Stoichiometry Review Assignment Answer Key

Example 1: Calculate the mass of a magnesium, Mg, atoms in grams.

$\dfrac{24.035 \text{ g Mg}}{1 \text{ mol Mg}}$. $\dfrac{1 \text{ mol Mg}}{6.02 \times 10^{23} \text{ molecules}}$. $\dfrac{1 \text{ molecule Mg}}{1 \text{ atom Mg}}$ $= 4.04 \times 10^{-23}$ g/Mg atom

Example 2: Calculate the number of atoms in one-millionth of a gram of magnesium, Mg.

1×10^{-6} g Mg . $\dfrac{1 \text{ mol Mg}}{24.30 \text{ g Mg}}$. $\dfrac{6.02 \times 10^{23} \text{ molecules}}{1 \text{ mol Mg}}$. $\dfrac{1 \text{ atom Mg}}{1 \text{ molecule Mg}}$ $= 2.48 \times 10^{16}$ atoms

Example 3: How many atoms are in 1.67 moles of magnesium?

1.67 mol Mg . $\dfrac{6.02 \times 10^{23} \text{ molecules}}{1 \text{ mol Mg}}$. $\dfrac{1 \text{ atom Mg}}{1 \text{ molecule Mg}}$ $= 1.01 \times 10^{24}$ atoms

Example 4: How many moles of magnesium are in 73.4 grams of magnesium?

73.4 g Mg . $\dfrac{1 \text{ mol Mg}}{24.30 \text{ g Mg}}$ $= 3.02$ mol Mg

Example 7: Calculate the number of propane, C_3H_8 molecules, in 74.6 grams of propane.

74.6 g C_3H_8 . $\dfrac{1 \text{ mol } C_3H_8}{44 \text{ g } C_3H_8}$. $\dfrac{6.02 \times 10^{23} \text{ molecules}}{1 \text{ mol } C_3H_8}$ $= 1.02 \times 10^{24}$ molecules C_3H_8

Example 8: What is the mass of 10.0 billion molecules of propane?

10×10^9 molecules C_3H_8 . $\dfrac{1 \text{ mol } C_3H_8}{6.02 \times 10^{23} \text{ molecules}}$. $\dfrac{44 \text{ g } C_3H_8}{1 \text{ mol } C_3H_8}$ $= 7.31 \times 10^{-13}$ g C_3H_8

Example 9: How many moles, molecules, and oxygen atoms are contained in 60-g sample of ozone O_3?

60 g O_3 . $\dfrac{1 \text{ mol } O_3}{48 \text{ g } O_3}$. $=$ _____   1.25 mol ozone

1.25 mol O_3 . $\dfrac{6.02 \times 10^{23} \text{ molecules}}{1 \text{ mol ozone}}$ $= 7.53 \times 10^{23}$ molecules ozone $= 22.5 \times 10^{23}$ atoms O

Example 13: What mass of phosphorous is contained in 45.3 grams of $(NH_4)_3PO_4$?

45.3 g $(NH_4)_3PO_4$. $\dfrac{1 \text{ mol } (NH_4)_3PO_4}{149.09 \text{ g } (NH_4)_3PO_4}$. $\dfrac{1 \text{ mol P}}{1 \text{ mol } (NH_4)_3PO_4}$. $\dfrac{30.97 \text{ g P}}{1 \text{ mol P}}$ $= 9.41$ g P

Example 14: What mass of ammonium phosphate would contain 15.0 g of nitrogen?

15.0 g N . $\dfrac{1 \text{ mol N}}{14 \text{ g N}}$. $\dfrac{1 \text{ mol } (NH_4)_3PO_4}{3 \text{ mol N}}$. $\dfrac{149.09 \text{ g } (NH_4)_3PO_4}{1 \text{ mol } (NH_4)_3PO_4}$ $= 53.22$ g P$(NH_4)_3PO_4$

Example 15: What mass of propane, C_3H_8, contains the same mass of carbon as is contained in 1.35 grams of barium carbonate, $BaCO_3$?

1.35 g $BaCO_3$. $\dfrac{1 \text{ mol } BaCO_3}{149.09 \text{ g } BaCO_3}$. $\dfrac{1 \text{ mol C}}{1 \text{ mol } BaCO_3}$. $\dfrac{1 \text{ mol } C_3H_8}{3 \text{ mol C}}$. $\dfrac{44 \text{ g } C_3H_8}{1 \text{ mol } C_3H_8}$ $= 0.097$ g C_3H_8

$$C_3H_8 + 5O_2 \rightarrow 3CO_2 + 4H_2O$$
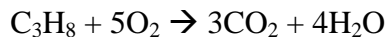
Example 16: What mass of H_2O is produced from the reaction of 6.3 g of propane?

6.3 g C_3H_8. $\dfrac{\text{1 mol } C_3H_8}{\text{44 g } C_3H_8}$. $\dfrac{\text{4 mol } H_2O}{\text{1 mol } C_3H_8}$. $\dfrac{\text{18 g } H_2O}{\text{1 mol } H_2O}$ = 10.31 g H_2O

Example 17: How many molecules of H_2O are produced when 2 moles of O_2 are reacted with excess propane?

2 mol O_2 . $\dfrac{\text{4 mol } H_2O}{\text{5 mol } O_2}$. $\dfrac{6.02 \times 10^{23} \text{ molecules}}{\text{1 mol } H_2O}$ = 9.63 x 10^{23} molecules H_2O

Example 18: How many molecules of H_2O are produced when 10 molecules of oxygen react?

10 molecules O_2 . $\dfrac{\text{1 mol } O_2}{6.02 \times 10^{23} \text{ molecules}}$. $\dfrac{\text{4 mol } H_2O}{\text{5 mol } O_2}$. $\dfrac{6.02 \times 10^{23} \text{ molecules}}{\text{1 mol } H_2O}$ = 8 molecules H_2O

Example 19: How many atoms of hydrogen in water are produced when 2.4 moles of propane are reacted?

2.4 mol C_3H_8. $\dfrac{\text{4 mol } H_2O}{\text{1 mol } C_3H_8}$. $\dfrac{\text{2 mol H}}{\text{1 mol } H_2O}$. $\dfrac{6.02 \times 10^{23} \text{ atoms}}{\text{1 mol H}}$ = 1.156 x 10^{25} atoms H_2O

Example 20: How many molecules of CO_2 are produced when 2.3 x 10^6 atoms of O_2 are reacted?

2.3 x 10^6 atoms O_2. $\dfrac{\text{1 mol } O_2}{\text{2 atoms O}}$. $\dfrac{6.02 \times 10^{23} \text{ molecules}}{\text{1 mol } O_2}$. $\dfrac{\text{3 mol } CO_2}{\text{5 mol } O_2}$. $\dfrac{6.02 \times 10^{23} \text{ atoms}}{\text{1 mol } CO_2}$ = 6.9 x 10^5 atoms CO_2

Example 21: How many grams of O atoms in CO_2 are produced when 23.2 g of propane are reacted?

23.2 g C_3H_8. $\dfrac{\text{1 mol } C_3H_8}{\text{44 g } C_3H_8}$. $\dfrac{\text{3 mol } CO_2}{\text{1 mol } C_3H_8}$. $\dfrac{\text{2 mol O atoms}}{\text{1 mol } CO_2}$. $\dfrac{\text{16 g O}}{\text{1 mol O atom}}$ = 50.62 g O

Example 22: How many grams of O in water are produced from the reaction of 11.2 grams of H in propane?

11.2 g H. $\dfrac{\text{1 mol H}}{\text{1 g H}}$. $\dfrac{\text{1 mol } C_3H_8}{\text{8 mol H}}$. $\dfrac{\text{4 mol } H_2O}{\text{1 mol } C_3H_8}$. $\dfrac{\text{1 mol O}}{\text{1 mol } H_2O}$. $\dfrac{\text{16 g O}}{\text{1 mol O}}$ = 89.6 g O

Example 23: What is mass of CO_2 produced when 6.5 g of propane is reacted with 14.2 g of O_2?

6.5 g C_3H_8 . $\dfrac{\text{1 mol } C_3H_8}{\text{44 g } C_3H_8}$ = 0.147 mol C_3H_8 . $\dfrac{\text{5 mol } O_2}{\text{1 mol } C_3H_8}$ = 0.74 mol O_2

14.2 g O_2 . $\dfrac{\text{1 mol } O_2}{\text{32 g } O_2}$ = 0.44 mol O_2 . $\dfrac{\text{3 mol } CO_2}{\text{5 mol } O_2}$. $\dfrac{\text{44 g } CO_2}{\text{1 mol } CO_2}$ = 11.7 g CO_2

Example 24: What is the number of atoms in H in H_2O are produced when 2.9 x 10^{11} molecules of propane are reacted with 5.4 x 10^{12} molecules of O_2?

2.9 x 10^{11} molecules C_3H_8 . $\dfrac{\text{1 mol } C_3H_8}{6.02 \times 10^{23} \text{ molecules}}$ = 4.82 x 10^{-13} mol C_3H_8

5.4 x 10^{12} molecules O_2 . $\dfrac{\text{1 mol } O_2}{6.02 \times 10^{23} \text{ molecules}}$ = 8.97 x 10^{-12} mol O_2

4.82 x 10^{-13} mol C_3H_8 . $\dfrac{\text{4 mol } H_2O}{\text{1 mol } C_3H_8}$. $\dfrac{\text{2 mol H}}{\text{1 mol } H_2O}$. $\dfrac{6.02 \times 10^{23} \text{ atoms}}{\text{1 mol H}}$ = 2.32 x 10^{12} atoms H