Unit 8, Lesson 02: Answers to Practice with Oxidation Numbers

1. Find the oxidation numbers of the elements in **bold** print.

   a) HClO Cl is 1+  
   b) KClO₃ Cl is 5+  
   c) MnO₂ Mn is 4+  
   d) PbSO₄ Pb is 2+  
   e) NaIO₄ I is 7+  
   f) ClO₄⁻ Cl is 7+  
   g) Na₂O₂ O is 1⁻  
   h) K₂SO₄ S is 6+  
   i) NH₄⁺ N is 3⁻  

2. State whether the change is an oxidation or a reduction.

   a) MnO₄⁻ becomes MnO₄²⁻ **reduction**  
   b) N₂ becomes NH₃ **reduction**  
   c) O²⁻ becomes O₂ **oxidation**  
   d) P₄O₆ becomes P₄O₁₀ **oxidation**  
   e) NH₃ becomes N₂O **oxidation**  
   f) SO₄²⁻ becomes S₂O₃²⁻ **reduction**

3. Identify the oxidizing and reducing agents in the following unbalanced reactions:

   \[ \text{I oxidation number goes from 0 to 1⁻. It is reduced it is the oxidizing agent.} \]

   a) \[ \text{I}_2 + \text{H}_2\text{S} \rightarrow \text{HI} + \text{S} \]

   S oxidation number goes from 2⁻ to 0. It is oxidized it is a reducing agent.

   \[ \text{Zn oxidation number goes from 0 to 2+. It is oxidized it is the reducing agent.} \]

   b) \[ \text{Zn} + \text{HNO}_₃ \rightarrow \text{Zn(NO}_₃)₂ + \text{NO}_₂ + \text{H}_₂\text{O} \]

   N oxidation number goes from 5⁺ to 4+. It is reduced it is an oxidizing agent.

   \[ \text{Ag oxidation number goes from 1⁺ to 0. It is reduced it is the oxidizing agent.} \]

   c) \[ \text{Ag}_₂\text{O} + \text{NH}_₃ \rightarrow \text{Ag} + \text{H}_₂\text{O} + \text{N}_₂ \]

   N oxidation number goes from 3⁻ to 0. It is oxidized it is a reducing agent.
d) \( \text{H}_2\text{O} + \text{ClO}_3^{1-} + \text{SO}_2 \rightarrow \text{SO}_4^{2-} + \text{HCl} \)

S oxidation number goes from 4+ to 6+. It is oxidized it is a reducing agent.

Cr oxidation number goes from 6+ to 3+. It is reduced it is the oxidizing agent.

e) \( \text{K}_2\text{Cr}_2\text{O}_7 + \text{HBr} \rightarrow \text{KBr} + \text{CrBr}_3 + \text{H}_2\text{O} + \text{Br}_2 \)

Br oxidation number goes from 1– to 0. It is oxidized it is a reducing agent.

Sn oxidation number goes from 2+ to 4+. It is oxidized it is the reducing agent.

f) \( \text{SnCl}_2 + \text{PbCl}_4 \rightarrow \text{SnCl}_4 + \text{PbCl}_2 \)

Pb oxidation number goes from 4+ to 2+. It is reduced it is an oxidizing agent.

Sb oxidation number goes from 0 to 3+. It is oxidized it is the reducing agent.

\( \text{Sb} + \text{Cl}_2 \rightarrow \text{SbCl}_3 \)

Cl oxidation number goes from 0 to 1–. It is reduced it is an oxidizing agent.

I oxidation number goes from 1– to 0. It is oxidized it is the reducing agent.

\( \text{NaI} + \text{H}_2\text{SO}_4 \rightarrow \text{H}_2\text{S} + \text{I}_2 + \text{Na}_2\text{SO}_4 + \text{H}_2\text{O} \)

S oxidation number goes from 6+ to 2–. It is reduced it is an oxidizing agent.