

Unit 4 Quiz – The Mole Concept

(no camera 5th)

I affirm that all work on this quiz is the result of my own effort and I did not give or accept help from another person in my class or another honors chemistry class.

Signature and date

Key

1. How many chlorine atoms are in 9.6 moles CCl_4 ?

$$\frac{9.6 \text{ mol } \text{CCl}_4}{1} \times \frac{6.02 \times 10^{23} \text{ molecules } \text{CCl}_4}{1 \text{ mole } \text{CCl}_4} \times \frac{4 \text{ atoms Cl}}{1 \text{ molecule } \text{CCl}_4} = 2.3 \times 10^{25} \text{ atoms Cl}$$

2. What is the mass in grams of 6.9×10^{21} molecules of dinitrogen pentoxide?

$$\frac{6.9 \times 10^{21} \text{ molecules } \text{N}_2\text{O}_5}{1} \times \frac{1 \text{ mole } \text{N}_2\text{O}_5}{6.02 \times 10^{23} \text{ molecules } \text{N}_2\text{O}_5} \times \frac{108.02 \text{ g } \text{N}_2\text{O}_5}{1 \text{ mole } \text{N}_2\text{O}_5} = 1.2 \text{ g } \text{N}_2\text{O}_5$$

3. What is the molar mass of aluminum nitrate?

$$\begin{array}{l} \text{Al} (\text{NO}_3)_3 \\ 1 \text{ Al} \times 26.98 = 26.98 \\ 3 \text{ N} \times 14.01 = 42.03 \\ 9 \text{ O} \times 16.00 = 144.00 \end{array} \left. \vphantom{\begin{array}{l} \text{Al} (\text{NO}_3)_3 \\ 1 \text{ Al} \times 26.98 = 26.98 \\ 3 \text{ N} \times 14.01 = 42.03 \\ 9 \text{ O} \times 16.00 = 144.00 \end{array}} \right\} 213.01 \text{ g}$$

4. How many molecules of carbon dioxide gas are in a tank if the gas in the tank

has a mass of 550.0 g?

$$\frac{550.0 \text{ g } \text{CO}_2}{1} \times \frac{1 \text{ mole } \text{CO}_2}{44.01 \text{ g } \text{CO}_2} \times \frac{6.02 \times 10^{23} \text{ molecules } \text{CO}_2}{1 \text{ mole } \text{CO}_2} = 7.52 \times 10^{24} \text{ molecules } \text{CO}_2$$

5. A. What is the percent of chlorine in magnesium chloride?

B. How many grams of chlorine are in 30.0 g of magnesium chloride?

$$\begin{array}{l} \text{A) } \text{MgCl}_2 \\ 1 \text{ Mg} \times 24.30 = 24.30 \\ 2 \text{ Cl} \times 35.45 = 70.90 \\ \hline 95.20 \end{array}$$

$$\% \text{ Cl} = \frac{70.90}{95.20} \times 100 = 74.5 \% \text{ Cl}$$

$$\text{B) } 30.0 \text{ g} \times 0.745 = 22.4 \text{ g Cl}$$

forgot to give bonus!

Key

27 poss. pts.

Unit 4 Quiz – The Mole Concept

5th period

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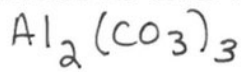
(5) 1. How many phosphorus atoms are in 2.6 moles P_2O_7 ?

$$\frac{2.6 \text{ mole } P_2O_7}{1} \times \frac{6.02 \times 10^{23} \text{ molecules } P_2O_7}{1 \text{ mole } P_2O_7} \times \frac{2 \text{ atoms P}}{1 \text{ molecule } P_2O_7} = 3.1 \times 10^{24} \text{ atoms P}$$

(6) 2. What is the mass in grams of 9.1×10^{21} molecules of nitrogen trioxide?

$$\frac{9.1 \times 10^{21} \text{ molecules } NO_3}{1} \times \frac{1 \text{ mole } NO_3}{6.02 \times 10^{23} \text{ molecules } NO_3} \times \frac{62.01 \text{ g } NO_3}{1 \text{ mole } NO_3} = .94 \text{ g } NO_3$$

(5) 3. What is the molar mass of aluminum carbonate?



$2Al \times 26.98 = 53.96$

$3C \times 12.01 = 36.03$

$9O \times 16.00 = 144.00$

233.99 g

-1 if wrong formula



(5) 4. How many molecules of ammonia gas (NH_3) are in a tank if the gas in the tank has a mass of 250.0 g?

$$\frac{250.0 \text{ g } NH_3}{1} \times \frac{1 \text{ mole } NH_3}{17.04 \text{ g } NH_3} \times \frac{6.02 \times 10^{23} \text{ molecules } NH_3}{1 \text{ mole } NH_3} = 8.83 \times 10^{24} \text{ molecules } NH_3$$

by mass!

(4) 5. A. What is the percent of carbon in carbon tetrafluoride?



$$1\text{C} \times 12.01 = 12.01$$

$$4\text{F} \times 19.00 = 76.00$$

$$\frac{12.01\text{g}}{88.01\text{g/mole}}$$

$$\frac{12.01\text{g}}{88.01\text{g}} \times 100 =$$

$$13.65\% \text{C}$$

(2) B. How many grams of carbon are in 250.0 g of carbon tetrafluoride?

$$250.0\text{g} \times 0.1365 = 34.13\text{g C}$$

+5

Bonus

What is the mass (in grams) of one molecule of carbon dioxide?

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$$\frac{1 \text{ molecule } \text{CO}_2}{1} \times \frac{1 \text{ mole } \text{CO}_2}{6.02 \times 10^{23} \text{ molecules } \text{CO}_2} \times \frac{44.01 \text{ g } \text{CO}_2}{1 \text{ mole } \text{CO}_2} = 7.31 \times 10^{-23} \text{ g } \text{CO}_2$$

Key

27 possible points

Unit 4 Quiz – The Mole Concept

1st period

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- (6) 1. What is the mass in grams of 9.1×10^{21} molecules of carbon dioxide?

$$\frac{9.1 \times 10^{21} \text{ molecules CO}_2}{1} \times \frac{1 \text{ mole CO}_2}{6.02 \times 10^{23} \text{ molecules CO}_2} \times \frac{44.01 \text{ g CO}_2}{1 \text{ mole CO}_2} = 0.66526 \text{ g CO}_2 \approx \boxed{.67 \text{ g CO}_2}$$

- (5) 2. How many nitrogen atoms are in 2.6 moles N_2O_5 ?

$$\frac{2.6 \text{ mole N}_2\text{O}_5}{1} \times \frac{6.02 \times 10^{23} \text{ molecules N}_2\text{O}_5}{1 \text{ mole N}_2\text{O}_5} \times \frac{2 \text{ atoms N}}{1 \text{ molecule N}_2\text{O}_5} = \boxed{3.1 \times 10^{24} \text{ atoms N}}$$

- (5) 3. What is the molar mass of calcium phosphate?

$$\text{Ca}_3(\text{PO}_4)_2 \quad \left. \begin{array}{l} 3 \text{ Ca} \times 40.08 = 120.24 \\ 2 \text{ P} \times 30.97 = 61.94 \\ 8 \text{ O} \times 16.00 = 128.00 \end{array} \right\} \boxed{310.18 \text{ g}}$$

- (4) 4. A. What is the percent of carbon in carbon

tetrachloride?

$$\text{CCl}_4 \quad \left. \begin{array}{l} 1 \text{ C} \times 12.01 = 12.01 \\ 4 \text{ Cl} \times 35.45 = 141.80 \end{array} \right\} \frac{12.01}{153.81} \times 100 = \boxed{7.808\% \text{ C}}$$

- (2) B. How many grams of carbon are in 250.0 g of carbon tetrachloride?

$$250.0 \times 0.07808 = \boxed{19.52 \text{ g C}}$$

(5) 5. How many water molecules are in a beaker of water

if the water in the beaker has a mass of 250.0 g?

$$\frac{250.0 \text{ g H}_2\text{O}}{1} \times \frac{1 \text{ mol H}_2\text{O}}{18.02 \text{ g H}_2\text{O}} \times \frac{6.02 \times 10^{23} \text{ molecules H}_2\text{O}}{1 \text{ mol H}_2\text{O}} = 8.35 \times 10^{24} \text{ molecules H}_2\text{O}$$

+5 Bonus Q

What is the mass (in grams) of one molecule of NO_2 ?

$$\frac{1 \text{ molecule NO}_2}{1} \times \frac{1 \text{ mole NO}_2}{6.02 \times 10^{23} \text{ molecules NO}_2} \times \frac{46.01 \text{ g NO}_2}{1 \text{ mole NO}_2} = 7.64 \times 10^{-23} \text{ g NO}_2$$

27 POSS points

Amalia L.
Matthew C.
Anna N.

(no camera)

Unit 3 Quiz – The Mole Concept

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Signature and date

Key

(5) 1. How many chlorine atoms are in 3.6 moles PCl_3 ?

$$\frac{3.6 \text{ moles } \text{PCl}_3}{1} \times \frac{6.02 \times 10^{23} \text{ molecules } \text{PCl}_3}{1 \text{ mole } \text{PCl}_3} \times \frac{3 \text{ atoms Cl}}{1 \text{ molecule } \text{PCl}_3} = 6.5 \times 10^{23} \text{ atoms Cl}$$

(6) 2. What is the mass in grams of 1.9×10^{21} molecules of dinitrogen pentoxide?

$$\frac{1.9 \times 10^{21} \text{ molecules } \text{N}_2\text{O}_5}{1} \times \frac{1 \text{ mole } \text{N}_2\text{O}_5}{6.02 \times 10^{23} \text{ molecules } \text{N}_2\text{O}_5} \times \frac{108.02 \text{ g } \text{N}_2\text{O}_5}{1 \text{ mole } \text{N}_2\text{O}_5} = 0.34 \text{ g } \text{N}_2\text{O}_5$$

(5) 3. What is the molar mass of aluminum sulfate?

$$\text{Al}_2(\text{SO}_4)_3 \quad \left. \begin{array}{l} 2 \text{ Al} \times 26.98 = 53.96 \\ 3 \text{ S} \times 32.07 = 96.21 \\ 12 \text{ O} \times 16.00 = 192.00 \end{array} \right\} 342.17 \text{ g}$$

(5) 4. How many molecules of carbon dioxide gas are in a tank if the gas in the tank has a mass of 250.0 g?

$$\frac{250.0 \text{ g } \text{CO}_2}{1} \times \frac{1 \text{ mole } \text{CO}_2}{44.01 \text{ g } \text{CO}_2} \times \frac{6.02 \times 10^{23} \text{ molecules } \text{CO}_2}{1 \text{ mole } \text{CO}_2} = 3.42 \times 10^{24} \text{ molecules } \text{CO}_2$$

(4) 5. A. What is the percent of magnesium in magnesium chloride?

$$\frac{24.31}{95.21} \times 100 = 25.53\%$$

(2) B. How many grams of magnesium are in 50.0 g of magnesium chloride?

A) MgCl_2 $\frac{1 \text{ Mg} \times 24.31 = 24.31}{2 \text{ Cl} \times 35.45 = 70.90}$ $\frac{24.31}{95.21} \text{ g/mol}$ B) $50.0 \text{ g} \times 0.2553 = 12.8 \text{ g Mg}$

Bonus

What is the mass (in grams) of one molecule of SO_2 ?

$$\frac{1 \text{ molecule } \text{SO}_2}{1} \times \frac{1 \text{ mol } \text{SO}_2}{6.02 \times 10^{23} \text{ molecules } \text{SO}_2} \times \frac{64.06 \text{ g } \text{SO}_2}{1 \text{ mol } \text{SO}_2} = 1.06 \times 10^{-22} \text{ g } \text{SO}_2$$