Chem 1020
Mole conversions and stoichiometry worksheet

1. How many Ag atoms are in 2.43 mol Ag atoms?

$$2.43 \text{ mol Ag atoms} \times \frac{6.022\times10^{23} \text{ Ag atoms}}{1 \text{ mol Ag atoms}} = 1.46\times10^{24} \text{ Ag atoms}$$

2. How many Br_2 molecules are in 18.2 mol Br_2 molecules?

$$18.2 \text{ mol } Br_2 \text{ molecules} \times \frac{6.022\times10^{23} \ Br_2 \text{ molecules}}{1 \text{ mol } Br_2 \text{ molecules}} = 1.10\times10^{25} \ Br_2 \text{ molecules}$$

3. 7.53×10^{28} Al atoms is equal to how many mol Al atoms?

$$7.53\times10^{28} \text{ Al atoms} \times \frac{1 \text{ mol Al atoms}}{6.022\times10^{23} \text{ Al atoms}} = 1.25\times10^{5} \text{ mol Al atoms}$$

4. 2.932×10^{17} H_2O molecules is equal to how many mol H_2O molecules?

$$2.932\times10^{17} \ H_2O \text{ molecules} \times \frac{1 \text{ mol } H_2O \text{ molecules}}{6.022\times10^{23} \ H_2O \text{ molecules}} = 4.869\times10^{-7} \text{ mol } H_2O \text{ molecules}$$

5. How many **mol** N atoms are in 8.3 mol HCN?

$$8.3 \text{ mol HCN} \times \frac{1 \text{ mol N atoms}}{1 \text{ mol HCN}} = 8.3 \text{ mol N atoms}$$

6. How many **mol** H atoms are in 2.63 mol CH_2O?

$$2.63 \text{ mol } CH_2O \times \frac{2 \text{ mol H atoms}}{1 \text{ mol } CH_2O} = 5.26 \text{ mol H atoms}$$

7. How many Cl atoms are in 3.63 mol CH_2Cl_2?

$$3.63 \text{ mol } CH_2Cl_2 \times \frac{2 \text{ mol Cl atoms}}{1 \text{ mol } CH_3Cl_2} \times \frac{6.022\times10^{23} \text{ Cl atoms}}{1 \text{ mol Cl atoms}} = 4.37\times10^{24} \text{ Cl atoms}$$

8. How many O atoms are in 6.229 mol $Ca(NO_3)_2$?

$$6.229\ \text{mol Ca(NO}_3\text{)}_2 \times \frac{6\ \text{mol O atoms}}{1\ \text{mol Ca(NO}_3\text{)}_2} \times \frac{6.022\times10^{23}\ \text{O atoms}}{1\ \text{mol O atoms}} = 2.251\times10^{25}\ \text{O atoms}$$

9. How many mol $FeCl_3$ are in 15.3 g $FeCl_3$?

$$\text{Molar mass FeCl}_3 = 55.85 + 3(35.45) = 162.2\ \text{g/mol}$$

$$15.3\ \text{g FeCl}_3 \times \frac{1\ \text{mol FeCl}_3}{162.2\ \text{g FeCl}_3} = 0.0943\ \text{mol FeCl}_3$$

10. How many mol Na_2CO_3 are in 23.5 g Na_2CO_3?

$$\text{Molar mass Na}_2\text{CO}_3 = 2(22.99) + 12.01 + 3(16.00) = 105.99\ \text{g/mol}$$

$$23.5\ \text{g Na}_2\text{CO}_3 \times \frac{1\ \text{mol Na}_2\text{CO}_3}{105.99\ \text{g Na}_2\text{CO}_3} = 0.222\ \text{g Na}_2\text{CO}_3$$

11. What mass is 3.52 mol $NaNO_3$?

$$\text{Molar mass NaNO}_3 = 22.99 + 14.01 + 3(16.00) = 85.00\ \text{g/mol}$$

$$3.52\ \text{mol NaNO}_3 \times \frac{85.00\ \text{g NaNO}_3}{1\ \text{mol NaNO}_3} = 299\ \text{g NaNO}_3$$

12. What mass is 7.326 mol C_2H_4?

$$\text{Molar mass C}_2\text{H}_4 = 2(12.01) + 4(1.008) = 28.052\ \text{g/mol}$$

$$7.326\ \text{mol C}_2\text{H}_4 \times \frac{28.052\ \text{g C}_2\text{H}_4}{1\ \text{mol C}_2\text{H}_4} = 205.5\ \text{g C}_2\text{H}_4$$

13. How many mol H atoms are in 18.2 g NH_3?

$$\text{Molar mass NH}_3 = 14.01 + 3(1.008) = 17.034\ \text{g/mol}$$

$$18.2\ \text{g NH}_3 \times \frac{1\ \text{mol NH}_3}{17.034\ \text{g NH}_3} \times \frac{3\ \text{mol H atoms}}{1\ \text{mol NH}_3} = 3.21\ \text{mol H atoms}$$

14. How many mol O atoms are in 3.52 g MnO_2?

$$\text{Molar mass MnO}_2 = 54.94 + 2(16.00) = 86.94\ \text{g/mol}$$

$$3.52\ \text{g MnO}_2 \times \frac{1\ \text{mol MnO}_2}{86.94\ \text{g MnO}_2} \times \frac{2\ \text{mol O atoms}}{1\ \text{mol MnO}_2} = 0.0810\ \text{mol O atoms}$$

15. How many S atoms are in 2.35 g Al_2S_3?

Molar mass $Al_2S_3 = 2(26.98) + 3(32.06) = 150.14$ g/mol

$$2.35 \text{ g } Al_2S_3 \times \frac{1 \text{ mol } Al_2S_3}{150.14 \text{ g } Al_2S_3} \times \frac{3 \text{ mol S atoms}}{1 \text{ mol } Al_2S_3} \times \frac{6.022 \times 10^{23} \text{ S atoms}}{1 \text{ mol S atoms}} = 2.83 \times 10^{22} \text{ S atoms}$$

16. How many F atoms are in 5.52 g $C_2H_2F_4$?

Molar mass $C_2H_2F_4 = 2(12.01) + 2(1.008) + 4(19.00) = 102.036$ g/mol

$$5.52 \text{ g } C_2H_2F_4 \times \frac{1 \text{ mol } C_2H_2F_4}{102.036 \text{ g } C_2H_2F_4} \times \frac{4 \text{ mol F atoms}}{1 \text{ mol } C_2H_2F_4} \times \frac{6.022 \times 10^{23} \text{ F atoms}}{1 \text{ mol F atoms}} = 1.30 \times 10^{23} \text{ F atoms}$$

17. What mass of O is in 7.56 g H_2O_2?

Molar mass $H_2O_2 = 2(1.008) + 2(16.00) = 34.016$ g/mol

Molar mass O = 16.00 g/mol

$$7.56 \text{ g } H_2O_2 \times \frac{1 \text{ mol } H_2O_2}{34.016 \text{ g } H_2O_2} \times \frac{2 \text{ mol O}}{1 \text{ mol } H_2O_2} \times \frac{16.00 \text{ g O}}{1 \text{ mol O}} = 7.11 \text{ g O}$$

18. What mass of Cl is in 38.2 g PCl_3?

Molar mass $PCl_3 = 30.97 + 3(35.45) = 137.32$ g/mol

Molar mass Cl = 35.45 g/mol

$$38.2 \text{ g } PCl_3 \times \frac{1 \text{ mol } PCl_3}{137.32 \text{ g } PCl_3} \times \frac{3 \text{ mol Cl}}{1 \text{ mol } PCl_3} \times \frac{35.45 \text{ g Cl}}{1 \text{ mol Cl}} = 29.6 \text{ g Cl}$$

~~For the following 6 questions, consider the following balanced chemical equation:~~

$$\text{~~} N_2 + 3H_2 \rightarrow 2NH_3 \text{~~}$$

~~Molar mass N_2 = 2(14.01) = 28.02 g/mol~~

~~Molar mass H_2 = 2(1.008) = 2.016 g/mol~~

~~Molar mass NH_3 = 14.01 + 3(1.008) = 17.034 g/mol~~

~~19. How many mol NH_3 can be produced from 7.23 mol N_2 (assuming H_2 is in excess)?~~

$$\text{~~}7.23 \text{ mol } N_2 \times \frac{2 \text{ mol } NH_3}{1 \text{ mol } N_2} = 14.5 \text{ mol } NH_3\text{~~}$$