

## ANSWER KEY

## EXTRA PRACTICE: 3-Step Mole Conversions

Name: \_\_\_\_\_

Solve the following mole conversion problems. Be sure to show your work &amp; include correct units.

## Part I: Particles → Mass

1. How many grams of silver are in
- $6.55 \times 10^{24}$
- atoms of silver?

$$\frac{6.55 \times 10^{24} \text{ atoms Ag}}{1} \times \frac{1 \text{ mol Ag}}{6.02 \times 10^{23} \text{ atoms Ag}} \times \frac{107.87 \text{ g Ag}}{1 \text{ mol Ag}} = 1174 \text{ g Ag}$$

2. How many grams of rubidium chloride are in
- $8.66 \times 10^{26}$
- formula units (f.u.) of rubidium chloride?

$$\frac{8.66 \times 10^{26} \text{ fu RbCl}}{1} \times \frac{1 \text{ mol RbCl}}{6.02 \times 10^{23} \text{ fu RbCl}} \times \frac{120.92 \text{ g RbCl}}{1 \text{ mol RbCl}} = 1.74 \times 10^5 \text{ g RbCl}$$

3. How many grams of dinitrogen tetrahydride are in
- $5.00 \times 10^{32}$
- molecules of dinitrogen tetrahydride?

$$\frac{5.00 \times 10^{32} \text{ molecule N}_2\text{H}_4}{1} \times \frac{1 \text{ mol N}_2\text{H}_4}{6.02 \times 10^{23} \text{ molecule N}_2\text{H}_4} \times \frac{32.052 \text{ g N}_2\text{H}_4}{1 \text{ mol N}_2\text{H}_4} = 2.66 \times 10^{10} \text{ g N}_2\text{H}_4$$

4. How many grams of potassium bromide are in
- $5.30 \times 10^{29}$
- formula units (f.u.) of potassium bromide?

$$\frac{5.30 \times 10^{29} \text{ fu KBr}}{1} \times \frac{1 \text{ mol KBr}}{6.02 \times 10^{23} \text{ fu KBr}} \times \frac{119 \text{ g KBr}}{1 \text{ mol KBr}} = 1.05 \times 10^8 \text{ g KBr}$$

5. How many grams of butane (
- $\text{C}_4\text{H}_{10}$
- ) are in
- $25.3 \times 10^{28}$
- molecules of butane?

$$\frac{25.3 \times 10^{28} \text{ molecule C}_4\text{H}_{10}}{1} \times \frac{1 \text{ mol C}_4\text{H}_{10}}{6.02 \times 10^{23} \text{ molecule C}_4\text{H}_{10}} \times \frac{58.12 \text{ g C}_4\text{H}_{10}}{1 \text{ mol C}_4\text{H}_{10}} = 2.44 \times 10^7 \text{ g C}_4\text{H}_{10}$$

6. How many grams of silver are in
- $1.33 \times 10^{25}$
- atoms of silver?

$$\frac{1.33 \times 10^{25} \text{ atoms Ag}}{1} \times \frac{1 \text{ mol Ag}}{6.02 \times 10^{23} \text{ atoms Ag}} \times \frac{107.87 \text{ g Ag}}{1 \text{ mol Ag}} = 2383 \text{ g Ag}$$

7. How many grams of sodium chloride are in
- $1.55 \times 10^{16}$
- formula units (f.u.) of sodium chloride?

$$\frac{1.55 \times 10^{16} \text{ fu NaCl}}{1} \times \frac{1 \text{ mol NaCl}}{6.02 \times 10^{23} \text{ fu NaCl}} \times \frac{58.44 \text{ g NaCl}}{1 \text{ mol NaCl}} = 1.50 \times 10^{-6} \text{ g NaCl}$$

8. How many grams of ammonia (
- $\text{NH}_3$
- ) are in
- $2.55 \times 10^{27}$
- molecules of ammonia?

$$\frac{2.55 \times 10^{27} \text{ molecule NH}_3}{1} \times \frac{1 \text{ mol NH}_3}{6.02 \times 10^{23} \text{ molecule NH}_3} \times \frac{17.034 \text{ g NH}_3}{1 \text{ mol NH}_3} = 7.22 \times 10^4 \text{ g NH}_3$$

9. How many grams of magnesium nitride are in
- $2.50 \times 10^{24}$
- formula units (f.u.) of magnesium nitride?

$$\frac{2.50 \times 10^{24} \text{ fu Mg}_3\text{N}_2}{1} \times \frac{1 \text{ mol Mg}_3\text{N}_2}{6.02 \times 10^{23} \text{ fu Mg}_3\text{N}_2} \times \frac{100.95 \text{ g Mg}_3\text{N}_2}{1 \text{ mol Mg}_3\text{N}_2} = 419 \text{ g Mg}_3\text{N}_2$$

10. How many grams of lithium fluoride are in
- $6.80 \times 10^{25}$
- formula units (f.u.) of lithium fluoride?

$$\frac{6.80 \times 10^{25} \text{ fu LiF}}{1} \times \frac{1 \text{ mol LiF}}{6.02 \times 10^{23} \text{ fu LiF}} \times \frac{25.941 \text{ g LiF}}{1 \text{ mol LiF}} = 2930 \text{ g LiF}$$

Part II: Mass → Particles

11. How many molecules of hydrogen peroxide ( $H_2O_2$ ) are in 100. grams of hydrogen peroxide?

$$\frac{100 \text{ g } H_2O_2}{1} \times \frac{1 \text{ mol } H_2O_2}{34.016 \text{ g } H_2O_2} \times \frac{6.02 \times 10^{23} \text{ molecule } H_2O_2}{1 \text{ mol } H_2O_2} = 1.77 \times 10^{24} \text{ molecule } H_2O_2$$

12. (CHALLENGE) - How many hydrogen atoms (H) are in 5.02 grams of methane ( $CH_4$ )?

$$\frac{5.02 \text{ g } CH_4}{1} \times \frac{1 \text{ mol } CH_4}{16.042 \text{ g } CH_4} \times \frac{6.02 \times 10^{23} \text{ molecule } CH_4}{1 \text{ mol } CH_4} \times \frac{4 \text{ atoms H}}{1 \text{ molecule } CH_4} = 7.53 \times 10^{23} \text{ atoms H}$$

13. How many formula units (f.u.) of magnesium fluoride are in 2.60 grams of magnesium fluoride?

$$\frac{2.60 \text{ g } MgF_2}{1} \times \frac{1 \text{ mol } MgF_2}{62.31 \text{ g } MgF_2} \times \frac{6.02 \times 10^{23} \text{ fu } MgF_2}{1 \text{ mol } MgF_2} = 2.51 \times 10^{22} \text{ fu } MgF_2$$

14. (CHALLENGE) - How many oxygen atoms (O) are in 200. grams of aluminum sulfate?

$$\frac{200 \text{ g } Al_2(SO_4)_3}{1} \times \frac{1 \text{ mol } Al_2(SO_4)_3}{342.14 \text{ g } Al_2(SO_4)_3} \times \frac{6.02 \times 10^{23} \text{ fu } Al_2(SO_4)_3}{1 \text{ mol } Al_2(SO_4)_3} \times \frac{12 \text{ atoms O}}{1 \text{ fu } Al_2(SO_4)_3} = 4.22 \times 10^{24} \text{ atoms O}$$

15. How many molecules of pentane ( $C_5H_{12}$ ) are in 0.211 grams of pentane?

$$\frac{0.211 \text{ g } C_5H_{12}}{1} \times \frac{1 \text{ mol } C_5H_{12}}{72.146 \text{ g } C_5H_{12}} \times \frac{6.02 \times 10^{23} \text{ molecule } C_5H_{12}}{1 \text{ mol } C_5H_{12}} = 1.76 \times 10^{21} \text{ molecule } C_5H_{12}$$

16. (CHALLENGE) - How many aluminum atoms (Al) are in 500. grams of aluminum sulfate?

$$\frac{500 \text{ g } Al_2(SO_4)_3}{1} \times \frac{1 \text{ mol } Al_2(SO_4)_3}{342.14 \text{ g } Al_2(SO_4)_3} \times \frac{6.02 \times 10^{23} \text{ fu } Al_2(SO_4)_3}{1 \text{ mol } Al_2(SO_4)_3} \times \frac{2 \text{ atoms Al}}{1 \text{ fu } Al_2(SO_4)_3} = 1.76 \times 10^{24} \text{ atoms Al}$$

17. How many atoms of iron are in  $3.33 \times 10^{-2}$  grams of iron?

$$\frac{3.33 \times 10^{-2} \text{ g Fe}}{1} \times \frac{1 \text{ mol Fe}}{55.85 \text{ g Fe}} \times \frac{6.02 \times 10^{23} \text{ atoms Fe}}{1 \text{ mol Fe}} = 3.59 \times 10^{20} \text{ atoms Fe}$$

18. How many formula units (f.u.) of strontium carbonate are in  $6.30 \times 10^6$  grams of strontium carbonate?

$$\frac{6.30 \times 10^6 \text{ g } SrCO_3}{1} \times \frac{1 \text{ mol } SrCO_3}{147.63 \text{ g } SrCO_3} \times \frac{6.02 \times 10^{23} \text{ fu } SrCO_3}{1 \text{ mol } SrCO_3} = 2.57 \times 10^{28} \text{ fu } SrCO_3$$

19. How many atoms of cobalt are in 0.126 grams of cobalt?

$$\frac{0.126 \text{ g Co}}{1} \times \frac{1 \text{ mol Co}}{58.93 \text{ g Co}} \times \frac{6.02 \times 10^{23} \text{ atoms Co}}{1 \text{ mol Co}} = 1.29 \times 10^{21} \text{ atoms Co}$$

20. How many formula units (f.u.) of strontium oxide are in  $1.49 \times 10^5$  grams of strontium oxide?

$$\frac{1.49 \times 10^5 \text{ g SrO}}{1} \times \frac{1 \text{ mol SrO}}{103.62 \text{ g SrO}} \times \frac{6.02 \times 10^{23} \text{ fu SrO}}{1 \text{ mol SrO}} = 8.66 \times 10^{26} \text{ fu SrO}$$