

Chem 140 Worksheet 6 Writing and Balancing Equations 26 points

1. Write a balanced equations describing each of the following chemical reactions.

- (a) Solid calcium carbonate is heated and decomposes to solid calcium oxide and carbon dioxide gas.
- (b) Gaseous butane, C_4H_{10} , reacts with diatomic oxygen gas to yield gaseous carbon dioxide and water vapor.
- (c) Aqueous solutions of magnesium chloride and sodium hydroxide react to produce solid magnesium hydroxide and aqueous sodium chloride.
- (d) Water vapor reacts with sodium metal to produce solid sodium hydroxide and hydrogen gas.

2. Colorful fireworks often involve the decomposition of barium nitrate and potassium chlorate and the reaction of the metals magnesium, aluminum, and iron with oxygen.

- (a) Write the formulas of barium nitrate and potassium chlorate.
- (b) The decomposition of solid potassium chlorate leads to the formation of solid potassium chloride and diatomic oxygen gas. Write an equation for the reaction.
- (c) The decomposition of solid barium nitrate leads to the formation of solid barium oxide, diatomic nitrogen gas, and diatomic oxygen gas. Write an equation for the reaction.
- (d) Write separate equations for the reactions of the solid metals magnesium, aluminum, and iron with diatomic oxygen gas to yield the corresponding metal oxides. (Assume the iron oxide contains Fe^{3+} ions.)

3. Aqueous hydrofluoric acid is used to etch glass and to analyze minerals for their silicon content. Hydrofluoric acid will also react with sand (silicon dioxide). Write an equation for the reaction of solid silicon dioxide with hydrofluoric acid to yield gaseous silicon tetrafluoride and liquid water.

Balance the Following:

- a. $\underline{\hspace{1cm}} \text{Na}_3\text{PO}_4 + \underline{\hspace{1cm}} \text{KOH} \rightarrow \underline{\hspace{1cm}} \text{NaOH} + \underline{\hspace{1cm}} \text{K}_3\text{PO}_4$
- b. $\underline{\hspace{1cm}} \text{MgF}_2 + \underline{\hspace{1cm}} \text{Li}_2\text{CO}_3 \rightarrow \underline{\hspace{1cm}} \text{MgCO}_3 + \underline{\hspace{1cm}} \text{LiF}$
- c. $\underline{\hspace{1cm}} \text{P}_4 + \underline{\hspace{1cm}} \text{O}_2 \rightarrow \underline{\hspace{1cm}} \text{P}_2\text{O}_3$
- d. $\underline{\hspace{1cm}} \text{RbNO}_3 + \underline{\hspace{1cm}} \text{BeF}_2 \rightarrow \underline{\hspace{1cm}} \text{Be}(\text{NO}_3)_2 + \underline{\hspace{1cm}} \text{RbF}$
- e. $\underline{\hspace{1cm}} \text{AgNO}_3 + \underline{\hspace{1cm}} \text{Cu} \rightarrow \underline{\hspace{1cm}} \text{Cu}(\text{NO}_3)_2 + \underline{\hspace{1cm}} \text{Ag}$
- f. $\underline{\hspace{1cm}} \text{CF}_4 + \underline{\hspace{1cm}} \text{Br}_2 \rightarrow \underline{\hspace{1cm}} \text{CBr}_4 + \underline{\hspace{1cm}} \text{F}_2$
- g. $\underline{\hspace{1cm}} \text{HCN} + \underline{\hspace{1cm}} \text{CuSO}_4 \rightarrow \underline{\hspace{1cm}} \text{H}_2\text{SO}_4 + \underline{\hspace{1cm}} \text{Cu}(\text{CN})_2$
- h. $\underline{\hspace{1cm}} \text{GaF}_3 + \underline{\hspace{1cm}} \text{Cs} \rightarrow \underline{\hspace{1cm}} \text{CsF} + \underline{\hspace{1cm}} \text{Ga}$
- i. $\underline{\hspace{1cm}} \text{BaS} + \underline{\hspace{1cm}} \text{PtF}_2 \rightarrow \underline{\hspace{1cm}} \text{BaF}_2 + \underline{\hspace{1cm}} \text{PtS}$
- j. $\underline{\hspace{1cm}} \text{N}_2 + \underline{\hspace{1cm}} \text{H}_2 \rightarrow \underline{\hspace{1cm}} \text{NH}_3$
- k. $\underline{\hspace{1cm}} \text{NaF} + \underline{\hspace{1cm}} \text{Br}_2 \rightarrow \underline{\hspace{1cm}} \text{NaBr} + \underline{\hspace{1cm}} \text{F}_2$
- l. $\underline{\hspace{1cm}} \text{Pb}(\text{OH})_2 + \underline{\hspace{1cm}} \text{HCl} \rightarrow \underline{\hspace{1cm}} \text{H}_2\text{O} + \underline{\hspace{1cm}} \text{PbCl}_2$
- m. $\underline{\hspace{1cm}} \text{AlBr}_3 + \underline{\hspace{1cm}} \text{K}_2\text{SO}_4 \rightarrow \underline{\hspace{1cm}} \text{KBr} + \underline{\hspace{1cm}} \text{Al}_2(\text{SO}_4)_3$
- n. $\underline{\hspace{1cm}} \text{CH}_4 + \underline{\hspace{1cm}} \text{O}_2 \rightarrow \underline{\hspace{1cm}} \text{CO}_2 + \underline{\hspace{1cm}} \text{H}_2\text{O}$
- o. $\underline{\hspace{1cm}} \text{Na}_3\text{PO}_4 + \underline{\hspace{1cm}} \text{CaCl}_2 \rightarrow \underline{\hspace{1cm}} \text{NaCl} + \underline{\hspace{1cm}} \text{Ca}_3(\text{PO}_4)_2$
- p. $\underline{\hspace{1cm}} \text{K} + \underline{\hspace{1cm}} \text{Cl}_2 \rightarrow \underline{\hspace{1cm}} \text{KCl}$
- q. $\underline{\hspace{1cm}} \text{Al} + \underline{\hspace{1cm}} \text{HCl} \rightarrow \underline{\hspace{1cm}} \text{H}_2 + \underline{\hspace{1cm}} \text{AlCl}_3$
- r. $\underline{\hspace{1cm}} \text{S} + \underline{\hspace{1cm}} \text{HNO}_3 \rightarrow \underline{\hspace{1cm}} \text{H}_2\text{SO}_4 + \underline{\hspace{1cm}} \text{NO}_2 + \underline{\hspace{1cm}} \text{H}_2\text{O}$
- s. $\underline{\hspace{1cm}} \text{Cu} + \underline{\hspace{1cm}} \text{HNO}_3 \rightarrow \underline{\hspace{1cm}} \text{Cu}(\text{NO}_3)_2 + \underline{\hspace{1cm}} \text{NO} + \underline{\hspace{1cm}} \text{H}_2\text{O}$
- t. $\underline{\hspace{1cm}} \text{N}_2 + \underline{\hspace{1cm}} \text{H}_2 \rightarrow \underline{\hspace{1cm}} \text{NH}_3$
- u. $\underline{\hspace{1cm}} \text{CO}_2 + \underline{\hspace{1cm}} \text{H}_2\text{O} \rightarrow \underline{\hspace{1cm}} \text{C}_6\text{H}_{12}\text{O}_6 + \underline{\hspace{1cm}} \text{O}_2$
- v. $\underline{\hspace{1cm}} \text{H}_2\text{S} + \underline{\hspace{1cm}} \text{O}_2 \rightarrow \underline{\hspace{1cm}} \text{H}_2\text{SO}_4$
- w. $\underline{\hspace{1cm}} \text{C}_6\text{H}_{12}\text{O}_6 \rightarrow \underline{\hspace{1cm}} \text{CH}_3\text{CH}_2\text{OH} + \underline{\hspace{1cm}} \text{CO}_2$
- x. $\underline{\hspace{1cm}} \text{CO}_2 + \underline{\hspace{1cm}} \text{H}_2\text{S} \rightarrow \underline{\hspace{1cm}} \text{C}_6\text{H}_{12}\text{O}_6 + \underline{\hspace{1cm}} \text{S} + \underline{\hspace{1cm}} \text{H}_2\text{O}$
- y. $\underline{\hspace{1cm}} \text{C}_6\text{H}_{12}\text{O}_6 \rightarrow \underline{\hspace{1cm}} \text{CH}_3\text{CHOHCOOH}$
- z. $\underline{\hspace{1cm}} \text{NH}_4\text{Cl} + \underline{\hspace{1cm}} \text{O}_2 \rightarrow \underline{\hspace{1cm}} \text{HNO}_2 + \underline{\hspace{1cm}} \text{HCl} + \underline{\hspace{1cm}} \text{H}_2\text{O}$