

Please show all of your work and remember to include all units!

- In the reaction $\underline{\hspace{1cm}} \text{C}_2\text{H}_6 + \underline{\hspace{1cm}} \text{O}_2 \rightarrow \underline{\hspace{1cm}} \text{CO}_2 + \underline{\hspace{1cm}} \text{H}_2\text{O}$
 - how many oxygen molecules react with 6 molecules of C_2H_6 ?
 - how many H_2O molecules are produced when 12 molecules of C_2H_6 react?
 - how many moles of oxygen molecules are needed to produce 18 mol of CO_2 ?
 - how many moles of CO_2 are produced when 13 mol of C_2H_6 are used up?
- In the reaction $\underline{\hspace{1cm}} \text{Fe} + \underline{\hspace{1cm}} \text{H}_2\text{O} \rightarrow \underline{\hspace{1cm}} \text{Fe}_3\text{O}_4 + \underline{\hspace{1cm}} \text{H}_2$
 - how many molecules of Fe_3O_4 are produced when 12 atoms of Fe react?
 - how many moles of Fe are required to produce 16 mol of H_2 ?
 - how many H_2 molecules are made when 40 molecules of Fe_3O_4 are produced?
 - how many moles of H_2O are required to react with 14.5 mol of Fe?
- How many moles of $\text{H}_2\text{O}_{(g)}$ are produced when 9.6 mol of $\text{O}_{2(g)}$ react according to the equation $2 \text{H}_{2(g)} + \text{O}_{2(g)} \rightarrow 2 \text{H}_2\text{O}_{(g)}$
- Consider the equation $\underline{\hspace{1cm}} \text{I}_{2(g)} + \underline{\hspace{1cm}} \text{F}_{2(g)} \rightarrow \underline{\hspace{1cm}} \text{IF}_{5(g)} + \underline{\hspace{1cm}} \text{I}_4\text{F}_{2(g)}$
 - how many moles of $\text{I}_4\text{F}_{2(g)}$ are produced by 5.40 mol of $\text{F}_{2(g)}$?
 - how many moles of $\text{F}_{2(g)}$ are required to produce 4.50 mol of $\text{IF}_{5(g)}$?
 - how many moles of $\text{I}_{2(g)}$ are required to react with 7.60 mol of $\text{F}_{2(g)}$?
- BE CAREFUL! A student decomposes some hydrogen peroxide, H_2O_2 , according to the equation $2 \text{H}_2\text{O}_2 \rightarrow 2 \text{H}_2\text{O} + \text{O}_2$
If a total of 0.125 mol of reactants and products are involved in the reaction, how many moles of O_2 are produced?
- Consider the reaction $4 \text{NH}_{3(g)} + 5 \text{O}_{2(g)} \rightarrow 6 \text{H}_2\text{O}_{(g)} + 4 \text{NO}_{(g)}$
 - What mass of $\text{NO}_{(g)}$ is produced when 2.00 mol of $\text{NH}_{3(g)}$ are reacted with excess O_2 ?
 - What mass of $\text{H}_2\text{O}_{(g)}$ is produced when 4.00 mol of $\text{O}_{2(g)}$ are reacted with excess $\text{NH}_{3(g)}$?
- $\text{C}_5\text{H}_{12(l)} + 8 \text{O}_{2(g)} \rightarrow 5 \text{CO}_{2(g)} + 6 \text{H}_2\text{O}_{(l)}$
 - What mass of $\text{CO}_{2(g)}$ is produced when 100.0g of $\text{C}_5\text{H}_{12(l)}$ is burned?
 - What mass of $\text{O}_{2(g)}$ is required to produce 60.0g of $\text{H}_2\text{O}_{(l)}$?
- Tetraethyl lead, $\text{Pb}(\text{C}_2\text{H}_5)_4$, is an "antiknock" ingredient which was added to some gasolines. Tetraethyl lead burns according to the equation $2 \text{Pb}(\text{C}_2\text{H}_5)_{4(l)} + 27 \text{O}_{2(g)} \rightarrow 2 \text{PbO}_{(s)} + 16 \text{CO}_{2(g)} + 20 \text{H}_2\text{O}_{(l)}$
 - How many molecules of CO_2 are formed when 1.00×10^{-6} g of tetraethyl lead is burned?
 - How many molecules of H_2O are formed when 135 molecules of O_2 react?
- Nitromethane, a fuel occasionally used in some drag racers, burns according to the reaction $4 \text{CH}_3\text{NO}_{2(l)} + 3 \text{O}_{2(g)} \rightarrow 4 \text{CO}_{2(g)} + 6 \text{H}_2\text{O}_{(l)} + 2 \text{N}_{2(g)}$
 - What mass of H_2O is produced when 0.150g of CH_3NO_2 is burned?
 - What mass of H_2O is produced when 0.410g of CO_2 is produced?

10. A sample of high purity silicon is prepared by strongly heating a mixture of hydrogen and silicon tetrachloride in a sealed tube: $\text{SiCl}_{4(g)} + 2 \text{H}_{2(g)} \rightarrow \text{Si}_{(s)} + 4 \text{HCl}_{(g)}$
If exactly 1.00g of silicon is required, what mass of each SiCl_4 and H_2 must react?
11. $2 \text{HgO}_{(s)} \rightarrow 2 \text{Hg}_{(l)} + \text{O}_{2(g)}$
What mass of HgO decomposes to yield one-third as many atoms as there are in 100.0g of neon gas?
12. When 7.682g of $\text{XZO}_{3(s)}$ is heated, 2.208g of O_2 and 5.474g of $\text{XZ}_{(s)}$ are formed. When XZ is mixed with AgNO_3 , all the XZ reacts to form 8.639g of $\text{AgZ}_{(s)}$. Find the molar masses of X and Z.

ANSWERS

1. $2 \text{C}_2\text{H}_6 + 7 \text{O}_2 \rightarrow 4 \text{CO}_2 + 6 \text{H}_2\text{O}$
a. 21 molecules O_2
b. 36 molecules H_2O
c. 31.5 mol O_2
d. 26 mol CO_2

2. $3 \text{Fe} + 4 \text{H}_2\text{O} \rightarrow \text{Fe}_3\text{O}_4 + 4 \text{H}_2$
a. 4 molecules Fe_3O_4
b. 12 mol Fe
c. 160 molecules H_2
d. 19.3 mol H_2O

3. 19 mol H_2O

4. $3 \text{I}_{2(g)} + 6 \text{F}_{2(g)} \rightarrow 2 \text{IF}_{5(g)} + \text{I}_4\text{F}_{2(g)}$
a. 0.900 mol I_4F_2
b. 13.5 mol F_2
c. 3.80 mol I_2

5. 0.025 mol O_2

6a. 60.0g NO

b. 86.4g H_2O

7a. ~~30.56~~ 30.56g CO_2

b. 142g O_2

8a. 1.49×10^{16} molecules CO_2

b. 100 molecules H_2O

9a. 0.0664g H_2O

b. 0.252g H_2O

10. 6.05g SiCl_4 0.14g H_2

11. 179g HgO [hint: 2 molecules HgO decompose into 4 atoms total ($2\text{Hg} + \text{O}_2$)]

12. Z = 80.1 g/mol (Br?) X = 38.9 g/mol (K?) [hint: balance both equations]