Name_____ Date_____ Per_____

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) $NaOH$
$23 + 16 + 1 = 40\ g/mol$

2) H_3PO_4
$1(3) \quad 30.9 \quad 16(4) = 97.9$

3) H_2O
$1(2) + 16 = 18\ g/mol$

4) Mn_2Se_7
$54.9(2) + 78.9(7) = 662.1\ g/mol$

5) $MgCl_2$
$24 \quad (35)(2) = 94\ g/mol$

6) $(NH_4)_2SO_4$
$14 \quad 1(4) = 28 \quad 32 + 16(4) = 152\ g/mol$
$2 = 56$

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 (**You do not need to worry about this yet**)

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

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

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

Solve the following:

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

15 ~~grams~~ x $\frac{\text{1 mole}}{\text{6.94 ~~grams~~}}$ = 2.1614 moles lithium = 2.2 moles Li

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

2.4 ~~moles~~ x $\frac{\text{32.07 grams}}{\text{1 ~~mole~~}}$ = 76.97 grams sulfur = 77 g Sulfur

3) **How many moles** are in 22 grams of argon? $Ag = 40\ g/mol$

$22\ g \cdot \frac{1\ mol}{40\ g} = 0.55\ mol$

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

$88.1\ g \cdot \frac{1\ mol}{24.3\ g} = 3.62\ mol$

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

$2.3\ g \cdot \frac{1\ mol}{30.97\ g} = 0.074\ mol$

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

$$11.9\,\text{mol} \cdot \frac{51.9\ \text{g}}{1\ \text{mol}} = 576\,\text{g}$$

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

$$9.8\,\text{mol} \cdot \frac{46.0\ \text{grams}}{1\ \text{mol}} = 392 \quad (390\,\text{g})$$

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

$$238\,\text{mol} \cdot \frac{74.9\ \text{g}}{1\ \text{mol}} = 17826\,\text{g} \quad (17800\,\text{g})$$

Solve the following:

9) 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 moles x $\frac{41.99\ \text{grams}}{1\ \text{mole}}$ = 188.955 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 x 16.00) + (3 x 1.01) = 78.01 g/ mole)

98.3 grams x $\frac{1\ \text{mole}}{78.01\ \text{grams}}$ = 1.2601 moles $Al(OH)_3$ = **1.26 moles $Al(OH)_3$**

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

$9 + 126.9(2) = 258.8$

$$0.02\,\text{mol} \cdot \frac{258.8\ \text{g}}{1\ \text{mol}} \quad 5.17\,\text{g} \quad (5.\,\text{g})$$

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

$63.5 + 16+1 = 17$ (×2) $\Rightarrow 97.5$ g/mol

$$68\,\text{g} \cdot \frac{1\ \text{mol}}{97.5\ \text{g}} = 0.697\,\text{mol} \quad (0.70\,\text{mol})$$

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

$39(2) + 32 = 110$ g/mol

$$3.3\,\text{mol} \cdot \frac{110\ \text{g}}{1\ \text{mol}} = 330\,\text{g}$$

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

$14 + 1(3) = 17$ g/mol

$$1.2\text{E}3\,\text{g} \cdot \frac{1\ \text{mol}}{17\ \text{g}} = 70.5\,\text{mol} \quad (71\,\text{mol})$$

15) How many grams are in 2.3×10^{-4} moles of calcium phosphate, $Ca_3(PO_3)_2$?

$(30.9 + 48)(2)$

$40(3) = 120$ } 277.8 g/mol

$$2.3\text{E}{-4}\,\text{mol} \cdot \frac{277\ \text{g}}{1\ \text{mol}} = 0.064\,\text{g}$$

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

32
28.0 } 60 g/mol

$$3.4\text{E}{-7}\,\text{g} \cdot \frac{1\ \text{mol}}{60\ \text{g}} = 6.0\text{E}{-9}\,\text{mol}$$