Review Exercise 7 - Answers

Calculating Molar Masses

Calculate the mass of one mole of each of the following substances to two decimal places. Include the correct unit in each answer. Again, work is shown for the first five.

1. $Ag_{(s)}$ **107.87 g/mol** (Just look it up on the Periodic Table).
2. $CO_{2(g)}$ 12.01g/mol + 2(16.00 g/mol) = **44.01 g/mol** (Add up the molar masses of all the atoms in the molecule)
3. $SO_{2(g)}$ 32.07 g/mol + 2(16.00 g/mol) = **64.07 g/mol**
4. $H_2SO_{4(l)}$ 2(1.01 g/mol) + 32.07 g/mol + 4(16.00 g/mol) = **98.09 g/mol**
5. Chlorine gas The formula is $Cl_{2(g)}$, so the molar mass is 2(35.45 g/mol) = **70.90 g/mol**

Here are the answers to the remainder:

Name of Compound	Molar mass	Name of Compound	Molar mass
6. Sodium hydrogen carbonate	84.01 g/mol	11.Aluminum sulfate	342.17 g/mol
7. $CaCO_{3(s)}$	100.09 g/mol	12. $(NH_4)_2SO_{4(s)}$	132.17 g/mol
8. Silver nitrate	169.88 g/mol	13. $C_8H_{18(g)}$	114.26 g/mol
9. $MgO_{(s)}$	40.31 g/mol	14. Lithium hydrogen sulfate	104.01 g/mol
10 $Hg_2O_{(s)}$	417.18 g/mol	15. $NaOH_{(s)}$	40.00 g/mol

Converting a given number of moles to a mass in grams (Conversion 1)

Find the mass in grams of each of the following quantities of the substances below. Use dimensional analysis for each one and report the answer in the correct units to the correct number of significant digits. The first 5 questions are done for you. The remainder supply only the answers.

1. 0.036 moles of $O_{2(g)}$ (0.036 ~~mol $O_{2(g)}$~~ x $\frac{32.00\ g\ O_{2(g)}}{1\ \text{~~mol } O_{2(g)}}$ = **1.2 g $O_{2(g)}$**)
2. 1.5 mol $AgNO_{3(s)}$ 1.5 ~~mol $AgNO_{3(s)}$~~ x $\frac{169.88\ g\ AgNO_{3(s)}}{1\ \text{~~mol } AgNO_{3(s)}}$ = **2.5×10^2 g $AgNO_{3(s)}$**
3. 2.1 x 10^{-3} mol $Na_2O_{(s)}$ 2.1 x 10^{-3} ~~mol $Na_2O_{(s)}$~~ x $\frac{61.98\ g\ Na_2O_{(s)}}{1\ \text{~~mol } Na_2O_{(s)}}$ = **0.13 g $Na_2O_{(s)}$**
4. 0.0792 mol $CO_{(g)}$ 0.0792 ~~mol $CO_{(g)}$~~ x $\frac{28.01\ g\ CO_{(g)}}{1\ \text{~~mol } CO_{(g)}}$ = **2.22 g $CO_{(g)}$**
5. 2.6 mol $Zn_{(s)}$ 2.6 ~~mol $Zn_{(s)}$~~ x $\frac{65.38\ g\ Zn_{(s)}}{1\ \text{~~mol } Zn_{(s)}}$ = **1.7×10^2 g $Zn_{(s)}$**
6. 4.44 mol $HNO_{3(l)}$ (**280 g $HNO_{3(l)}$**)
7. 0.120 mol sodium hydroxide (**4.80 g NaOH**)

8. 1.20 mol $K_2Cr_2O_{7(s)}$ **(353 g $K_2Cr_2O_{7(s)}$)**

9. 4.05 mol dinitrogen pentoxide **(437 g N_2O_5)**

10. 0.0102 mol $Mg(NO_3)_{2(s)}$ **(1.51 g $Mg(NO_3)_{2(s)}$)**

11. 0.0010 mol $H_2O_{2(l)}$ **(0.034 g $H_2O_{2(l)}$)**

12. 6.5 mol $(NH_4)_2CO_{3(s)}$ **(6.2 x 10^2 g $(NH_4)_2CO_{3(s)}$)**

13. 0.00150 mol barium phosphate **(0.903 g barium phosphate)**

14. 2.5 x 10^{-3} mol $CH_3COOH_{(l)}$ **(0.15 g $CH_3COOH_{(l)}$)**

Converting a given mass in grams of a substance to moles (Conversion 2)

Calculate the number of moles of each substance present in each of the following samples, to the correct number of significant digits. The first 5 are done in detail showing dimensional analysis.

1. 142 g $Cl_{2(g)}$ $142\ \cancel{g\ Cl_{2(g)}} \times \frac{1\ mol\ Cl_{2(g)}}{70.90\ \cancel{g\ Cl_{2(g)}}} =$ **2.00 mol $Cl_{2(g)}$**

2. 17.5 g $NaCl_{(s)}$ $17.5\ \cancel{g\ NaCl_{(s)}} \times \frac{1\ mol\ NaCl_{(s)}}{58.44\ \cancel{g\ NaCl_{(s)}}} =$ **0.299 mol $NaCl_{(s)}$**

3. 76.5 g of water $76.5\ \cancel{g\ H_2O_{(l)}} \times \frac{1\ mol\ H_2O_{(l)}}{18.02\ \cancel{g\ H_2O_{(l)}}} =$ **4.25 mol $H_2O_{(l)}$**

4. 8.80 g of $CO_{2(g)}$ $8.80\ \cancel{g\ CO_{2(g)}} \times \frac{1\ mol\ CO_{2(g)}}{44.01\ \cancel{g\ CO_{2(g)}}} =$ **0.200 mol $CO_{2(g)}$**

5. 150.0 g $MgCO_{3(s)}$ $150.0\ \cancel{g\ MgCO_{3(s)}} \times \frac{1\ mol\ MgCO_{3(s)}}{84.32\ \cancel{g\ MgCO_{3(s)}}} =$ **1.779 mol $MgCO_{3(s)}$**

6. 1.25 g $CuSO_{4(s)}$ **(0.00783 mol $CuSO_{4(s)}$)**

7. 9.81 g $H_2SO_{4(aq)}$ **(0.100 mol $H_2SO_{4(aq)}$)**

8. 0.980 g $CO_{(g)}$ **(0.350 mol $CO_{(g)}$)**

9. 68.8 g of lithium hydrogen carbonate **(1.01 mol $LiHCO_{3(s)}$)**

10 122.6 g of $Al_2(SO_4)_{3(s)}$ **(0.3583 mol $Al_2(SO_4)_{3(s)}$)**

11. 1.36 kg of carbon tetrachloride **(8.84 mol CCl_4)**

12. 40.0 g of $NaOH_{(s)}$ **(1.00 mol $NaOH_{(s)}$)**

13. 225 g of $H_2S_{(g)}$ **(6.60 mol $H_2S_{(g)}$)**

14. 0.00600 g $Al_2S_{3(s)}$ **(4.00 x 10^{-5} mol $Al_2S_{3(s)}$)**