Name: _____

28. Half Reactions

You can balance aqueous redox reactions by following the procedure in page 593 of your textbook:

1. Separate the oxidation and reduction half reactions.
2. Balance each half reaction following these steps:
   a. Balance all the elements except hydrogen and oxygen.
   b. Balance the oxygen atoms by using water as the oxygen source.
   c. Balance the hydrogen atoms using H^+ as the hydrogen source.
   d. Balance the charges using electrons.
3. Multiply the half reactions to make the electrons cancel when they add.
4. Add together the half reactions and cancel identical species on both sides.

1. Find and balance the complete reaction between iodine and chlorine in aqueous solution:

$$Cl_2\ (aq) + I_2\ (aq) \rightarrow IO_3^-\ (aq) + HCl\ (aq)$$

   a. Which reactant is oxidized in this reaction? _____ Which reactant is reduced? _____

   b. Write the two half reactions.

   c. Balance the reduction half reaction following step 2 above.

   d. Balance the oxidation half reaction following step 2 above.

   e. Check that each species in each half reaction is balanced in terms of oxidation number: the oxidation states of all the elements in each species add to the total charge of the species. ____

   f. Check that the two half reactions are balanced with respect to the elements ____ and with respect to the charges. ____

   g. Multiply each half reaction by a whole number so that the number of electrons in the reactants of one half reaction is the same as the number of electrons in the products of the other half reaction.

   h. Add the two half reactions and cancel all identical species on both sides.

2. Following the procedure above, find and balance the redox reaction between sulfide and nitrate in aqueous solution.

$$S^{2-}\,(aq) + NO_3^-\,(aq) \rightarrow S\,(s) + NO\,(g)$$

3. Following the procedure above, find and balance the redox reaction between arsenate and sulfide in aqueous solution.

$$AsO_4^-\,(aq) + S^{2-}\,(aq) \rightarrow AsO_3^-\,(aq) + S\,(s)$$