

Work each of the following problems. SHOW ALL WORK.

1. How many grams are contained in 0.54 moles of calcium?

$$? \text{ g Ca} = 0.54 \text{ mol Ca} \times \frac{40.1 \text{ g Ca}}{1 \text{ mol Ca}} = 22 \text{ g Ca}$$

2. Convert 2.54 moles magnesium carbonate to formula units.

$$? \text{ f.u. MgCO}_3 = 2.54 \text{ mol MgCO}_3 \times \frac{6.02 \times 10^{23} \text{ f.u. MgCO}_3}{1 \text{ mol MgCO}_3} = 1.53 \times 10^{24} \text{ f.u. MgCO}_3$$

3. What is the mass of  $3.1 \times 10^{20}$  molecules of carbon monoxide?

$$? \text{ g CO} = 3.1 \times 10^{20} \text{ molecules CO} \times \frac{1 \text{ mol CO}}{6.02 \times 10^{23} \text{ molecules CO}} \times \frac{28.0 \text{ g CO}}{1 \text{ mol CO}} = 1.4 \times 10^{-2} \text{ (or 0.014) g CO}$$

4. How many formula units are contained in 0.67 g CaO?

$$? \text{ f.u. CaO} = 0.67 \text{ g CaO} \times \frac{1 \text{ mol CaO}}{56.1 \text{ g CaO}} \times \frac{6.02 \times 10^{23} \text{ f.u. CaO}}{1 \text{ mol CaO}} = 7.2 \times 10^{21} \text{ f.u. CaO}$$

5. The number of nitrogen molecules in 1.2 moles of  $\text{N}_2$  is  $7.2 \times 10^{23}$ .

$$? \text{ molecules N}_2 = 1.2 \text{ mol N}_2 \times \frac{6.02 \times 10^{23} \text{ molecules N}_2}{1 \text{ mol N}_2} = 7.2 \times 10^{23} \text{ molecules N}_2$$

6.  $1.23 \times 10^{28}$  f.u. of  $\text{Al}_2\text{O}_3$  =  $2.08 \times 10^6 \text{ g Al}_2\text{O}_3$  grams  $\text{Al}_2\text{O}_3$

$$? \text{ g Al}_2\text{O}_3 = 1.23 \times 10^{28} \text{ f.u. Al}_2\text{O}_3 \times \frac{1 \text{ mol Al}_2\text{O}_3}{6.02 \times 10^{23} \text{ f.u. Al}_2\text{O}_3} \times \frac{102.0 \text{ g Al}_2\text{O}_3}{1 \text{ mol Al}_2\text{O}_3} = 2.08 \times 10^6 \text{ g Al}_2\text{O}_3$$

7. Convert 3.1 moles of water to grams of water.

$$? \text{ g } H_2O = 3.1 \text{ mol } H_2O \times \frac{18.0 \text{ g } H_2O}{1 \text{ mol } H_2O} = 56 \text{ g } H_2O$$

8. What is the mass in grams of  $4.6 \times 10^{21}$  molecules of carbon tetrabromide?

$$? \text{ g } CBr_4 = 4.6 \times 10^{21} \text{ molecules } CBr_4 \times \frac{1 \text{ mol } CBr_4}{6.02 \times 10^{23} \text{ molecules } CBr_4} \times \frac{331.6 \text{ g } CBr_4}{1 \text{ mol } CBr_4} = 2.5 \text{ g } CBr_4$$

9.  $3.2 \times 10^{23}$  f.u. NaCl = \_\_\_\_\_<sup>31</sup> grams NaCl

$$? \text{ g } NaCl = 3.2 \times 10^{23} \text{ f.u. } NaCl \times \frac{1 \text{ mol } NaCl}{6.02 \times 10^{23} \text{ f.u. } NaCl} \times \frac{58.5 \text{ g } NaCl}{1 \text{ mol } NaCl} = 31 \text{ g } NaCl$$

10. How many moles of silver is equal to 0.31 grams of silver?

$$? \text{ mol } Ag = 0.31 \text{ g } Ag \times \frac{1 \text{ mol } Ag}{107.9 \text{ g } Ag} = 2.9 \times 10^{-3} \text{ (or } 0.0029) \text{ mol } Ag$$

11. The mass of 2.60 moles of  $SO_2$  is \_\_\_\_\_<sup>167 g  $SO_2$</sup> .

$$? \text{ g } SO_2 = 2.60 \text{ mol } SO_2 \times \frac{64.1 \text{ g } SO_2}{1 \text{ mol } SO_2} = 167 \text{ g } SO_2$$

### BONUS

How many atoms of oxygen are contained in 12.3 kilograms of carbon dioxide?

$$\begin{aligned} ? \text{ atoms } O &= 12.3 \text{ kg } CO_2 \times \frac{1000 \text{ g } CO_2}{1 \text{ kg } CO_2} \times \frac{1 \text{ mol } CO_2}{44.0 \text{ g } CO_2} \times \frac{6.02 \times 10^{23} \text{ molecules } CO_2}{1 \text{ mol } CO_2} \times \frac{2 \text{ atoms } O}{1 \text{ molecule } CO_2} \\ &= 3.37 \times 10^{26} \text{ atoms } O \end{aligned}$$