

CH 151 Problem Set #3 - Chapter 4

- * **Complete problem set on separate pieces of paper** showing all work, circling final answers, etc.
 - * **Section 01:** Self correct problem set during recitation (**July 12, 8 AM**) before turning in to the instructor
 - * **Section W1:** Watch recitation video here: <http://mhchem.org/t/c.htm> Self correct your work while watching
Email problem set (mike.russell@mhcc.edu) by **11:59 PM Wed, July 12**
 - * **Important Tables and/or Constants:** periodic table (<http://mhchem.org/pertab>)
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1. What do the symbols in parentheses stand for in the following equations?
 - a. $\text{PCl}_3(\text{l}) + \text{Cl}_2(\text{g}) \rightarrow \text{PCl}_5(\text{s})$
 - b. $\text{NaCl}(\text{aq}) + \text{AgNO}_3(\text{aq}) \rightarrow \text{AgCl}(\text{s}) + \text{NaNO}_3(\text{aq})$
2. For each of the following balanced equations, indicate how many atoms of each element are present on the reactant and product sides of the chemical equation.
 - a. $4 \text{Al} + 3 \text{O}_2 \rightarrow 2 \text{Al}_2\text{O}_3$
 - b. $2 \text{Na} + 2 \text{H}_2\text{O} \rightarrow 2 \text{NaOH} + \text{H}_2$
 - c. $2 \text{Co} + 3 \text{HgCl}_2 \rightarrow 2 \text{CoCl}_3 + 3 \text{Hg}$
 - d. $\text{H}_2\text{SO}_4 + 2 \text{NH}_3 \rightarrow (\text{NH}_4)_2\text{SO}_4$
3. Balance the following chemical equations.
 - a. $\text{Fe} + \text{O}_2 \rightarrow \text{Fe}_2\text{O}_3$
 - b. $\text{NaClO}_3 \rightarrow \text{NaCl} + \text{O}_2$
 - c. $\text{Au}_2\text{S}_3 + \text{H}_2 \rightarrow \text{H}_2\text{S} + \text{Au}$
 - d. $\text{NH}_3 + \text{O}_2 \rightarrow \text{N}_2\text{O} + \text{H}_2\text{O}$
4. Balance the following combustion equations.
 - a. $\text{C}_2\text{H}_4 + \text{O}_2 \rightarrow \text{CO}_2 + \text{H}_2\text{O}$
 - b. $\text{C}_6\text{H}_{12} + \text{O}_2 \rightarrow \text{CO}_2 + \text{H}_2\text{O}$
 - c. $\text{C}_3\text{H}_6\text{O} + \text{O}_2 \rightarrow \text{CO}_2 + \text{H}_2\text{O}$
 - d. $\text{C}_5\text{H}_{10}\text{O}_2 + \text{O}_2 \rightarrow \text{CO}_2 + \text{H}_2\text{O}$
5. Balance the following chemical equations.
 - a. $\text{Al} + \text{Sn}(\text{NO}_3)_2 \rightarrow \text{Al}(\text{NO}_3)_3 + \text{Sn}$
 - b. $\text{Na}_2\text{CO}_3 + \text{Mg}(\text{NO}_3)_2 \rightarrow \text{MgCO}_3 + \text{NaNO}_3$
 - c. $\text{Al}(\text{NO}_3)_3 + \text{H}_2\text{SO}_4 \rightarrow \text{Al}_2(\text{SO}_4)_3 + \text{HNO}_3$
 - d. $\text{Ba}(\text{C}_2\text{H}_3\text{O}_2)_2 + (\text{NH}_4)_3\text{PO}_4 \rightarrow \text{Ba}_3(\text{PO}_4)_2 + \text{NH}_4\text{C}_2\text{H}_3\text{O}_2$
6. Classify each of the following chemical reactions as precipitation, decomposition, single-replacement, combustion, acid-base or combination.
 - a. $3 \text{CuSO}_4 + 2 \text{Al} \rightarrow \text{Al}_2(\text{SO}_4)_3 + 3 \text{Cu}$
 - b. $\text{K}_2\text{CO}_3 \rightarrow \text{K}_2\text{O} + \text{CO}_2$
 - c. $2 \text{AgNO}_3 + \text{K}_2\text{SO}_4 \rightarrow \text{Ag}_2\text{SO}_4(\text{s}) + 2 \text{KNO}_3$
 - d. $2 \text{SO}_2 + \text{O}_2 \rightarrow 2 \text{SO}_3$
 - e. $\text{H}_2\text{SO}_4 + 2 \text{KOH} \rightarrow 2 \text{H}_2\text{O} + \text{K}_2\text{SO}_4$
 - f. $\text{CH}_4 + 2 \text{O}_2 \rightarrow \text{CO}_2 + 2 \text{H}_2\text{O}$

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7. Identify the products of, and then write a balanced chemical equation for, each of the following chemical reactions.
 - a. $\text{AlCl}_3 \rightarrow ? + ?$ (decomposition reaction into elements)
 - b. $\text{HNO}_3 + \text{NaOH} \rightarrow ? + ?$ (acid-base reaction)
 - c. $\text{Al} + \text{Ni}(\text{NO}_3)_2 \rightarrow ? + ?$ (single replacement reaction)
 - d. $\text{Be} + \text{N}_2 \rightarrow ?$ (combination reaction)
8. Write a balanced chemical equation for the thermal decomposition of each of the following metal carbonates to its metal oxide and carbon dioxide.
 - a. BeCO_3
 - b. Li_2CO_3
 - c. ZnCO_3
 - d. Cs_2CO_3
9. Write a balanced chemical equation for the combustion of each of the following hydrocarbons in air.
 - a. C_5H_{12}
 - b. C_4H_6
 - c. C_7H_8
 - d. C_8H_{18}
10. Write a balanced chemical equation for the combustion of each of the following hydrocarbons in air.
 - a. $\text{C}_2\text{H}_4\text{O}$
 - b. $\text{C}_5\text{H}_{10}\text{O}$
 - c. $\text{C}_2\text{H}_4\text{O}_2$
 - d. $\text{C}_3\text{H}_6\text{O}_2$
11. Balance the following chemical equations.
 - a. $\text{NH}_3 + \text{O}_2 + \text{CH}_4 \rightarrow \text{HCN} + \text{H}_2\text{O}$
 - b. $\text{KClO}_3 + \text{HCl} \rightarrow \text{KCl} + \text{Cl}_2 + \text{H}_2\text{O}$