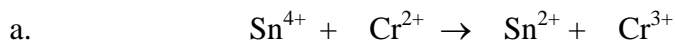


Chem 151 Help Session Handouts II (Fall 2009)
Balancing of Redox Reactions

1. Simple redox reactions can be balanced by inspection.

For the skeletal unbalanced reactions below, circle the oxidizing agents and balance the equation by inspection.

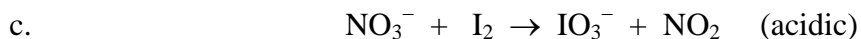


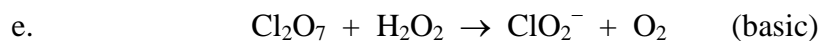
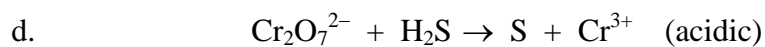
2. More complicated redox reactions occurring in an aqueous solution can be balanced using the systematic method outlined inside the box.

Follow the Steps:

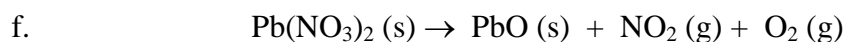
1. *Use the changes of O.N. to identify the substances that is/are oxidized and that is/are reduced.*
2. *Write the oxidation and reduction half-reaction equations. For each half-reaction,*
 - a. *Balance all elements except O and H.*
 - b. *Balance the electrons gained or lost based on the changes of oxidation number.*
 - c. *Balance the net charges by adding H^+ (when reaction takes place in an acidic medium) or OH^- (when reaction takes place in a basic medium) to either side of the equation.*
 - d. *Balance O and H by adding H_2O to either side of the equation.*
3. *Make the number of electrons gained from the reduction half reaction equal to the electrons lost in the oxidation half-reaction. This can be achieved by multiplying one or both of the balanced half-reaction equations by a factor.*
4. *Add the balanced oxidation and reduction half-reactions together to obtain the balanced redox equation.*

Use the systematic method to balance the skeletal redox reactions (listed on this page and next page) occurring in aqueous medium as specified:





3. For redox reactions that do not occur in aqueous solution, one may **NOT** add H^+ , OH^- , or H_2O . In some situations, it is easier to balance the whole equation instead of splitting it into two half reactions.



4. **Predicting products of a redox reaction needs knowledge of the chemical properties of the reactants.**

For the reaction described below,

- i. write a skeletal reaction equation
- ii. identify the oxidizing agent
- iii. balance the reaction equation

A piece of copper metal is dropped into a beaker of dilute nitric acid, a gas (which later is identified as nitrogen monoxide) evolved and the solution turns blue gradually.