Unit 8 Activity Sheet — Chemistry 30A

• do not need to insert "1" when balancing

A. Balance each of the following reactions and classify each reaction as combination, decomposition, single replacement, or double replacement.

Study handout on types of rxtns!

1. 2 $Ca(s)$ + ___ $O_2(g)$ -----> 2 $CaO(s)$ — synthesis or combination
2. 2 $KClO_3(s)$ -----> 2 $KCl(s)$ + 3 $O_2(g)$ — decomposition
3. ___ $Zn(s)$ + 2 $HCl(aq)$ -----> ___ $ZnCl_2(aq)$ + ___ $H_2(g)$ — single replacement
4. ___ $P_4(s)$ + 5 $O_2(g)$ ------> ___ $P_4O_{10}(s)$ — synthesis or combination
5. ___ $HCl(aq)$ + ___ $NaOH(aq)$ -----> ___ $NaCl(aq)$ + ___ H_2O — double replacement
6. ___ $CO_2(g)$ + ___ H_2O -----> ___ $H_2CO_3(aq)$ — synthesis or combination
7. ___ $Cu(s)$ + 2 $AgNO_3(aq)$ -----> 2 $Ag(s)$ + ___ $Cu(NO_3)_2$ — single replacement
8. ___ $N_2(g)$ + 3 $H_2(g)$ ------> 2 $NH_3(g)$ — synthesis or combination
9. ___ $Na_2O(s)$ + ___ H_2O ------> 2 $NaOH(aq)$ — synthesis/combination
10. 2 $HgO(s)$ -----> 2 $Hg(l)$ + ___ $O_2(g)$ — decomposition

B. Balance the following reactions.

1. 2 $NaCl$ + ___ H_2SO_4 -----> ___ $Na_2SO_4(aq)$ + 2 $HCl(aq)$
2. 3 Fe + 4 H_2O -----> ___ Fe_3O_4 + 4 H_2
3. 3 $Ca(OH)_2$ + 2 H_3PO_4 -----> ___ $Ca_3(PO_4)_2$ + 3 H_2O
4. ___ Na_2O + 2 HCl -----> 2 $NaCl$ + ___ H_2O
5. 2 KOH + ___ H_2SO_4 ------> ___ K_2SO_4 + 2 H_2O
6. ___ HNO_3 + ___ NH_4OH -----> ___ NH_4NO_3 + ___ H_2O
7. 2 NH_4OH + ___ H_2SO_4 ------> ___ $(NH_4)_2SO_4$ + 2 H_2O
8. 2 $Al(OH)_3$ + 3 H_2SO_4 ------> ___ $Al_2(SO_4)_3$ + 6 H_2O

C. Work these problems.

1. Calculate how many grams of sulfur dioxide is formed from burning 10 grams of sulfur. $S(s) + O_2(g) \text{ ------> } SO_2(g)$

$$10g \text{ of } S \times \frac{1 \text{ mole } S(s)}{32.0g} \times \frac{1 \text{ mole } SO_2(g)}{1 \text{ mole } S(s)} \times \frac{64.0g}{1 \text{ mole } SO_2} = 20.0g \text{ of } SO_2$$

2. How many grams of oxygen gas can be produced from 10 grams of potassium ($KClO_3$) chlorate? $2\ KClO_3 \text{ -----> } 2\ KCl\ (s) + 3O_2(g)$

molecular weight of $KClO_3$ = 122.5g/mole

$$10.0g\ KClO_3 \times \frac{1 \text{ mole } KClO_3}{122.5 g/\text{mole}} \times \frac{3 \text{ mole } O_2}{2 \text{ mole } KClO_3} \times \frac{32.0g}{1 \text{ mole } O_2} = 3.92\ g \text{ of } O_2(g)$$

3. How many grams of oxygen are required to burn 8.0 grams of methane (CH_4)?

$CH_4(g) + 2O_2(g) \text{ -----> } CO_2(g) + 2H_2O(g)$

↳ molecular weight = 16.0g/mole

$8.0g\ CH_4 \times \frac{1 mole\ CH_4}{16.0g} \times \frac{2 mol\ O_2}{1 mole\ CH_4} \times \frac{32.0g}{1 mole\ O_2} = 32.0g\ O_2$

4. How many grams of hydrogen are required to convert 7.0 grams of nitrogen into ammonia? $N_2(g) + 3H_2(g) \text{ -----> } 2NH_3(g)$

$7.0g\ N_2 \times \frac{1 mole\ N_2}{28g} \times \frac{3 mol\ H_2}{1 mol\ N_2} \times \frac{2.0g}{1 mol\ H_2} = 1.5g\ of\ H_2(g)$

D. Practice Quiz Questions.

1. Balance the following equation:

$3\ CaSO_4 + 2\ K_3PO_4 \text{ -----> } \_\_\_\ Ca_3(PO_4)_2 + 3\ K_2SO_4$

The sum of all the coefficients is

(a.) 9 b. 8 c. 6 d. 4 e. none of these

2. Balance the following equation:

$2\ KClO_3 \text{ -----> } 2\ KCl + 3\ O_2$

$\frac{2 moles\ KClO_3}{3 moles\ O_2} = \frac{1 mole\ KClO_3}{x\ moles\ O_2}$

How many moles of oxygen gas can be produced from the decomposition of one mole of $KClO_3$? $x = 1.5$ moles of $O_2(g)$

3. The equation, $N_2 + 3H_2 \text{ -----> } 2NH_3$ says

a. three atoms of hydrogen react with each molecule of nitrogen
b. two molecules of product are produced from every molecule of hydrogen
(c.) there are 6 atoms of hydrogen contained in the reaction products for every molecule of nitrogen which reacts
d. a gram of nitrogen will react with 3 grams of hydrogen

make sure you understand this one

4. Which set of coefficients balances this equation?

$3\ CH_4(g) \text{ -----> } \_\_\_\ C_3H_8(g) + 2\ H_2(g)$

a. 3,1,2 b. 3,2,1 (c.) 3,1,2 d. 3,2,3 e. 3,2,3

5. 1.00 gram of hydrogen gas (H_2) contains about

a. 6.02×10^{23} molecules
b. 6.02×10^{23} atoms
c. one atom
d. one mole
e. one molecule

6. When the equation, $Al + O_2 \text{ -----> } Al_2O_3$, is balanced, which term will appear?

a. $2\ Al_2$ b. 2 Al c. $3\ Al_2O_3$ (d.) $2\ Al_2O_3$ e. $2\ O_2$

$1.00g\ H_2(g) \times \frac{1 mole\ H_2}{2.0g\ H_2} \times \frac{6.02 \times 10^{23} molecules}{1 mole\ H_2} \times \frac{2 atoms\ H}{1 molecule\ H_2} = 6.02 \times 10^{23}\ atoms$