

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.

- $2 \text{Ca(s)} + \text{O}_2\text{(g)} \rightarrow 2 \text{CaO(s)}$ synthesis or combination
- $2 \text{KClO}_3\text{(s)} \rightarrow 2 \text{KCl(s)} + 3 \text{O}_2\text{(g)}$ decomposition
- $\text{Zn(s)} + 2 \text{HCl(aq)} \rightarrow \text{ZnCl}_2\text{(aq)} + \text{H}_2\text{(g)}$ single replacement
- $\text{P}_4\text{(s)} + 5 \text{O}_2\text{(g)} \rightarrow \text{P}_4\text{O}_{10}\text{(s)}$ synthesis or combination
- $\text{HCl(aq)} + \text{NaOH(aq)} \rightarrow \text{NaCl(aq)} + \text{H}_2\text{O}$ double replacement
- $\text{CO}_2\text{(g)} + \text{H}_2\text{O} \rightarrow \text{H}_2\text{CO}_3\text{(aq)}$ synthesis or combination
- $\text{Cu(s)} + 2 \text{AgNO}_3\text{(aq)} \rightarrow 2 \text{Ag(s)} + \text{Cu(NO}_3)_2$ single replacement
- $\text{N}_2\text{(g)} + 3 \text{H}_2\text{(g)} \rightarrow 2 \text{NH}_3\text{(g)}$ synthesis or combination
- $\text{Na}_2\text{O(s)} + \text{H}_2\text{O} \rightarrow 2 \text{NaOH(aq)}$ synthesis / combination
- $2 \text{HgO(s)} \rightarrow 2 \text{Hg(l)} + \text{O}_2\text{(g)}$ decomposition

B. Balance the following reactions.

- $2 \text{NaCl} + \text{H}_2\text{SO}_4 \rightarrow \text{Na}_2\text{SO}_4\text{(aq)} + 2 \text{HCl(aq)}$
- $3 \text{Fe} + 4 \text{H}_2\text{O} \rightarrow \text{Fe}_3\text{O}_4 + 4 \text{H}_2$
- $3 \text{Ca(OH)}_2 + 2 \text{H}_3\text{PO}_4 \rightarrow \text{Ca}_3\text{(PO}_4)_2 + 3 \text{H}_2\text{O}$
- $\text{Na}_2\text{O} + 2 \text{HCl} \rightarrow 2 \text{NaCl} + \text{H}_2\text{O}$
- $2 \text{KOH} + \text{H}_2\text{SO}_4 \rightarrow \text{K}_2\text{SO}_4 + 2 \text{H}_2\text{O}$
- $\text{HNO}_3 + \text{NH}_4\text{OH} \rightarrow \text{NH}_4\text{NO}_3 + \text{H}_2\text{O}$
- $2 \text{NH}_4\text{OH} + \text{H}_2\text{SO}_4 \rightarrow (\text{NH}_4)_2\text{SO}_4 + 2 \text{H}_2\text{O}$
- $2 \text{Al(OH)}_3 + 3 \text{H}_2\text{SO}_4 \rightarrow \text{Al}_2\text{(SO}_4)_3 + 6 \text{H}_2\text{O}$

C. Work these problems.

- Calculate how many grams of sulfur dioxide is formed from burning 10 grams of sulfur. $\text{S(s)} + \text{O}_2\text{(g)} \rightarrow \text{SO}_2\text{(g)}$

$$10\text{g of S} \times \frac{1 \text{ mole S(s)}}{32.0\text{g}} \times \frac{1 \text{ mole SO}_2\text{(g)}}{1 \text{ mole S(s)}} \times \frac{64.0\text{g}}{1 \text{ mole SO}_2} = 20.0\text{g of SO}_2$$

- How many grams of oxygen gas can be produced from 10 grams of potassium (KClO₃) chlorate? $2 \text{KClO}_3 \rightarrow 2 \text{KCl(s)} + 3 \text{O}_2\text{(g)}$

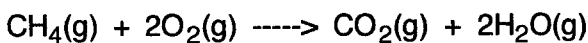
molecular weight of KClO₃ = 122.5g/mole

$$10.0\text{g KClO}_3 \times \frac{1 \text{ mole KClO}_3}{122.5\text{g/mole}} \times \frac{3 \text{ mole O}_2}{2 \text{ mole KClO}_3} \times \frac{32.0\text{g}}{1 \text{ mole O}_2} = 3.92\text{g of O}_2\text{(g)}$$

Study
handout
on types
of rxns!

Unit 8 activity sheet (continued)

3. How many grams of oxygen are required to burn 8.0 grams of methane (CH₄)?



↳ molecular weight = 16.0g/mole

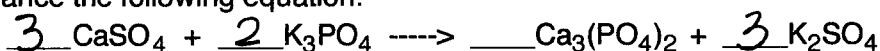
$$8.0\text{g CH}_4 \times \frac{1\text{mole CH}_4}{16.0\text{g}} \times \frac{2\text{mole O}_2}{1\text{mole CH}_4} \times \frac{32.0\text{g}}{1\text{mole O}_2} = 32.0\text{g O}_2$$

4. How many grams of hydrogen are required to convert 7.0 grams of nitrogen into ammonia? N₂(g) + 3H₂(g) → 2NH₃(g)

$$7.0\text{g N}_2 \times \frac{1\text{mole N}_2}{28\text{g}} \times \frac{3\text{mole H}_2}{1\text{mole N}_2} \times \frac{2.0\text{g}}{1\text{mole H}_2} = 1.5\text{g of H}_2(\text{g})$$

D. Practice Quiz Questions.

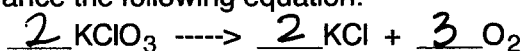
1. Balance the following equation:



The sum of all the coefficients is

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

2. Balance the following equation:



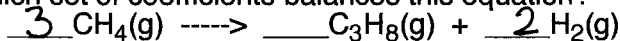
$$\frac{2\text{moles KClO}_3}{3\text{moles O}_2} = \frac{1\text{mole KClO}_3}{x\text{moles O}_2}$$

How many moles of oxygen gas can be produced from the decomposition of one mole of KClO₃? $X = 1.5\text{ moles of O}_2(\text{g})$

3. The equation, N₂ + 3H₂ → 2NH₃ 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

4. Which set of coefficients balances this equation?



- 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 (H₂) contains about

- a. 6.02 X 10²³ molecules d. one mole
 b. 6.02 X 10²³ atoms e. one molecule
 c. one atom

6. When the equation, Al + O₂ → Al₂O₃, is balanced, which term will appear?

- a. 2 Al₂ b. 2 Al c. 3 Al₂O₃ (d) 2 Al₂O₃ e. 2 O₂

$$1.00\text{g H}_2(\text{g}) \times \frac{1\text{mole H}_2}{2.0\text{g H}_2} \times \frac{6.02 \times 10^{23}\text{ molecules}}{1\text{mole H}_2} \times \frac{2\text{ atoms H}}{1\text{molecule H}_2} = 6.02 \times 10^{23}\text{ atoms}$$