aligned} \text{N}_2 & \quad \frac{0.0250 \text{ L}}{22.4 \text{ L/mol}} \\ & = 0.00112 \text{ mol} \end{aligned}$$

4. Calculate the mass, in grams, of:

a) 2.00×10^6 molecules of carbon monoxide

$$\text{CO} \left(\frac{2.00 \times 10^6 \text{ molecules}}{6.022 \times 10^{23}} \right) (28.0104 \text{ g/mol})$$

$$= 9.30 \times 10^{-17} \text{ g}$$

g) 1 atom of gold

$$\text{Au} \left(\frac{1}{6.022 \times 10^{23}} \right) (196.9665 \text{ g/mol})$$

$$= 3.271 \times 10^{-22} \text{ g}$$

b) 1.25 L of ammonia gas at STP

$$\text{NH}_3 \left(\frac{1.25 \text{ L}}{22.4 \text{ L/mol}} \right) (17.03052 \text{ g/mol})$$

$$= 0.950 \text{ g}$$

h) 7 molecules of nitrogen

$$\text{N}_2 \left(\frac{7}{6.022 \times 10^{23}} \right) (28.0134 \text{ g/mol})$$

$$= 3.256 \times 10^{-22} \text{ g}$$

c) 5.00 molecules of nitrogen gas at STP

$$\text{N}_2 \left(\frac{5.00 \text{ molecules}}{6.022 \times 10^{23}} \right) (28.0134 \text{ g/mol})$$

$$= 2.33 \times 10^{-22} \text{ g}$$

i) 3.45 mL of oxygen at STP

$$\text{O}_2 \left(\frac{0.00345 \text{ L}}{22.4 \text{ L/mol}} \right) (31.9988 \text{ g/mol})$$

$$= 0.00493 \text{ g}$$

d) ~~16~~ 3.41×10^{20} atoms silver

$$\left(\frac{3.41 \times 10^{20}}{6.022 \times 10^{23}} \right) (107.8682 \text{ g/mol})$$

$$= ~~17.66 \times 10^{-23} \text{ g}~~ \underline{0.0611 \text{ g}}$$

j) 20 atoms of helium

$$\left(\frac{20}{6.022 \times 10^{23}} \right) (4.00260 \text{ g/mol})$$

$$= 1.329 \times 10^{-22} \text{ g}$$

e) 5.50×10^{-6} mol of water

$$\text{H}_2\text{O} (5.50 \times 10^{-6} \text{ mol}) (18.01528 \text{ g/mol})$$

$$= 9.91 \times 10^{-5} \text{ g}$$

k) 1.00×10^8 L of hydrogen at STP

$$\text{H}_2 \left(\frac{1.00 \times 10^8 \text{ L}}{22.4 \text{ L/mol}} \right) (2.01588 \text{ g/mol})$$

$$= 9.00 \times 10^6 \text{ g}$$

f) 4.15×10^{15} molecules of dinitrogen tetroxide

$$\text{N}_2\text{O}_4 \left(\frac{4.15 \times 10^{15} \text{ molecules}}{6.022 \times 10^{23} \text{ molecules/mol}} \right) (92.011 \text{ g/mol})$$

$$= 6.34 \times 10^{-7} \text{ g}$$

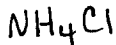
l) 5.91 mol of potassium oxalate $\text{K}_2\text{C}_2\text{O}_7$

$$(5.91 \text{ mol}) (150.2168 \text{ g/mol})$$

$$= 888 \text{ g}$$

5. Determine the number of atoms contained in:

a) 1.00 mol of ammonium chloride



$$(1.00 \text{ mol}) (6.022 \times 10^{23}) (6) \\ = 3.61 \times 10^{24} \text{ atoms}$$

b) 8.00 g of iron

Fe

$$\left(\frac{8.00 \text{ g}}{55.847 \text{ g/mol}} \right) (6.022 \times 10^{23}) \\ = 8.63 \times 10^{22} \text{ atoms}$$

c) 12.0 g of hydrogen peroxide



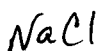
$$\left(\frac{12.0 \text{ g}}{34.014 \text{ g/mol}} \right) (6.022 \times 10^{23}) (4) \\ = 8.50 \times 10^{23} \text{ atoms}$$

d) 55.0 mL of dinitrogen monoxide gas at STP



$$\left(\frac{0.0550 \text{ L}}{22.4 \text{ L/mol}} \right) (6.022 \times 10^{23}) (3) \\ = 4.44 \times 10^{21} \text{ atoms}$$

e) 5.00 g of sodium chloride



$$\left(\frac{5.00 \text{ g}}{58.442 \text{ g/mol}} \right) (6.022 \times 10^{23}) (2) \\ = 1.03 \times 10^{23} \text{ atoms}$$

f) 8.30×10^{-7} mL of boron trifluoride gas at STP



$$\left(\frac{8.30 \times 10^{-7} \text{ L}}{22.4 \text{ L/mol}} \right) (6.022 \times 10^{23}) (4) \\ = 8.93 \times 10^{16} \text{ atoms}$$

g) 2.50 mol of oxygen O_2

$$(2.50 \text{ mol}) (6.022 \times 10^{23}) (2) \\ = 3.01 \times 10^{24} \text{ atoms}$$

h) 15.0 L of argon at STP Ar

$$\left(\frac{15.0 \text{ L}}{22.4 \text{ L/mol}} \right) (6.022 \times 10^{23}) (1) \\ = 4.03 \times 10^{23} \text{ atoms}$$

i) 2.50×10^{-4} mol of phosphoric acid H_3PO_4

~~$$(2.50 \times 10^{-4}) (6.022 \times 10^{23}) (8) \\ = 1.20 \times 10^{21} \text{ atoms}$$~~

I) 40.0 g of potassium K

$$\left(\frac{40.0 \text{ g}}{39.0983 \text{ g/mol}} \right) (6.022 \times 10^{23}) \\ = 6.16 \times 10^{23} \text{ atoms}$$

J) 100.0 g of ammonium citrate $(\text{NH}_4)_3\text{C}_6\text{H}_5\text{O}_7$

$$\left(\frac{100.0 \text{ g}}{243.21688 \text{ g/mol}} \right) (6.022 \times 10^{23}) (33) \\ = 8.17 \times 10^{24} \text{ atoms}$$

K) 15.0 g of potassium dichromate $\text{K}_2\text{Cr}_2\text{O}_7$

$$\left(\frac{15.0 \text{ g}}{294.1844 \text{ g/mol}} \right) (6.022 \times 10^{23}) (11) \\ = 3.38 \times 10^{23} \text{ atoms}$$

6. What volume at STP is occupied by the following gases:

O_3

a) 0.235 mol of ozone

$$(0.235 \text{ mol})(22.4 \text{ L/mol}) = 5.26 \text{ L}$$

e) 9.36 mol of helium He

$$(9.36 \text{ mol})(22.4 \text{ L/mol}) = \cancel{209} \text{ L} = 210. \text{ L}$$

SO_2

b) 16.5 g of sulfur dioxide

$$\left(\frac{16.5 \text{ g}}{64.0648 \text{ g/mol}} \right) (22.4 \text{ L/mol}) = 5.77 \text{ L}$$

f) 6.98×10^{15} atoms of xenon Xe

$$\left(\frac{6.98 \times 10^{15}}{6.022 \times 10^{23}} \right) (22.4 \text{ L/mol}) = 2.60 \times 10^{-7} \text{ L}$$

H_2Te

d) 28.4 mg of hydrogen telluride

$$\left(\frac{0.0284 \text{ g}}{129.61588 \text{ g/mol}} \right) (22.4 \text{ L/mol}) = 0.00491 \text{ L} = 4.91 \text{ mL}$$

g) 5.65×10^{22} molecules of ammonia NH_3

$$\left(\frac{5.65 \times 10^{22}}{6.022 \times 10^{23}} \right) (22.4 \text{ L/mol}) = 2.10 \text{ L}$$

HCl

d) 8.65×10^{21} molecules of hydrogen chloride

$$\left(\frac{8.65 \times 10^{21}}{6.022 \times 10^{23}} \right) (22.4 \text{ L/mol}) = 0.322 \text{ L}$$

h) 15.7 g of chlorine Cl_2

$$\left(\frac{15.7 \text{ g}}{70.906 \text{ g/mol}} \right) (22.4 \text{ L/mol}) = 4.96 \text{ L}$$

7. Calculate the percentage composition of each compound listed below.

a) potassium nitrate KNO_3

$$\% K = \frac{39.0983}{\cancel{85.1038} + 39.0983} = \frac{39.0983}{124.2021} = 31.48\%$$

$$= \cancel{31.48\%} K = 45.94\% K$$

$$\% N = \frac{14.0067}{\cancel{85.1038} + 14.0067} = \frac{14.0067}{99.1105} = 14.13\%$$

$$= \cancel{14.13\%} N = 11.46\% N$$

$$\% O = \frac{3(15.9994)}{\cancel{85.1038} + 3(15.9994)} = \frac{47.9982}{133.092} = 36.07\%$$

$$= \cancel{36.07\%} O = 37.60\% O$$

7. Calculate the percentage composition of each compound (listed below).

b) ammonium sulfate $(\text{NH}_4)_2 \text{SO}_4$

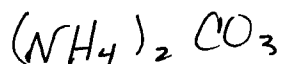
$$\begin{aligned} \% \text{N} &= \frac{2(14.0067)}{132.14052} & \% \text{H} &= \frac{8(1.00794)}{132.14052} & \% \text{S} &= \frac{32.066}{132.14052} & \% \text{O} &= \frac{4(15.9994)}{132.14052} \\ &= 21.20 \% \text{N} & &= 6.10 \% \text{H} & &= 24.27 \% \text{S} & &= 48.43 \% \text{O} \end{aligned}$$

c) calcium phosphate



$$\begin{aligned} \% \text{Ca} &= \frac{3(40.08)}{310.18272} & \% \text{P} &= \frac{2(30.97376)}{310.18272} & \% \text{O} &= \frac{8(15.9994)}{310.18272} \\ &= 38.76 \% \text{Ca} & &= 19.92 \% \text{P} & &= 41.26 \% \text{O} \end{aligned}$$

d) ammonium carbonate



$$\begin{aligned} \% \text{N} &= \frac{2(14.0067)}{96.08612} & \% \text{H} &= \frac{8(1.00794)}{96.08612} & \% \text{C} &= \frac{12.011}{96.08612} & \% \text{O} &= \frac{3(15.9994)}{96.08612} \\ &= 29.15 \% \text{N} & &= 8.39 \% \text{H} & &= 12.50 \% \text{C} & &= 49.95 \% \text{O} \end{aligned}$$

7. Calculate the percentage composition of each compound (listed below).

e) aluminum nitrate $\text{Al}(\text{NO}_3)_3$

$$\% \text{Al} = \frac{26.98154}{212.99624}$$

$$= 12.67 \% \text{Al}$$

$$\% \text{N} = \frac{3(14.0067)}{212.99624}$$

$$= 19.73 \% \text{N}$$

$$\% \text{O} = \frac{9(15.9994)}{212.99624}$$

$$= 67.60 \% \text{O}$$

f) calcium acetate $\text{Ca}(\text{C}_2\text{H}_3\text{O}_2)_2$

$$\% \text{Ca} = \frac{40.08}{158.16924}$$

$$= 25.34 \% \text{Ca}$$

$$\% \text{C} = \frac{4(12.011)}{158.16924}$$

$$= 30.38 \% \text{C}$$

$$\% \text{H} = \frac{6(1.00794)}{158.16924}$$

$$= 3.82 \% \text{H}$$

$$\% \text{O} = \frac{4(15.9994)}{158.16924}$$

$$= 40.46 \% \text{O}$$

8. Determine the empirical formula for each compound (listed below).

a) 80.0% carbon; 20.0% hydrogen

$$\frac{80.0 \text{ g C}}{12.011}$$

$$\frac{6.66056}{6.66056}$$

1

$$\frac{20.0 \text{ g H}}{1.00794}$$

$$\frac{19.84245}{6.66056}$$

: 2.979

$\Rightarrow 1:3 \Rightarrow \text{CH}_3$

8. Determine the empirical formula for each compound listed below.

b) 35.0% nitrogen; 5.0% hydrogen; 60.0% oxygen

$$\begin{array}{ccc}
 \frac{35.0 \text{ g N}}{14.0067 \text{ g/mol}} & \frac{5.0 \text{ g H}}{1.00794 \text{ g/mol}} & \frac{60.0 \text{ g O}}{15.9994 \text{ g/mol}} \\
 \hline
 2.498804 \text{ mol} & 4.966613 \text{ mol} & 3.750141 \text{ mol} \\
 2.498804 & 2.498804 & 2.498804 \\
 \hline
 1.00 & 1.985 & 1.50 \\
 \begin{array}{l} (\times 2) \\ \Rightarrow \end{array} & (\times 2) & (\times 2) \\
 \hline
 2 : 4 : 3 & &
 \end{array}$$

$\text{N}_2\text{H}_4\text{O}_3$

c) 83.7% carbon; 16.3% hydrogen

$$\begin{array}{ccc}
 \frac{83.7 \text{ g C}}{12.011 \text{ g/mol}} & \frac{16.3 \text{ g H}}{1.00794 \text{ g/mol}} & \\
 \hline
 6.968612 \text{ mol} & 16.171598 \text{ mol} & \\
 6.968612 & 6.968612 & \\
 \hline
 1 & 2.320634 & \\
 (\times 3) & (\times 3) & \\
 \hline
 3 : 6.962 & & \\
 3 : 7 & &
 \end{array}$$

C_3H_7

d) 26.6% potassium; 35.4% chromium; 38.0% oxygen

$$\begin{array}{ccc}
 \frac{26.6 \text{ g K}}{39.0983 \text{ g/mol}} & \frac{35.4 \text{ g Cr}}{51.996 \text{ g/mol}} & \frac{38.0 \text{ g O}}{15.9994 \text{ g/mol}} \\
 \hline
 0.680336 \text{ mol} & 0.680822 \text{ mol} & 2.375089 \text{ mol} \\
 0.680336 & 0.680336 & 0.680336 \\
 \hline
 1 & 1.0007 & 3.491 \\
 (\times 2) & (\times 2) & (\times 2) \\
 \hline
 2 : 2 : 7 & &
 \end{array}$$

$\text{K}_2\text{Cr}_2\text{O}_7$

8. Determine the empirical formula for each compound listed below.

e) 21.2% nitrogen; 6.1% hydrogen; 24.3% sulfur; 48.4% oxygen

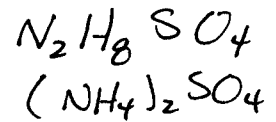
X

$$\begin{array}{cccc} \frac{21.2 \text{ g N}}{14.0067} & \frac{6.1 \text{ g H}}{1.00794} & \frac{24.3 \text{ S}}{32.066} & \frac{48.4 \text{ g O}}{15.9994} \end{array}$$

$$\begin{array}{cccc} \frac{1.513561}{0.757812} & \frac{6.051948}{0.757812} & \frac{0.757812}{0.757812} & \frac{3.025113}{0.757812} \end{array}$$

$$1.997 \quad 7.99 \quad : \quad 1 \quad : \quad 3.99$$

$$\Rightarrow 2 : 8 : 1 : 4$$



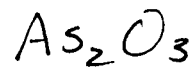
f) An oxide of arsenic which contains 3.26 g of arsenic and 1.04 g of oxygen.

X

$$\begin{array}{cc} \frac{3.26 \text{ g As}}{74.9216 \text{ g/mol}} & \frac{1.04 \text{ g O}}{15.9994 \text{ g/mol}} \\ \frac{0.043512 \text{ mol}}{0.043512} & \frac{0.065002 \text{ mol}}{0.043512} \end{array}$$

$$\begin{array}{cc} 1 & 1.49 \\ (\times 2) & (\times 2) \end{array}$$

$$2 : 3$$



g) Chemical analysis of a 10.000 g of oil of wintergreen shows that it consists of 6.320 g of carbon, 0.530 g of hydrogen, and 3.16 g of oxygen. What is the simplest formula for oil of wintergreen?

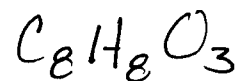
e

$$\begin{array}{ccc} \frac{6.320 \text{ g C}}{12.011} & \frac{0.530 \text{ g H}}{1.00794} & \frac{3.16 \text{ g O}}{15.9994} \\ \frac{0.526184}{0.197507} & \frac{0.525225}{0.197507} & \frac{0.197507}{0.197507} \end{array}$$

$$\begin{array}{ccc} 2.664123 & 2.662305 & 1 \\ (\times 3) & (\times 3) & (\times 3) \end{array}$$

$$7.992 \quad 7.987 \quad : \quad 3$$

$$8 : 8 : 3$$



8. Determine the empirical formula for each compound listed below.

a) A rock sample weighing 5.88×10^{-4} g is known to contain calcium, phosphorus, and oxygen. The amount of the first two elements in this rock is found to be 2.28×10^{-4} g and 1.18×10^{-4} g respectively. What is the empirical formula for the compound in this rock sample?

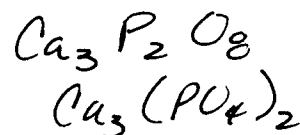
f

$$\frac{2.28 \times 10^{-4} \text{ g Ca}}{40.08 \text{ g/mol}} \quad \frac{1.18 \times 10^{-4} \text{ g P}}{30.97376 \text{ g/mol}} \quad \frac{2.42 \times 10^{-4} \text{ g O}}{15.9994}$$

$$\frac{5.688623 \times 10^{-6}}{3.809676 \times 10^{-6}} \quad \frac{3.809676 \times 10^{-6}}{3.809676 \times 10^{-6}} \quad \frac{1.512557 \times 10^{-5} \text{ mol}}{3.809676 \times 10^{-6}}$$

$$1.49 (\times 2) : 1 (\times 2) : 3.97 (\times 2)$$

$$3 : 2 : 8$$

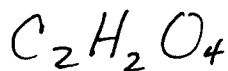


9. Calculate the molecular formula for the following compounds.

a) 26.7% carbon; 2.2% hydrogen; 71.1% oxygen; molar mass - 90.0 g/mol

$$\frac{24.03 \text{ g C}}{12.011} \quad \frac{1.98 \text{ g H}}{1.00794} \quad \frac{63.99 \text{ g O}}{15.9994}$$

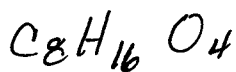
$$2.00 \text{ mol C} \quad 1.96 \text{ mol H} \quad 4.00 \text{ mol O}$$



b) 54.6% carbon; 9.0% hydrogen; 36.4% oxygen; molar mass - 176 g/mol

$$\frac{96.096 \text{ g C}}{12.011} \quad \frac{15.84 \text{ g H}}{1.00794} \quad \frac{64.064 \text{ g O}}{15.9994}$$

$$8.00 \text{ mol C} \quad 15.72 \text{ mol H} \quad 4.004 \text{ mol O}$$



9. Calculate the molecular formula for the following compounds.

c) Analysis of a compound shows that it consists of 24.3% carbon, 4.1% hydrogen, and 71.6% chlorine. The molecular mass of the compound is determined to be ~~99.8~~ ^{99.8} g/mol. What molecular formula corresponds to these data?

$$\frac{24.2514 \text{ g C}}{12.011}$$

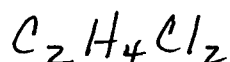
$$\frac{4.0918 \text{ g H}}{1.00794}$$

$$\frac{71.4568 \text{ g Cl}}{35.453 \text{ g/mol}}$$

$$2.019 \text{ mol C}$$

$$4.059 \text{ mol H}$$

$$2.016 \text{ mol Cl}$$



d) Chemical analysis of a gaseous compound shows its composition to be 36.4% carbon, 57.5% fluorine, and 6.1% hydrogen. A sample of 1.00 L of this gas has a mass of 2.96 g. What molecular formula do these data suggest for this compound?

$$\frac{2.96 \text{ g}}{1.00 \text{ L}} = \frac{x}{22.4 \text{ L}} = 66.304 \text{ g/mol}$$

$$\frac{24.135 \text{ g C}}{12.011}$$

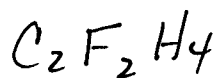
$$\frac{38.1248 \text{ g F}}{18.998403}$$

$$\frac{4.044544 \text{ g H}}{1.00794}$$

$$2.009 \text{ mol C}$$

$$2.007 \text{ mol F}$$

$$4.013 \text{ mol H}$$



9. Calculate the molecular formula for the following compounds.

e) Analysis of an organic compound indicates that it has a percentage composition as follows: 40.7% carbon; 5.0% hydrogen; 54.3% oxygen. When this compound is vapourized, 35.0 mL of the vapour has a mass of 0.184 g. What molecular formula do you predict for this compound?

$$\frac{0.0350 \text{ L}}{0.184 \text{ g}} = \frac{22.4 \text{ L}}{x} \quad x = 117.76 \text{ g/mol}$$

$$\frac{47.92832 \text{ g C}}{12.011}$$

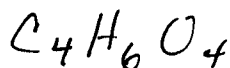
$$3.99 \text{ mol C}$$

$$\frac{5.888 \text{ g H}}{1.00794}$$

$$5.84 \text{ mol H}$$

$$\frac{63.94368 \text{ g O}}{15.9994}$$

$$4.00 \text{ mol O}$$



f) A gaseous compound is found to have the following composition: 30.5% nitrogen and 69.5% oxygen. The molar mass of the gas is found to be 91.8 g/mol. What is the molecular formula of this gas?

$$\frac{27.999 \text{ g N}}{14.0067}$$

$$1.999 \text{ mol N}$$

$$\frac{63.801 \text{ g O}}{15.9994}$$

$$3.99 \text{ mol O}$$

