

CH1020 Exercises (Worksheet 11)

1. What is the oxidation number of nitrogen in each of the following species:

- a. N_2
- b. N_2H_4
- c. NH_4^+
- d. NO_2

2. Determine the oxidation numbers for each element in the following substances:

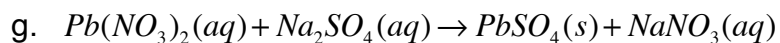
- a. SO_2
- b. $HBrO$
- c. PF_3
- d. K_2O_2
- e. $LiCoO_2$
- f. $NaAlH_4$
- g. $HClO_2$
- h. $BaCrO_4$
- i. HSO_4^-

3. Which element is oxidized and which is reduced in the following reactions:

- a. $N_2(g) + 3H_2(g) \rightarrow 2NH_3(g)$
- b. $3Fe(NO_3)_2(aq) + 2Al(s) \rightarrow 3Fe(s) + 2Al(NO_3)_3(aq)$
- c. $PbS(s) + 4H_2O_2(aq) \rightarrow PbSO_4(s) + 4H_2O(g)$
- d. $Cl_2(aq) + 2NaI(aq) \rightarrow I_2(aq) + 2NaCl(aq)$

4. Which of the following reactions are redox reactions? For those that are, indicate which element is the oxidizing agent and which is the reducing agent. For those that are not redox reactions, indicate whether they are precipitation or neutralization reactions.

- a. $P_4(s) + 10HClO(aq) + 6H_2O(l) \rightarrow 4H_3PO_4(aq) + 10HCl(aq)$
- b. $Br_2(l) + 2K(s) \rightarrow KBr(s)$
- c. $ZnCl_2(aq) + 2NaOH(aq) \rightarrow Zn(OH)_2(s) + 2NaCl(aq)$
- d. $Ba(s) + Cl_2(g) \rightarrow BaCl_2(s)$
- e. $HBr(aq) + KOH(aq) \rightarrow H_2O(l) + KBr(aq)$
- f. $2MnCO_3(s) + O_2(g) \rightarrow 2MnO_2(s) + 2CO_2(g)$



5. Using the activity series, write balanced chemical equations for the following reactions. If no reaction occurs, write NR.

- a. Nickel metal is added to a solution of copper(II)nitrate
- b. Zinc metal is added to a solution of magnesium sulfate
- c. Hydrobromic acid solution is added to tin metal
- d. Hydrogen gas is bubbled through an aqueous solution of nickel(II)chloride
- e. Aluminum metal is added to a solution of cobalt(II)sulfate
- f. Hydrogen gas is bubbled through a solution of silver nitrate
- g. Hydrochloric acid is added to gold metal