

This is ACA # 30. It is OK to use your textbook, but if you can answers the questions without it that is OK too.

I recommend you print out this page and bring it to class. [Click here](#) to show a set of five ACA30 student responses, randomly selected from all of the student responses thus far, in a new window.

John , here are [your responses](#) to the ACA and the [Expert's response](#).

1. In Section 4.6 in Chapter 4 on page 200 are a set of rules for assigning oxidation states/numbers. An expanded set of rules are;

A. Any atom in a pure element or molecule such as O₂, H₂, N₂, P₄, or Zn has an oxidation number of zero.

B. For ions consisting of a single atom, the oxidation number is equal to the charge on the ion; Cl⁻ has an oxidation number of -1 and Zn²⁺ has an oxidation number of +2.

C. Fluorine is always -1.

D. Chlorine, bromine and iodine are -1 except in compounds with fluorine or oxygen (both of which have higher electronegativities).

E. The oxidation number of hydrogen is +1 except when bound to a metal (hydrogen is more electronegative).

F. The oxidation number of oxygen is usually -2 (except in H₂O₂ when oxygen has an oxidation number of -1)..

G. The sum of the oxidation numbers in a neutral compound must be zero.

H. The sum of the oxidation numbers for a polyatomic ion must equal the ion charge.

Assign the oxidation numbers to the following elements in the following compounds:

a) Al₂O₃

Element	Oxidation number
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Al	3+
	+3
O	2-
	-2

79%

+6 14%
0 7%

86%

-6 7%
4 7%b) PO_4^{-3}

Element Oxidation number

P	5+
	+5

86%

3 7%
0 7%

O	2-
	-2

57%

-8 21%
2 7%
4 7%
-1 7%c) $\text{Mg}(\text{NO}_3)_2$

Element Oxidation number

Mg	2+
	+2

86%

N	5+
	+5

79%

O	2-
	-2

57%

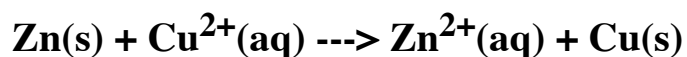
d) NH_4^+

Element	Oxidation number	
N	3-	79%
	-3	
H	1+	86%
	+1	

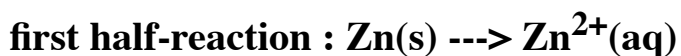
e) Na_2SO_4

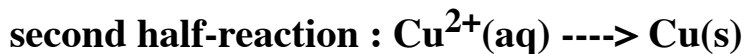
Element	Oxidation number	
Na	1+	65%
	+1	
O	2-	64%
	-2	
S	6+	57%
	+6	

2. The overall reaction

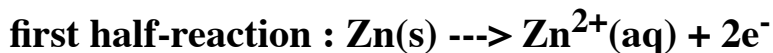


can be broken into two half-reactions that reflect which element lost electrons and which element gained electrons. If we divide the overall reaction into two half-reactions based on the elements we would have

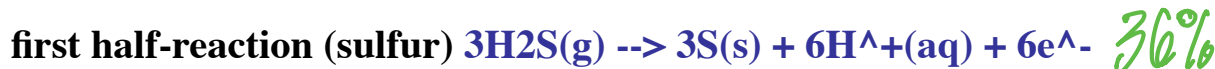
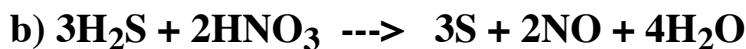
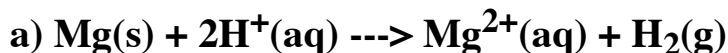




Notice that the number of elements is balanced for each of these half-reactions, but the charge is not. For the first half-reaction the charge is 0 (zero) on the reactants side and +2 on the products side. To balance the charge in the half-reaction we must add two electrons ($2e^-$ to the right side of the half-reaction). When we look at the second half-reaction it is clear two electrons must be added to the left side of the half-reaction.



Check out that when we add the first and second half-reactions together the electrons cancel and the overall reaction is the same as we had when we started. Being able to recognize the half-reactions given the overall reaction is important in Chapter 19. Lets try a few examples; NOTE: a is easy, b is a little more difficult, c is disgusting!



first half-reaction $8e^- + 8H^+(aq) + K_2S_5(s) + 2HCl(g) \rightarrow 5H_2S(g) + 2KCl(s)$ 21%

$K_2S_5(s) + 2HCl(g) \rightarrow 5S(s) + 2KCl(s) + 2H^+ + 2e^-$

second half-reaction $K_2S_5(s) + 2HCl(g) \rightarrow 5S(s) + 2KCl(s) + 2H^+(aq) + 2e^-$

$8e^- + 8H^+ + K_2S_5(s) + 2HCl(g) \rightarrow 5H_2S(g) + 2KCl(s)$

3. Is there anything about the questions that you feel you do not understand? List your concerns/questions.

nothing

4. If there is one question you would like to have answered in lecture, what would that question be?

nothing