Name_____ Date_____

AP Chemistry

Reaction Prediction – 5

For each of the following eight reactions, in part (i) write a BALANCED equation and in part (ii) answer the question about the reaction. In part (i), coefficients should be in terms of lowest whole numbers. Assume that solutions are aqueous unless otherwise indicated. Represent substances in solutions as ions if the substances are extensively ionized. Omit formulas for any ions or molecules that are unchanged by the reaction.

a) Solid ammonium nitrate is heated to temperatures above 300^0C.

i. $2NH_4NO_3(s) \longrightarrow 2N_2(g) + 1\ O_2(g) + 4H_2O(g)$ or $NH_4NO_3(s) \longrightarrow N_2O_{(g)} + 2H_2O_{(g)}$

ii. The reaction is performed in a crucible. Compare the mass of the crucible before and after the reaction.
All products are gases so mass before will appear greater. Although if gasses were captured they would be the same.

b) Liquid bromine is shaken with sodium iodide solution

i. $Br_2\ (l) + 2I^-(aq) \longrightarrow 2Br^-(aq) + I_2(aq)$ or $Br_{2(l)} + 3I^-_{(aq)} \longrightarrow 2Br^-_{(aq)} + I_3^-\ (aq)$

ii. State the reducing agent. Explain.
Br_2 is the reducing agent (Bromine is oxidized)

c) Solutions of cobalt (II) nitrate and sodium hydroxide are mixed.

i. $Co^{2+)}\ (aq) + 2OH^-(aq) \longrightarrow Co(OH)_2(s)$

ii. What observation indicates a reaction occurred?
Color Change

d) Ethene gas is burned in air.

i. $C_2H_4(g) + O_2(g) \longrightarrow CO_2(g) + 2H_2O(g)$

ii. Will the pressure increase, decrease or stay the same? Explain.
2 moles gas $\longrightarrow$ 3 moles gas pressure will increase.

e) A solution of sodium bromide is added to an acidified solution of potassium bromate.

i. $Br^-(aq) + 6H^-(aq) + BrO_3^-(aq) + 3H_2O(l)$

ii. What are the oxidation states of bromine?
$Br^- = -1$ Br in $BrO^-_3 = +5$ $Br_2 = 0$

f) Carbon dioxide gas is passed over hot, solid sodium oxide.

i. $CO_2(g) + Na_2O(s) \longrightarrow Na_2CO_3(s)$

ii. Explain the mass change of the solid before and after the reaction.
Mass increases due to the addition of carbon and more oxygen.

g) Solutions of potassium permanganate and sodium oxalate are mixed.(hint pg 68)

i. $8H^+\ 2MnO_4^-(aq) + 3C_2O_4^{2-}(aq) \longrightarrow 2MnO_2(s) + 6CO_2(g) + 4H_2O$

ii. Permanganate is a strong oxidizing agent. Show the oxidation half reaction.
$C_20_4^{2-} \longrightarrow 2C0_2 + 2e^-$

h) Equal volumes of equimolar solutions of phosphoric acid and potassium hydroxide are mixed

i. $H_3PO_4(aq) + OH_-(aq) \longrightarrow H_2PO_4^-(aq) + HOH(l)$

ii. Will the resulting solution be acidic, neutral or basic? Explain.
Weak acid + Strong base $\longrightarrow$ acidic solution.

Reaction predictions from:
Hague, G., & Smith, J. (2001). *The Ultimate Chemical Equations Handbook*. Batavia, IL: Flinn Scientific, Inc.
Correlating questions (ii) from:
Rodney Schmitz (2007) Moore County Schools, NC