

Name KEK Date _____ Per _____

Mole to Grams, Grams to Moles Conversions Worksheet

To find moles divide molar mass

To find grams multiply molar mass

What are the molecular weights of the following compounds?

- 1) NaOH - 39.997g 2) H₃PO₄ - 97.995g
 3) H₂O - 18.015g 4) Mn₂Se₇ - 662.596g
 5) MgCl₂ - 95.210g 6) (NH₄)₂SO₄ - 128.109g

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

1 mole = 6.02×10^{23} particles

1 mole = molar mass (could be atomic mass from periodic table or molecular mass)

1 mole = 22.4 L of a gas at STP

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

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

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

Solve the following:

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

$\frac{15 \text{ grams}}{7 \text{ grams}} \times \frac{1 \text{ mole}}{1} = 2.14 \text{ moles lithium}$ OR $(15\text{g}/7\text{g} = 2.14\text{moles})$

- 2) How many grams are in 2.4 moles of sulfur? (molar mass of sulfur is 32 g/ mole)

$2.4 \text{ moles} \times \frac{32 \text{ grams}}{1 \text{ mole}} = 76.8 \text{ grams sulfur}$ OR $2.4\text{moles} \times 32 \text{ g} = 77 \text{ g}$

- 3) How many moles are in 22 grams of argon?

$\frac{22 \text{ g Ar}}{1} \times \frac{1 \text{ mol Ar}}{39.948 \text{ g Ar}} = 0.55 \text{ mol Ar}$

- 4) How many grams are in 88.1 moles of magnesium?

$\frac{88.1 \text{ mol Mg}}{1} \times \frac{24.305 \text{ g Mg}}{1 \text{ mol Mg}} = 2.14 \times 10^3 \text{ g Mg}$

- 5) How many moles are in 2.3 grams of phosphorus?

$\frac{2.3 \text{ g P}}{1} \times \frac{1 \text{ mol P}}{30.974 \text{ g P}} = 0.074 \text{ mol} = 7.4 \times 10^{-2} \text{ mol P}$

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

$\frac{11.9 \text{ mol Cr}}{1} \times \frac{51.996 \text{ g Cr}}{1 \text{ mol Cr}} = 618.75 \text{ g Cr} = 619 \text{ g Cr}$

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

$$\frac{9.8 \text{ g Ca}}{1} \times \frac{1 \text{ mol Ca}}{40.078 \text{ g Ca}} = 0.24 \text{ mol Ca}$$

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

$$\frac{238 \text{ mol As}}{1} \times \frac{74.922 \text{ g As}}{1 \text{ mol As}} = 17931.4 \text{ g As}$$

Solve the following:

$$1.78 \times 10^4 \text{ g As}$$

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

(molar mass of NaF is $23 + 19 = 42 \text{ g/mole}$)

$$4.5 \text{ moles} \times \frac{42 \text{ grams}}{1 \text{ mole}} = 189 \text{ grams NaF} \quad \text{OR} \quad 4.5 \text{ moles} \times 42 \text{ g} = 189 \text{ g}$$

10) How many moles are in 98.3 grams of aluminum hydroxide, $\text{Al}(\text{OH})_3$?

(molar mass of $\text{Al}(\text{OH})_3$ is $27 + (3 \times 16) + (3 \times 1) = 78 \text{ g/mole}$)

$$98.3 \text{ grams} \times \frac{1 \text{ mole}}{78 \text{ grams}} = 1.26 \text{ moles Al}(\text{OH})_3 \quad \text{OR} \quad (98.3 \text{ g} / 78 \text{ g} = 1.26 \text{ moles})$$

11) How many grams are in 0.02 moles of beryllium iodide, BeI_2 ?

$$\frac{0.02 \text{ mol BeI}_2}{1} \times \frac{262.821 \text{ g BeI}_2}{1 \text{ mol BeI}_2} = 5.256 \text{ g} = 5 \text{ g BeI}_2$$

12) How many moles are in 68 grams of copper (II) hydroxide, $\text{Cu}(\text{OH})_2$?

$$\frac{68 \text{ g Cu}(\text{OH})_2}{1} \times \frac{1 \text{ mol Cu}(\text{OH})_2}{97.561 \text{ g Cu}(\text{OH})_2} = 0.697 \text{ mol} = 0.70 \text{ mol Cu}(\text{OH})_2$$

13) How many grams are in 3.3 moles of potassium sulfide, K_2S ?

$$\frac{3.3 \text{ mol K}_2\text{S}}{1} \times \frac{110.263 \text{ g K}_2\text{S}}{1 \text{ mol K}_2\text{S}} = 363.9 \text{ g} = 360 \text{ g K}_2\text{S}$$

14) How many moles are in 1.2×10^3 grams of ammonia, NH_3 ?

$$\frac{1.2 \times 10^3 \text{ g NH}_3}{1} \times \frac{1 \text{ mol NH}_3}{17.031 \text{ g NH}_3} = 70.46 \text{ mol} = 70 \text{ mol NH}_3$$

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

$$\frac{2.3 \times 10^4 \text{ mol Ca}_3(\text{PO}_3)_2}{1} \times \frac{278.178 \text{ g Ca}_3(\text{PO}_3)_2}{1 \text{ mol Ca}_3(\text{PO}_3)_2} = 6.4 \times 10^6 \text{ g}$$

16) How many moles are in 3.4×10^7 grams of silicon dioxide, SiO_2 ?

$$\frac{3.4 \times 10^7 \text{ g SiO}_2}{1} \times \frac{1 \text{ mol SiO}_2}{60.0843 \text{ g SiO}_2} = 5.659 \times 10^5 \text{ mol} = 5.7 \times 10^5 \text{ mol SiO}_2$$

17) How many grams are in 1.11 moles of manganese sulfate, $\text{Mn}_3(\text{SO}_4)_7$?

$$\frac{1.11 \text{ mol Mn}_3(\text{SO}_4)_7}{1} \times \frac{837.259 \text{ g Mn}_3(\text{SO}_4)_7}{1 \text{ mol Mn}_3(\text{SO}_4)_7} = 929.36 \text{ g} = 9.29 \times 10^2 \text{ g Mn}_3(\text{SO}_4)_7$$

Grams and Particles Conversion Worksheet

Solve the following:

- 1) How many molecules are there in 24 grams of FeF_3 ? (molar mass of FeF_3 is 113 g/mole)

$$24 \text{ grams} \times \frac{1 \text{ mole}}{113 \text{ grams}} \times \frac{6.02 \times 10^{23} \text{ molecules}}{1 \text{ mole}} = 1.28 \times 10^{23} \text{ molecules}$$

- 2) How many molecules are there in 450 grams of Na_2SO_4 ?

$$\frac{450 \text{ g } \text{Na}_2\text{SO}_4}{1} \times \frac{1 \text{ mol } \text{Na}_2\text{SO}_4}{142.043 \text{ g } \text{Na}_2\text{SO}_4} \times \frac{6.02 \times 10^{23} \text{ molecules } \text{Na}_2\text{SO}_4}{1 \text{ mol } \text{Na}_2\text{SO}_4} = 1.9 \times 10^{24} \text{ molecules } \text{Na}_2\text{SO}_4$$

- 3) How many grams are there in 2.3×10^{24} atoms of silver? (molar mass of Ag is 108g/mole)

$$2.3 \times 10^{24} \text{ atoms} \times \frac{1 \text{ mole}}{6.02 \times 10^{23} \text{ atoms}} \times \frac{108 \text{ grams}}{1 \text{ mole}} = 421 \text{ grams of silver}$$

- 4) How many grams are there in 7.4×10^{23} molecules of AgNO_3 ?

$$\frac{7.4 \times 10^{23} \text{ molecules } \text{AgNO}_3}{1} \times \frac{1 \text{ mol } \text{AgNO}_3}{6.02 \times 10^{23} \text{ molecules } \text{AgNO}_3} \times \frac{169.873 \text{ g } \text{AgNO}_3}{1 \text{ mol } \text{AgNO}_3} = 208.8 \text{ g} = 210 \text{ g } \text{AgNO}_3$$

- 5) How many grams are there in 7.5×10^{23} molecules of H_2SO_4 ?

$$\frac{7.5 \times 10^{23} \text{ molecules } \text{H}_2\text{SO}_4}{1} \times \frac{1 \text{ mol } \text{H}_2\text{SO}_4}{6.02 \times 10^{23} \text{ molecules } \text{H}_2\text{SO}_4} \times \frac{98.079 \text{ g } \text{H}_2\text{SO}_4}{1 \text{ mol } \text{H}_2\text{SO}_4} = 122.2 \text{ g} = 120 \text{ g } \text{H}_2\text{SO}_4$$

- 6) How many molecules are there in 122 grams of $\text{Cu}(\text{NO}_3)_2$?

$$\frac{122 \text{ g } \text{Cu}(\text{NO}_3)_2}{1} \times \frac{1 \text{ mol } \text{Cu}(\text{NO}_3)_2}{187.556 \text{ g } \text{Cu}(\text{NO}_3)_2} \times \frac{6.02 \times 10^{23} \text{ molecules } \text{Cu}(\text{NO}_3)_2}{1 \text{ mol } \text{Cu}(\text{NO}_3)_2} = 3.92 \times 10^{23} \text{ molecules } \text{Cu}(\text{NO}_3)_2$$

- 7) How many grams are there in 9.4×10^{25} molecules of H_2 ?

$$\frac{9.4 \times 10^{25} \text{ molecules } \text{H}_2}{1} \times \frac{1 \text{ mol } \text{H}_2}{6.02 \times 10^{23} \text{ molecules } \text{H}_2} \times \frac{2.016 \text{ g } \text{H}_2}{1 \text{ mol } \text{H}_2} = 314.8 \text{ g} = 310 \text{ g } \text{H}_2$$

- 8) How many molecules are there in 230 grams of CoCl_2 ?

$$\frac{230 \text{ g } \text{CoCl}_2}{1} \times \frac{1 \text{ mol } \text{CoCl}_2}{129.839 \text{ g } \text{CoCl}_2} \times \frac{6.02 \times 10^{23} \text{ molecules } \text{CoCl}_2}{1 \text{ mol } \text{CoCl}_2} = 1.066 \times 10^{24} \text{ molecules}$$

$1.07 \times 10^{24} \text{ molecules } \text{CoCl}_2$

9) How many molecules are there in 2.3 grams of NH_4SO_2 ?

$$\frac{2.3 \text{ g } \text{NH}_4\text{SO}_2}{1} \times \frac{1 \text{ mol } \text{NH}_4\text{SO}_2}{82.103 \text{ g } \text{NH}_4\text{SO}_2} \times \frac{6.02 \times 10^{23} \text{ molecules } \text{NH}_4\text{SO}_2}{1 \text{ mol } \text{NH}_4\text{SO}_2} = 1.686 \times 10^{22} \text{ molecules}$$

$1.7 \times 10^{22} \text{ molecules } \text{NH}_4\text{SO}_2$

10) How many grams are there in 3.3×10^{23} molecules of N_2I_6 ?

$$\frac{3.3 \times 10^{23} \text{ molecules } \text{N}_2\text{I}_6}{1} \times \frac{1 \text{ mol } \text{N}_2\text{I}_6}{6.02 \times 10^{23} \text{ molecules } \text{N}_2\text{I}_6} \times \frac{789.440 \text{ g } \text{N}_2\text{I}_6}{1 \text{ mol } \text{N}_2\text{I}_6} = 432.75 \text{ g}$$

$430 \text{ g } \text{N}_2\text{I}_6$

11) How many molecules are there in 200 grams of CCl_4 ?

$$\frac{200 \text{ g } \text{CCl}_4}{1} \times \frac{1 \text{ mol } \text{CCl}_4}{153.822 \text{ g } \text{CCl}_4} \times \frac{6.02 \times 10^{23} \text{ molecules } \text{CCl}_4}{1 \text{ mol } \text{CCl}_4} = 7.83 \times 10^{23} \text{ molecules } \text{CCl}_4$$

12) How many grams are there in 1×10^{24} molecules of BCl_3 ?

$$\frac{1 \times 10^{24} \text{ molecules } \text{BCl}_3}{1} \times \frac{1 \text{ mol } \text{BCl}_3}{6.02 \times 10^{23} \text{ molecules } \text{BCl}_3} \times \frac{117.17 \text{ g } \text{BCl}_3}{1 \text{ mol } \text{BCl}_3} = 194.6 \text{ g } \text{BCl}_3$$

13) How many grams are there in 4.5×10^{22} molecules of $\text{Ba}(\text{NO}_2)_2$?

$$\frac{4.5 \times 10^{22} \text{ molecules } \text{Ba}(\text{NO}_2)_2}{1} \times \frac{1 \text{ mol } \text{Ba}(\text{NO}_2)_2}{6.02 \times 10^{23} \text{ molecules } \text{Ba}(\text{NO}_2)_2} \times \frac{279.338 \text{ g } \text{Ba}(\text{NO}_2)_2}{1 \text{ mol } \text{Ba}(\text{NO}_2)_2} = 17.1 \text{ g } \text{Ba}(\text{NO}_2)_2$$

14) How many molecules are there in 9.34 grams of LiCl ?

$$\frac{9.34 \text{ g } \text{LiCl}}{1} \times \frac{1 \text{ mol } \text{LiCl}}{42.394 \text{ g } \text{LiCl}} \times \frac{6.02 \times 10^{23} \text{ molecules } \text{LiCl}}{1 \text{ mol } \text{LiCl}} = 1.33 \times 10^{23} \text{ molecules } \text{LiCl}$$

15) How many grams do 4.3×10^{21} molecules of UF_6 weigh?

$$\frac{4.3 \times 10^{21} \text{ molecules } \text{UF}_6}{1} \times \frac{1 \text{ mol } \text{UF}_6}{6.02 \times 10^{23} \text{ molecules } \text{UF}_6} \times \frac{352.019 \text{ g } \text{UF}_6}{1 \text{ mol } \text{UF}_6} = 2.51 \text{ g } \text{UF}_6$$

16) How many molecules are there in 230 grams of NH_4OH ?

$$\frac{230 \text{ g } \text{NH}_4\text{OH}}{1} \times \frac{1 \text{ mol } \text{NH}_4\text{OH}}{35.046 \text{ g } \text{NH}_4\text{OH}} \times \frac{6.02 \times 10^{23} \text{ molecules } \text{NH}_4\text{OH}}{1 \text{ mol } \text{NH}_4\text{OH}} = 3.95 \times 10^{24} \text{ molecules } \text{NH}_4\text{OH}$$