

Mole Calculation Worksheet

- 1) How many moles are in 40.0 grams of water?
- 2) How many grams are in 3.7 moles of Na_2O ?
- 3) How many atoms are in 14 moles of cadmium?
- 4) How many moles are in 4.3×10^{22} molecules of H_3PO_4 ?
- 5) How many molecules are in 48.0 grams of NaOH ?
- 6) How many grams are in 4.63×10^{24} molecules of CCl_4 ?

Solutions

- 1) How many moles are in 40.0 grams of water?

$$40.0 \text{ g H}_2\text{O} \times \frac{1 \text{ mole H}_2\text{O}}{18.01 \text{ g H}_2\text{O}} = 2.22 \text{ mole H}_2\text{O}$$

- 2) How many grams are in 3.7 moles of Na₂O?

$$3.7 \text{ moles Na}_2\text{O} \times \frac{62 \text{ g Na}_2\text{O}}{1 \text{ mole Na}_2\text{O}} = 230 \text{ g Na}_2\text{O}$$

- 3) How many atoms are in 14 moles of cadmium?

$$14 \text{ mole Cd} \times \frac{6.022 \times 10^{23} \text{ atoms Cd}}{1 \text{ mole Cd}} = 8.4 \times 10^{23} \text{ atoms Cd}$$

- 4) How many moles are in 4.3×10^{22} molecules of H₃PO₄?

$$4.3 \times 10^{22} \text{ molecules H}_3\text{PO}_4 \times \frac{1 \text{ mole H}_3\text{PO}_4}{6.022 \times 10^{23} \text{ molecules H}_3\text{PO}_4} = 7.1 \times 10^{-2} \text{ moles H}_3\text{PO}_4$$

- 5) How many molecules are in 48.0 grams of NaOH?

$$48.0 \text{ g NaOH} \times \frac{1 \text{ mole NaOH}}{40 \text{ g NaOH}} \times \frac{6.022 \times 10^{23} \text{ molecules NaOH}}{1 \text{ mole NaOH}} = 7.23 \times 10^{23} \text{ molecules NaOH}$$

- 6) How many grams are in 4.63×10^{24} molecules of CCl₄?

$$4.63 \times 10^{24} \text{ molecules CCl}_4 \times \frac{1 \text{ mole CCl}_4}{6.022 \times 10^{23} \text{ molecules CCl}_4} \times \frac{153.8 \text{ g CCl}_4}{1 \text{ mole CCl}_4} = 1180 \text{ g CCl}_4$$

Mole to Grams, Grams to Moles Conversions Worksheet

What are the molecular weights of the following compounds? (all masses must be to nearest hundredth)

- 1) NaOH
- 2) H₃PO₄
- 3) H₂O
- 4) Mn₂Se₇
- 5) MgCl₂
- 6) (NH₄)₂SO₄

There are three definitions (equalities) of mole. They are:

$$1 \text{ mole} = 6.02 \times 10^{23} \text{ particles}$$

$$1 \text{ mole} = \text{molar mass (could be atomic mass from periodic table or molecular mass)}$$

$$1 \text{ mole} = 22.4 \text{ L of a gas at STP (You do not need to worry about this yet)}$$

Each definition can be written as a set of two conversion factors. They are:

$$1 \text{ mole} = \text{molar mass(g)} \text{ can be written as } \left[\frac{1 \text{ mole}}{\text{molar mass (g)}} \right] \text{ OR } \left[\frac{\text{molar mass (g)}}{1 \text{ mole}} \right]$$

$$1 \text{ mole} = 6.02 \times 10^{23} \text{ particles can be written as } \left[\frac{1 \text{ mole}}{6.02 \times 10^{23}} \right] \text{ OR } \left[\frac{6.02 \times 10^{23}}{1 \text{ mole}} \right]$$

Solve the following:

- 7) How many moles are in 15 grams of lithium? (molar mass of lithium is 6.94 g/mole)

$$\cancel{15 \text{ grams}} \times \frac{1 \text{ mole}}{\cancel{6.94 \text{ grams}}} = 2.1614 \text{ moles lithium} = \boxed{}$$

- 5) How many grams are in 2.4 moles of sulfur? (molar mass of sulfur is 32.07 g/ mole)

$$\cancel{2.4 \text{ moles}} \times \frac{32.07 \text{ grams}}{\cancel{1 \text{ mole}}} = 76.97 \text{ grams sulfur} = \boxed{77 \text{ g Sulfur}}$$

- 3) How many moles are in 22 grams of argon?
- 4) How many grams are in 88.1 moles of magnesium?
- 5) How many moles are in 2.3 grams of phosphorus?

6) **How many grams** are in 11.9 moles of chromium?

7) **How many moles** are in 9.8 grams of calcium?

8) **How many grams** are in 238 moles of arsenic?

7) How many grams are in 4.5 moles of sodium fluoride, NaF?

(molar mass of NaF is $22.99 + 19.00 = 41.99$ g/ mole)

$$4.5 \text{ moles} \times \frac{41.99 \text{ grams}}{1 \text{ mole}} = 188.955 \text{ g NaF} =$$

190 g NaF

10) How many moles are in 98.3 grams of aluminum hydroxide, Al(OH)₃?

(molar mass of Al(OH)₃ is $26.98 + (3 \times 16.00) + (3 \times 1.01) = 78.01$ g/ mole)

$$98.3 \text{ grams} \times \frac{1 \text{ mole}}{78.01 \text{ grams}} = 1.2601 \text{ moles Al(OH)}_3 =$$

1.26 moles Al(OH)₃

11) How many grams are in 0.02 moles of beryllium iodide, BeI₂?

12) How many moles are in 68 grams of copper (II) hydroxide, Cu(OH)₂?

13) How many grams are in 3.3 moles of potassium sulfide, K₂S?

14) How many moles are in 1.2×10^3 grams of ammonia, NH₃?

15) How many grams are in 2.3×10^{-4} moles of calcium phosphate, Ca₃(PO₃)₂?

16) How many moles are in 3.4×10^{-7} grams of silicon dioxide, SiO₂?

Mole Calculation Worksheet – Answer Key

What are the molecular weights of the following compounds?

- 1) NaOH $22.99 + 16.00 + 1.01 = 40.00$ grams/mol 2) H₃PO₄ $3(1.01) + 30.97 + 4(16.00) = 98.00$ grams
3) H₂O $2(1.01) + 16.00 = 18.02$ grams 4) Mn₂Se₇ $2(54.94) + 7(78.96) = 662.60$ grams
5) MgCl₂ = $24.31 + 2(35.45) = 95.21$ grams 6) (NH₄)₂SO₄ $2(14.01) + 8(1.01) + 32.07 + 4(16.00) = 132.17$ grams

Solve the following:

- 1) How many moles are in 15 grams of lithium? 2.161 moles = **2.2 moles**
- 2) How many grams are in 2.4 moles of sulfur? 76.968 g = **77 grams**
- 3) How many moles are in 22 grams of argon? 0.550688 moles = **0.55 moles**
- 4) How many grams are in 88.1 moles of magnesium? 2141.711 grams = **2140 g**
- 5) How many moles are in 2.3 grams of phosphorus? 0.074265 moles = **0.074 moles**
- 6) How many grams are in 11.9 moles of chromium? 618.8 grams = **619 g**
- 7) How many moles are in 9.8 grams of calcium? 0.24451 moles = **0.24 moles**
- 8) How many grams are in 238 moles of arsenic? $17,830.96$ grams = **17,800 g**
- 9) How many grams are in 4.5 moles of sodium fluoride, NaF? 188.955 g NaF = **190 g**
- 10) How many moles are in 98.3 grams of aluminum hydroxide, Al(OH)₃? 1.2601 moles = **1.26 moles**
- 11) How many grams are in 0.02 moles of beryllium iodide, BeI₂? 5.2562 grams = **5 g**
- 12) How many moles are in 68 grams of copper (II) hydroxide, Cu(OH)₂? 0.6969 moles = **0.70 moles**
- 13) How many grams are in 3.3 moles of potassium sulfide, K₂S? 363.891 grams = **360 g**
- 14) How many moles are in 1.2×10^3 grams of ammonia, NH₃? 70.5882 moles = **71 moles**

15) How many grams are in 2.3×10^{-4} moles of calcium phosphate, $\text{Ca}_3(\text{PO}_3)_2$? **$0.06398 \text{ g} =$**
 0.064 g

16) How many moles are in 3.4×10^{-7} grams of silicon dioxide, SiO_2 ? **$5.6582 \times 10^{-9} \text{ mol} = 5.7 \times 10^{-9}$**
 mol