Stoich HW #1 ANSWERS

Carbon disulfide is an important industrial solvent. It is prepared by the reaction of solid carbon and sulfur dioxide gas this way:

$$C_{(S)} + SO_{2(G)} \longrightarrow CS_{2(L)} + CO_{(G)}$$

A. Balance this equation, write the word equation for it.

B. What is the MOLE RATIO for this reaction?

C. How many moles of carbon disulfide form when 2.7 moles of carbon react?

D. How many moles of carbon are needed to react are needed to react with 5.44 moles of SO_2?

E. How many moles of carbon monoxide form at the same time 0.246 moles carbon disulfide form?

F. How many moles of sulfur dioxide are needed to make 118 moles of carbon disulfide?

A. $5C_{(S)} + 2SO_{2(G)} \longrightarrow CS_{2(L)} + 4CO_{(G)}$

carbon and sulfur dioxide form carbon disulfide and carbon monoxide

B. 5:2:1:4

C. MR= $\frac{CS_2}{C}$ $\frac{1}{5}$ $\frac{X}{2.7}$

Cross multiply to solve

$5x = 2.7$

$X = 0.54$ moles CS_2 *(2SF)*

D. MR= $\frac{C}{SO_2}$ $\frac{5}{2}$ $\frac{X}{5.44}$

Cross multiply to solve

$2x = 27.2$

$X = 13.6$ moles C *(3SF)*

E. MR= $\frac{CO}{CS_2}$ $\frac{4}{1}$ $\frac{X}{0.246}$

Cross multiply to solve

$X = 0.984$ moles CO *(3SF)*

F. MR= $\frac{SO_2}{CS_2}$ $\frac{2}{1}$ $\frac{X}{118}$

Cross multiply to solve

$X = 236$ moles SO_2 *(3SF)*

Stoich HW #2 ANSWERS

Ammonia is formed by combining H_2 gas with N_2 gas, as shown in this balanced chemical equation:

$$N_{2(G)} + 3H_{2(G)} \rightarrow 2NH_{3(G)}$$

A. How many grams of ammonia form when 512 moles of nitrogen react?

A. MR = $\frac{NH_3}{N_2}$ $\frac{2}{1}$ $\frac{X}{512}$

First Cross multiply to solve for moles of ammonia

X = 1024 moles ammonia

Then, convert that many moles of NH_3 into grams of NH_3 with the molar mass of NH_3.

$$\frac{1024 \text{ moles } NH_3}{1} \times \frac{17 \text{ grams } NH_3}{1 \text{ moles } NH_3} = 17{,}408 \text{ grams ammonia}$$

17,400 grams NH_3 *with 3 SF*

B. How many liters of N_2 are needed to react with 2.2 moles of H_2?

B. MR = $\frac{N_2}{H_2}$ $\frac{1}{3}$ $\frac{X}{2.2}$

First Cross multiply to solve for moles of N_2

3X = 2.2

X = 0.73 moles nitrogen *with 2 SF*

Then, convert those moles into liters using the equality of 1 mole of any gas = 22.4 moles of gas at STP

$$\frac{0.73 \text{ moles } N_2}{1} \times \frac{22.4 \text{ L } N_2}{1 \text{ moles } N_2} = 16.352 \text{ liters} = 16 \text{ Liters } N_2$$

With 2 SF

C. How many moles of NH_3 form when 8.32×10^{24} molecules H_2 reacts?

First determine how many moles that many molecules of hydrogen is with the equality
1 mole of any substance = 6.02×10^{23} particles (in this case they are molecules)

$$\frac{8.32 \times 10^{24} \text{ molecules } H_2}{1} \times \frac{1 \text{ mole Hydrogen}}{6.02 \times 10^{24} \text{ molecules } H_2} = \frac{8.32}{6.02} \times \frac{10^{24}}{10^{23}} = 1.38 \times 10^{1} \text{ moles } H_2$$

$= 13.8$ moles H_2

Then using this number of moles, do the mole ratio with hydrogen and ammonia

MR = $\frac{NH_3}{H_2}$ $\frac{2}{3}$ $\frac{X}{13.8}$

First Cross multiply to solve for moles of NH_3

3X = 27.6

X = 9.20 moles NH_3 *with 3 SF*

Stoich HW #3 name: **ANSWERS**

$$Zn_{(S)} + 2HCl_{(AQ)} \longrightarrow ZnCl_{2(AQ)} + H_{2(G)}$$

1. You start with 548 grams of zinc and sufficient acid to completely react all of the zinc. How many formula units of zinc chloride form?

MR $\frac{Zn}{ZnCl_2}$ $\frac{1}{1}$ $\frac{8.43}{X}$ X = 8.43 moles $ZnCl_2$

548g Zn X $\frac{1 \text{ mole Zn}}{65 \text{ g Zn}}$ = 8.43 moles Zn

8.43 moles $ZnCl_2$ X $\frac{6.02 \times 1023 \text{ FU's } ZnCl_2}{1 \text{ mole } ZnCl_2}$ =

50.7486×10^{23} = 50.7×10^{23} = **5.07×10^{24} FU's of $ZnCl_2$**

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2. You end with 944 liters of hydrogen. How many grams of zinc are required?

MR $\frac{H_2}{Zn}$ $\frac{1}{1}$ $\frac{42.1}{X}$ X = 42.1 moles Zn

944 L H_2 X $\frac{1 \text{ mole } H_2}{22.4 \text{ L } H_2}$ = 42.1 moles H_2

42.1 moles Zn X $\frac{65 \text{ grams zinc}}{1 \text{ mole Zn}}$ =

2736.5 = 2740 g Zn

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3. You measure 4.91×10^{24} atoms of zinc completely react. How many liters of hydrogen gas form?

MR $\frac{Zn}{H_2}$ $\frac{1}{1}$ $\frac{8.16}{X}$ X = 8.16 moles H_2

4.91×10^{24} atoms Zn X $\frac{1 \text{ mole Zn}}{6.02 \times 10^{23} \text{ atoms Zn}}$ =

= $\frac{4.91}{6.02}$ X $\frac{10^{24}}{10^{23}}$ = 0.816×10^{1} = 8.16 moles Zn

8.16 moles H_2 x $\frac{22.4 \text{ liters } H_2}{1 \text{ mole } H_2}$ =

183 liters H_2