

**REDOX REACTIONS**

## Chapters 4 &amp; 20

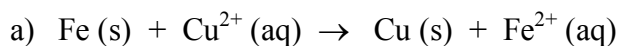
1. In the compounds below, assign oxidation numbers to the underlined element:

- |  |           |  |            |
|--|-----------|--|------------|
| a) H <sub>3</sub> <u>P</u> O <sub>2</sub>  | P : _____ | d) H <sub>2</sub> <u>C</u> O             | C : _____  |
| b) Na <sub>2</sub> <u>C</u> O <sub>4</sub> | C : _____ | e) <u>C</u> lF <sub>4</sub> <sup>-</sup> | Cl : _____ |
| c) Mn <u>S</u> O <sub>4</sub>              | S : _____ | g) Al <u>H</u> <sub>3</sub>              | H : _____  |

2. Identify which substance is oxidized and which substance is reduced in each of the following redox reactions.

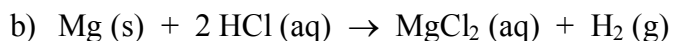
- |  |                |               |
|--|----------------|---------------|
| a) 2 Al + 3 Cl <sub>2</sub> → 2 AlCl <sub>3</sub>                            | oxidized _____ | reduced _____ |
| b) 2 NiS + 3 O <sub>2</sub> → 2 NiO + 2 SO <sub>2</sub>                      | oxidized _____ | reduced _____ |
| c) 3 H <sub>2</sub> S + 2 HNO <sub>3</sub> → 3 S + 2 NO + 4 H <sub>2</sub> O | oxidized _____ | reduced _____ |

3. For each reaction shown below, write oxidation and reduction half-reactions.



Oxidation ½ reaction:

Reduction ½ reaction:



Oxidation ½ reaction:

Reduction ½ reaction:

**BALANCING REDOX REACTIONS**

## Half-Reaction Method

1. Assign oxidation number to each element and identify the substance being oxidized and the substance being reduced.
2. Write oxidation and reduction half-reactions. In oxidation half-reaction electrons should appear on the product side, and in the reduction half-reaction they should appear on the reactant side.
3. Balance each half-reaction with respect to all elements, except H and O.

**For Acid Solutions:**

4. Add the appropriate number of H<sub>2</sub>O molecules to the deficient side to balance O.
5. Add H<sup>+</sup> to the deficient side to balance H.

**For Basic Solutions:**

4. For each deficient O:  
Add two (2) hydroxides, OH<sup>-</sup>, to the deficient side.  
Add one (1) water, H<sub>2</sub>O, to the other side.
5. For each deficient H:  
Add one (1) water, H<sub>2</sub>O, to the deficient side.  
Add one (1) hydroxide, OH<sup>-</sup>, to the other side.

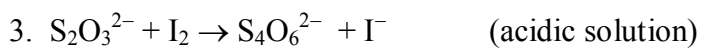
Balance each of the following redox reactions using the half-reaction method:



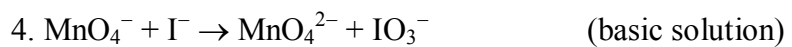
Oxidation	HALF-REACTION
<hr style="width: 50%; margin: 0 auto;"/> element      # of e <sup>-</sup>	
Reduction	HALF-REACTION
<hr style="width: 50%; margin: 0 auto;"/> element      # of e <sup>-</sup>	
Balanced total reaction	



Oxidation  ----- element    # of e <sup>-</sup>	HALF-REACTION
Reduction  ----- element    # of e <sup>-</sup>	HALF-REACTION
Balanced total reaction	



Oxidation  ----- element    # of e <sup>-</sup>	HALF-REACTION
Reduction  ----- element    # of e <sup>-</sup>	HALF-REACTION
Balanced total reaction	



Oxidation  ----- element    # of e <sup>-</sup>	HALF-REACTION
Reduction  ----- element    # of e <sup>-</sup>	HALF-REACTION
Balanced total reaction	



Oxidation  ----- element    # of e <sup>-</sup>	HALF-REACTION
Reduction  ----- element    # of e <sup>-</sup>	HALF-REACTION
Balanced total reaction	