Review Exercise 8 - Answers

Balance the following equations and use the mole ratio from the balanced equation to complete the table which follows each equation:

1. **2** $H_2O_{(l)}$ -------> **2** $H_{2(g)}$ + **1** $O_{2(g)}$

2 $H_2O_{(l)}$ ------->	2 $H_{2(g)}$ +	1 $O_{2(g)}$
5.00 mol	**5.00 mol**	**2.50 mol**
1.20 mol	**1.20 mol**	0.600 mol
3.00 mol	3.00 mol	**1.50 mol**

2. **2** $Na_{(s)}$ + **2** $HOH_{(l)}$ -------> **1** $H_{2(g)}$ + **2** $NaOH_{(aq)}$

2 $Na_{(s)}$ +	2 $HOH_{(l)}$ ---------->	1 $H_{2(g)}$ +	2 $NaOH_{(aq)}$
8.0 mol	**8.0 mol**	**4.0 mol**	**8.0 mol**
0.20 mol	0.20 mol	**0.10 mol**	**0.20 mol**
9.60 mol	**9.60 mol**	4.80 mol	**9.60 mol**
16.0 mol	**16.0 mol**	**8.00 mol**	16.0 mol

3. **1** $Al_2(SO_4)_{3(aq)}$ + **6** $NH_4OH_{(aq)}$ -------> **2** $Al(OH)_{3(s)}$ + **3** $(NH_4)_2SO_{4(aq)}$

1 $Al_2(SO_4)_{3(aq)}$ +	6 $NH_4OH_{(aq)}$ ---------->	2 $Al(OH)_{3(s)}$ +	3 $(NH_4)_2SO_{4(aq)}$
3.00 mol	**18.0 mol**	**6.00 mol**	**9.00 mol**
0.333 mol	2.00 mol	**0.667 mol**	**1.00 mol**
0.500 mol	**3.00 mol**	1.00 mol	**1.50 mol**
0.333 mol	**2.00 mol**	**0.667 mol**	1.00 mol

4. **1** $C_4H_{8(g)}$ + **6** $O_{2(g)}$ --------> **4** $CO_{2(g)}$ + **4** $H_2O_{(g)}$

1 $C_4H_{8(g)}$ +	6 $O_{2(g)}$ -------->	4 $CO_{2(g)}$ +	4 $H_2O_{(g)}$
0.053 mol	**0.318 mol**	**0.212 mol**	0.212 mol
0.0300 mol	**0.180 mol**	0.120 mol	**0.120 mol**
0.0833 mol	0.500 mol	**0.333 mol**	**0.333 mol**
0.320 mol	**1.92 mol**	**1.28 mol**	**1.28 mol**

5. __**1**__ $P_{4(s)}$ + __**6**__ $I_{2(s)}$ --------> __**4**__ $PI_{3(s)}$

__**1**__ $P_{4(s)}$	+ __**6**__ $I_{2(s)}$	--------> __**4**__ $PI_{3(s)}$
0.705 mol	**4.23 mol**	2.82 mol
0.0660 mol	0.396 mol	**0.264 mol**
2.50 mol	**15.0 mol**	**10.0 mol**

6. Use the following equation to answer the questions below.

$N_{2(g)}$ + $3H_{2(g)}$ -------> $2NH_{3(g)}$

a) How many moles of hydrogen will react with 5.0 moles of nitrogen?

$5.0 \text{ mol } N_{2(g)} \times \frac{3 \text{ mol } H_{2(g)}}{1 \text{ mol } N_{2(g)}} = 15 \text{ mol } H_{2(g)}$

b) How many moles of hydrogen and nitrogen will react to produce 20 moles of ammonia?

The mole ratio is 1 mol $N_{2(g)}$: 3 mol $H_{2(g)}$: 2 mol $NH_{3(g)}$

20 moles of $NH_{3(g)}$ is10 times the 2 mol of $NH_{3(g)}$ in the equation.

Therefore 10 moles of $N_{2(g)}$ and 30 mol of $H_{2(g)}$ will be required to produce 20 moles of $NH_{3(g)}$

c) If 4.0 moles of hydrogen are used, how many moles of nitrogen are needed?

$4.0 \text{ mol } H_{2(g)} \times \frac{1 \text{ mol } N_{2(g)}}{3 \text{ mol } H_{2(g)}} = 1.3 \text{ mol } N_{2(g)}$

d) If 3.6 moles of nitrogen are used, how many moles of ammonia are produced?

$3.6 \text{ mol } N_{2(g)} \times \frac{2 \text{ mol } NH_{3(g)}}{1 \text{ mol } N_{2(g)}} = 7.2 \text{ mol } NH_{3(g)}$

e) If 0.673 moles of ammonia are produced, how many moles of hydrogen are needed?

$0.673 \text{ mol } NH_{3(g)} \times \frac{3 \text{ mol } H_{2(g)}}{2 \text{ mol } NH_{3(g)}} = 1.01 \text{ mol } H_{2(g)}$

f) If 2.3 moles of ammonia are produced, how many moles of nitrogen are needed?

$2.3 \text{ mol } NH_{3(g)} \times \frac{1 \text{ mol } N_{2(g)}}{2 \text{ mol } NH_{3(g)}} = 1.2 \text{ mol } N_{2(g)}$