OXIDATION-REDUCTION REACTIONS
ADDITIONAL PRACTICE

I. After studying sections 4.6 – 4.7 in your text, determine the oxidation number for each element in the following compounds. Answers are listed at the end of the worksheet.

Hint: Always work from the outside (of formula) to determine the oxidation number for transition metals and/or nonmetals in polyatomic ions.

(a) S₈       (b) TiCl₄       (c) N₂O₄       (d) H₃PO₄       (e) Cr₂(SO₄)₃       (f) Fe(NO₂)₃

II. Determine the oxidation numbers. Label which reactant species is oxidized and which is reduced; then label which reactant is the oxidizing agent and which is the reducing agent.

(a) 4 Fe + 3 O₂ → 2 Fe₂O₃

Each Fe lost 3 e⁻ so Fe is oxidized & is reducing agent.
Each O gained 2 e⁻ so O₂ was reduced & is oxidizing agent.

(b) Mg + 2 AgNO₃ → Mg(NO₃)₂ + 2 Ag

Each Mg lost 2 e⁻ so Mg is oxidized & is reducing agent.
Each Ag gained 1 e⁻ so Ag in AgNO₃ was reduced & AgNO₃ is oxidizing agent.

(c) I₂ + 2 S₂O₃²⁻ → S₄O₆²⁻ + 2 I⁻

Each S lost 0.5 e⁻ so S in S₂O₃²⁻ is oxidized & S₂O₃²⁻ is reducing agent.
Each I gained 1 e⁻ so I₂ was reduced & is oxidizing agent.

(c) 3 H₃AsO₃ + BrO₃⁻ → Br⁻ + 3 H₃AsO₄

ANSWERS:

I. (a) S = 0       (b) Ti=4+     Cl=1–
     (c) N=4+     O=2–       (d) H=1+     P=5+     O=2–
     (e) Cr=3+     S=6+     O=2–       (f) Fe=3+     N=3+     O=2–

II. 0 0 3+ 2–

(a) 4 Fe + 3 O₂ → 2 Fe₂O₃

(b) Mg + 2 AgNO₃ → Mg(NO₃)₂ + 2 Ag

(c) I₂ + 2 S₂O₃²⁻ → S₄O₆²⁻ + 2 I⁻
(d) \[ 2 \text{K} + 2 \text{H}_2\text{O} \rightarrow 2 \text{KOH} + \text{H}_2 \]

Each K lost 1 e\(^-\) so K is oxidized & is reducing agent.
Each H gained 1e\(^-\) so H in H\(_2\)O was reduced & H\(_2\)O is oxidizing agent.

(e) \[ 3 \text{H}_3\text{AsO}_3 + \text{BrO}_3^- \rightarrow \text{Br}^- + 3 \text{H}_3\text{AsO}_4 \]

Each As lost 2 e\(^-\) so As in H\(_3\)AsO\(_3\) is oxidized & H\(_3\)AsO\(_3\) is reducing agent.
Each Br gained 6e\(^-\) so Br in BrO\(_3^-\) was reduced & BrO\(_3^-\) is oxidizing agent.