

Work each of the following problems. SHOW ALL WORK.

1. How many atoms are contained in 3.46 moles of magnesium?

$$? \text{ atoms Mg} = 3.46 \cancel{\text{ mol Mg}} \times \frac{6.02 \times 10^{23} \text{ atoms Mg}}{1 \cancel{\text{ mol Mg}}} = 2.08 \times 10^{24} \text{ atoms Mg}$$

2. Convert 256.3 g sodium carbonate to formula units.

$$? \text{ f.u. Na}_2\text{CO}_3 = 256.3 \cancel{\text{ g Na}_2\text{CO}_3} \times \frac{1 \cancel{\text{ mol Na}_2\text{CO}_3}}{106.0 \cancel{\text{ g Na}_2\text{CO}_3}} \times \frac{6.02 \times 10^{23} \text{ f.u. Na}_2\text{CO}_3}{1 \cancel{\text{ mol Na}_2\text{CO}_3}} = 1.46 \times 10^{24} \text{ f.u. Na}_2\text{CO}_3$$

3. What is the mass of 12.4 molecules of carbon tetrachloride?

$$? \text{ g CCl}_4 = 12.4 \cancel{\text{ molecules CCl}_4} \times \frac{1 \cancel{\text{ mol CCl}_4}}{6.02 \times 10^{23} \cancel{\text{ molecules CCl}_4}} \times \frac{154.0 \text{ g CCl}_4}{1 \cancel{\text{ mol CCl}_4}} = 3.17 \times 10^{-21} \text{ g CCl}_4$$

4. How many moles are contained in 0.43 g  $\text{Al}_2\text{O}_3$ ?

$$? \text{ mol Al}_2\text{O}_3 = 0.43 \cancel{\text{ g Al}_2\text{O}_3} \times \frac{1 \cancel{\text{ mol Al}_2\text{O}_3}}{102.0 \cancel{\text{ g Al}_2\text{O}_3}} = 4.2 \times 10^{-3} \text{ mol Al}_2\text{O}_3$$

5. The number of silicon atoms in 42.1 g of silicon is  $9.02 \times 10^{23}$  atoms Si.

$$? \text{ atoms Si} = 42.1 \cancel{\text{ g Si}} \times \frac{1 \cancel{\text{ mol Si}}}{28.1 \cancel{\text{ g Si}}} \times \frac{6.02 \times 10^{23} \text{ atoms Si}}{1 \cancel{\text{ mol Si}}} = 9.02 \times 10^{23} \text{ atoms Si}$$

6. 11.6 g of  $\text{CuCl}_2$  = 0.0862 moles  $\text{CuCl}_2$

$$? \text{ mol CuCl}_2 = 11.6 \cancel{\text{ g CuCl}_2} \times \frac{1 \cancel{\text{ mol CuCl}_2}}{134.5 \cancel{\text{ g CuCl}_2}} = 0.0862 \text{ mol CuCl}_2$$

7. Convert 2.76 g Se to moles Se.

$$? \text{ mol Se} = 2.76 \text{ g Se} \times \frac{1 \text{ mol Se}}{79.0 \text{ g Se}} = 0.0349 \text{ mol Se}$$

8. What is the mass in grams of  $9.31 \times 10^{21}$  atoms of carbon?

$$? \text{ g C} = 9.31 \times 10^{21} \text{ atoms C} \times \frac{1 \text{ mol C}}{6.02 \times 10^{23} \text{ atoms C}} \times \frac{12.0 \text{ g C}}{1 \text{ mol C}} = 0.186 \text{ g C}$$

9. 2.86 f.u. MgO = 4.75 x 10<sup>-24</sup> moles MgO

$$? \text{ mol MgO} = 2.86 \text{ f.u. MgO} \times \frac{1 \text{ mol MgO}}{6.02 \times 10^{23} \text{ f.u. MgO}} = 4.75 \times 10^{-24} \text{ mol MgO}$$

10. How many grams of sodium is equal to  $6.92 \times 10^{21}$  atoms of sodium?

$$? \text{ g Na} = 6.92 \times 10^{21} \text{ atoms Na} \times \frac{1 \text{ mol Na}}{6.02 \times 10^{23} \text{ atoms Na}} \times \frac{23.0 \text{ g Na}}{1 \text{ mol Na}} = 0.264 \text{ g Na}$$

11. The mass of 3.55 moles of NaCl is 208 g.

$$? \text{ g NaCl} = 3.55 \text{ mol NaCl} \times \frac{58.5 \text{ g NaCl}}{1 \text{ mol NaCl}} = 208 \text{ g NaCl}$$

### BONUS

What is the mass, in kilograms, of  $2.46 \times 10^{20}$  formula units of barium chloride?

$$? \text{ kg BaCl}_2 = 2.46 \times 10^{20} \text{ f.u. BaCl}_2 \times \frac{1 \text{ mol BaCl}_2}{6.02 \times 10^{23} \text{ f.u. BaCl}_2} \times \frac{208.3 \text{ g BaCl}_2}{1 \text{ mol BaCl}_2} \times \frac{1 \text{ kg BaCl}_2}{1000 \text{ g BaCl}_2} = 8.51 \times 10^{-5} \text{ kg BaCl}_2$$