

# Mole Problems #1 - Answer Key

$$1.a) \frac{2.30 \times 10^{-1} \text{ mol NaCl}}{1 \text{ mol NaCl}} \left| \frac{6.02 \times 10^{23} \text{ molecules NaCl}}{1 \text{ mol NaCl}} \right. = \boxed{1.38 \times 10^{23} \text{ molec. NaCl}}$$

$$b) \frac{5.6 \text{ mol K}_2\text{S}}{1 \text{ mol K}_2\text{S}} \left| \frac{6.02 \times 10^{23} \text{ molec. K}_2\text{S}}{1 \text{ mol K}_2\text{S}} \right. = \boxed{3.4 \times 10^{24} \text{ molec. K}_2\text{S}}$$

$$c) \frac{3.42 \times 10^2 \text{ mol MgO}}{1 \text{ mol MgO}} \left| \frac{6.02 \times 10^{23} \text{ molec. MgO}}{1 \text{ mol MgO}} \right. = \boxed{2.06 \times 10^{26} \text{ molec. MgO}}$$

$$d) \frac{0.450 \text{ mol CaI}_2}{1 \text{ mol CaI}_2} \left| \frac{6.02 \times 10^{23} \text{ molec. CaI}_2}{1 \text{ mol CaI}_2} \right. = \boxed{2.71 \times 10^{23} \text{ molec. CaI}_2}$$

$$2.a) \frac{0.250 \text{ moles CaSO}_4}{1 \text{ mol CaSO}_4} \left| \frac{6.02 \times 10^{23} \text{ molec. CaSO}_4}{1 \text{ molecule CaSO}_4} \right| \frac{4 \text{ atoms O}}{1 \text{ molecule CaSO}_4} = \boxed{6.02 \times 10^{23} \text{ atoms O}}$$

$$b) \frac{1.20 \times 10^{-2} \text{ mol Na}_3\text{PO}_4}{1 \text{ mol Na}_3\text{PO}_4} \left| \frac{6.02 \times 10^{23} \text{ molec. Na}_3\text{PO}_4}{1 \text{ molec. Na}_3\text{PO}_4} \right| \frac{3 \text{ atoms Na}}{1 \text{ molec. Na}_3\text{PO}_4} = \boxed{2.17 \times 10^{22} \text{ atoms Na}}$$

$$c) \frac{3.20 \text{ mol Fe(NO}_3)_3}{1 \text{ mol Fe(NO}_3)_3} \left| \frac{6.02 \times 10^{23} \text{ molec. Fe(NO}_3)_3}{1 \text{ molec. Fe(NO}_3)_3} \right| \frac{13 \text{ atoms}}{1 \text{ molec. Fe(NO}_3)_3} = \boxed{2.50 \times 10^{25} \text{ atoms}}$$

$$d) \frac{6.30 \times 10^{-1} \text{ mol (NH}_4)_2\text{CO}_3}{1 \text{ mol (NH}_4)_2\text{CO}_3} \left| \frac{6.02 \times 10^{23} \text{ molec. (NH}_4)_2\text{CO}_3}{1 \text{ molec. (NH}_4)_2\text{CO}_3} \right| \frac{8 \text{ atoms H}}{1 \text{ molec. (NH}_4)_2\text{CO}_3} = \boxed{3.03 \times 10^{24} \text{ atoms H}}$$

$$3) a) \frac{2.50 \text{ g NO}_2}{46.0 \text{ g NO}_2} \times \frac{1 \text{ mol NO}_2}{1 \text{ mol NO}_2} \times \frac{6.02 \times 10^{23} \text{ molec. NO}_2}{1 \text{ mol NO}_2} = 3.27 \times 10^{22} \text{ molec. NO}_2$$

$$b) \frac{1.0 \times 10^2 \text{ g CuO}}{79.5 \text{ g CuO}} \times \frac{1 \text{ mol CuO}}{1 \text{ mol CuO}} \times \frac{6.02 \times 10^{23} \text{ molec. CuO}}{1 \text{ mol CuO}} = 7.6 \times 10^{23} \text{ molec. CuO}$$

$$c) \frac{0.358 \text{ mg BaBr}_2}{1000 \text{ mg}} \times \frac{1 \text{ g}}{297.1 \text{ g BaBr}_2} \times \frac{1 \text{ mol BaBr}_2}{1 \text{ mol BaBr}_2} \times \frac{6.02 \times 10^{23} \text{ molec. BaBr}_2}{1 \text{ mol BaBr}_2} = 7.25 \times 10^{17} \text{ molec. BaBr}_2$$

$$d) \frac{2.20 \times 10^4 \text{ cg AgCl}}{100 \text{ cg}} \times \frac{1 \text{ g}}{143.4 \text{ g AgCl}} \times \frac{1 \text{ mol AgCl}}{1 \text{ mol AgCl}} \times \frac{6.02 \times 10^{23} \text{ molec. AgCl}}{1 \text{ mol AgCl}} = 9.24 \times 10^{23} \text{ molec. AgCl}$$

$$4. a) \frac{3.5 \text{ g SnCl}_4}{260.7 \text{ g SnCl}_4} \times \frac{1 \text{ mol SnCl}_4}{1 \text{ mol SnCl}_4} \times \frac{6.02 \times 10^{23} \text{ molec. SnCl}_4}{1 \text{ mol SnCl}_4} \times \frac{4 \text{ atoms Cl}}{1 \text{ molec. SnCl}_4} = 3.2 \times 10^{22} \text{ atoms Cl}$$

$$b) \frac{68.5 \text{ mg Ca}_3(\text{PO}_4)_2}{1000 \text{ mg}} \times \frac{1 \text{ g}}{310.3 \text{ g Ca}_3(\text{PO}_4)_2} \times \frac{1 \text{ mol Ca}_3(\text{PO}_4)_2}{1 \text{ mol Ca}_3(\text{PO}_4)_2} \times \frac{6.02 \times 10^{23} \text{ molec. Ca}_3(\text{PO}_4)_2}{1 \text{ mol Ca}_3(\text{PO}_4)_2} \times \frac{3 \text{ atoms Ca}}{1 \text{ molec. Ca}_3(\text{PO}_4)_2} = 3.99 \times 10^{20} \text{ atoms Ca}$$

$$c) \frac{4.50 \times 10^2 \text{ cg NH}_4\text{NO}_3}{100 \text{ cg}} \times \frac{1 \text{ g}}{80 \text{ g NH}_4\text{NO}_3} \times \frac{1 \text{ mol NH}_4\text{NO}_3}{1 \text{ mol NH}_4\text{NO}_3} \times \frac{6.02 \times 10^{23} \text{ molec. NH}_4\text{NO}_3}{1 \text{ mol NH}_4\text{NO}_3} \times \frac{2 \text{ atoms N}}{1 \text{ molec. NH}_4\text{NO}_3} = 6.77 \times 10^{22} \text{ atoms N}$$

$$d) \frac{2.64 \times 10^{-3} \text{ kg KOH}}{1 \text{ kg}} \times \frac{1000 \text{ g}}{56.1 \text{ g KOH}} \times \frac{1 \text{ mol KOH}}{1 \text{ mol KOH}} \times \frac{6.02 \times 10^{23} \text{ molec. KOH}}{1 \text{ mol KOH}} \times \frac{3 \text{ atoms total}}{1 \text{ molec. KOH}} = 8.50 \times 10^{22} \text{ total atoms}$$

$$5. a) \frac{1.20 \text{ mol } C_3H_8 \mid 22.4 \text{ L } C_3H_8}{\mid 1 \text{ mol } C_3H_8} = \boxed{26.9 \text{ L } C_3H_8}$$

$$b) \frac{4.2 \times 10^{-1} \text{ g } Br_2 \mid 1 \text{ mol } Br_2 \mid 22.4 \text{ L } Br_2}{\mid 159.8 \text{ g } Br_2 \mid 1 \text{ mol } Br_2} = \boxed{0.059 \text{ L } Br_2}$$

$$c) \frac{0.345 \text{ dag } NO_2 \mid 10 \text{ g} \mid 1 \text{ mol } NO_2 \mid 22.4 \text{ L } NO_2}{\mid 1 \text{ dag} \mid 46.0 \text{ g } NO_2 \mid 1 \text{ mol } NO_2} = \boxed{1.68 \text{ L } NO_2}$$

$$d) \frac{4.50 \times 10^{25} \text{ molec. } SO_3 \mid 1 \text{ mol } SO_3 \mid 22.4 \text{ L } SO_3}{\mid 6.02 \times 10^{23} \text{ molec. } SO_3 \mid 1 \text{ mol } SO_3} = \boxed{1.67 \times 10^3 \text{ L } SO_3}$$