

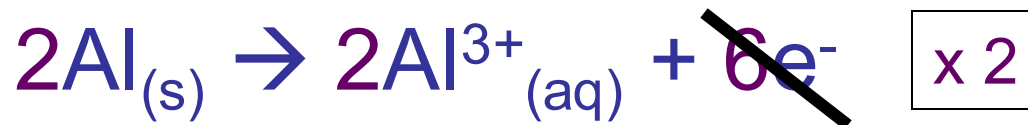
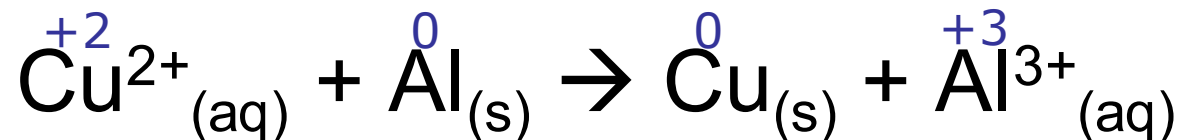
BALANCING REDOX REACTIONS

Half-Reaction Method

BALANCING REDOX REACTIONS

An overall redox reaction can be balanced using half-reactions once the correct number of electrons have been accounted for.

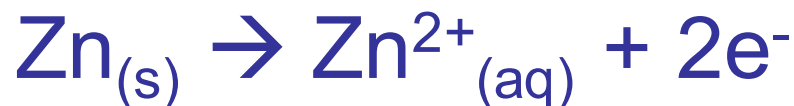
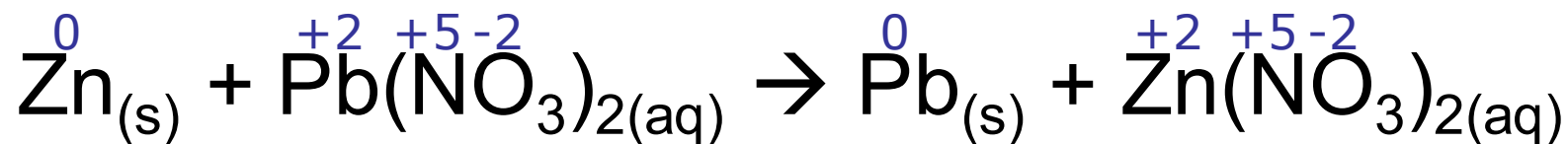
BALANCING REDOX REACTIONS



BALANCING REDOX REACTIONS

Example #1

Write a balanced equation to describe the reaction between zinc metal with aqueous lead (II) nitrate.

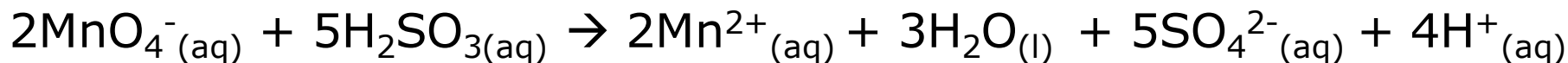
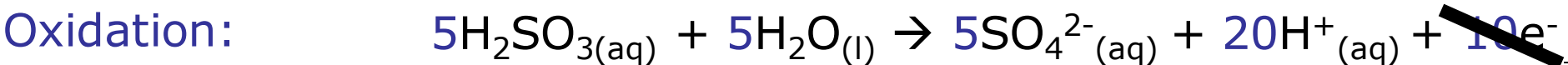
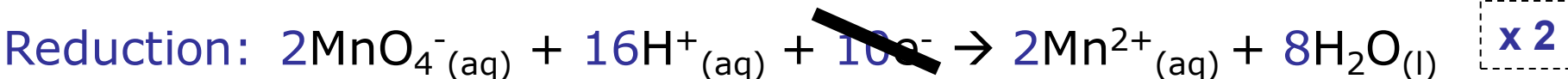


BALANCING REDOX REACTIONS

Example #2

Write the balanced redox equation for the reaction of MnO_4^- in an acidic solution with H_2SO_3 resulting with the products of Mn^{2+} and SO_4^{2-} .

You can use half-reactions from the Half Reactions Table



BALANCING REDOX REACTIONS

Sometimes, the half-reaction you need is not part of the given tables. Therefore, you need to come up with the reaction yourself.

BALANCING REDOX REACTIONS

Example #3

Write the balanced equation for the half-reaction where NO is reduced to N₂O in an acidic solution.

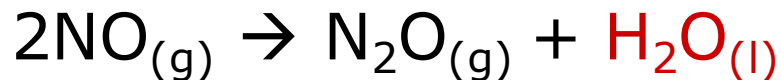
1. Write down the reactant and product and balance atoms other than oxygen and hydrogen.
2. Add **H₂O** molecules to balance the oxygen atoms.
3. Add **H⁺** ions to balance the hydrogen atoms.
4. Add **electrons** to balance the charge on both sides of the equation.



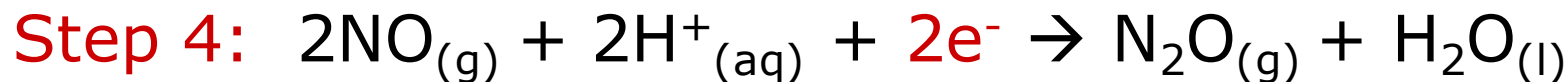
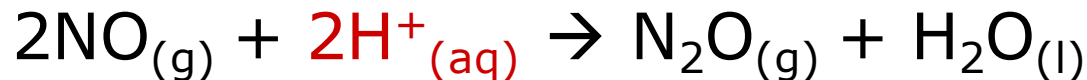
Step 1:



Step 2:



Step 3:



BALANCING REDOX REACTIONS

Example #4

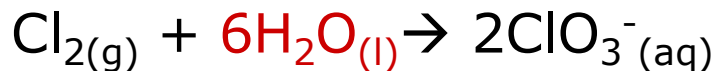
Write the balanced equation for the oxidation half-reaction where Cl_2 is oxidized to ClO_3^- in a basic solution.

1. Write down the reactant and product and balance atoms other than oxygen and hydrogen.
2. Add H_2O molecules to balance the oxygen atoms.
3. Add H^+ ions to balance the hydrogen atoms.
4. Add OH^- ions equal in number to the H^+ ions to both sides of the reaction.
5. Combine H^+ and OH^- ions on the same side of the equation to form H_2O molecules.
6. Add **electrons** to balance the charge.



Step 1:

Step 2:



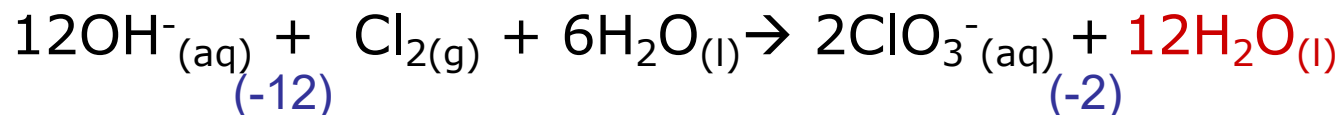
Step 3:



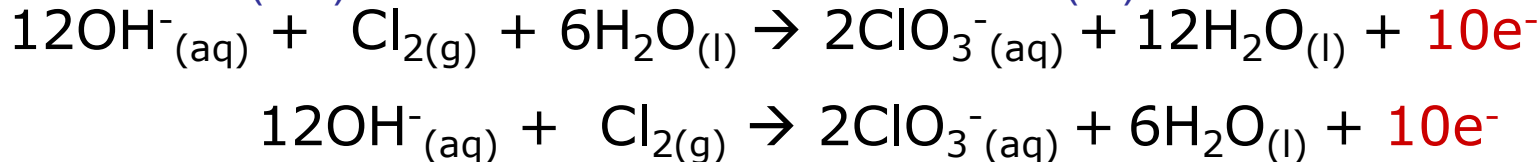
Step 4:



Step 5:



Step 6:



BALANCING REDOX REACTIONS

For the most part, the complete redox reactions you will need to balance will require you to develop your own half-reactions.

The method used is the **ion-electron method** or the **half-reaction method**.

BALANCING REDOX REACTIONS

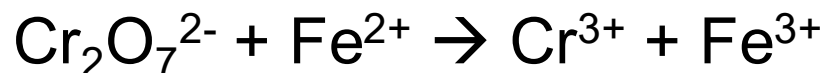
It is important to know whether the reaction occurs in an acidic or basic environment, as different final products will be produced.

This information will always be provided.

BALANCING REDOX REACTIONS

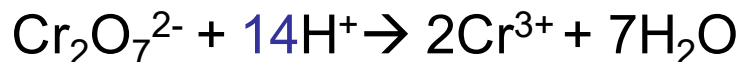
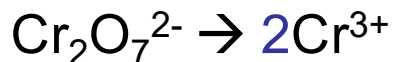
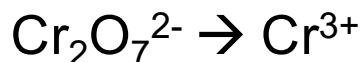
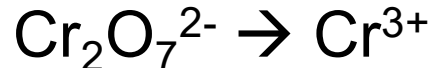
Example #5

Balance the following redox reaction which occurs in an acidic solution:



Which half-reaction is reduction? Which is oxidation?

Separate into two
skeleton half
equations



Reduction

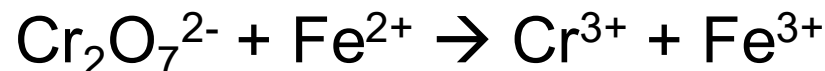


Oxidation

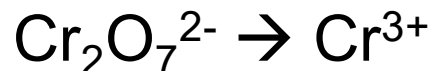
BALANCING REDOX REACTIONS

Example #5

Balance the following redox reaction which occurs in an acidic solution:



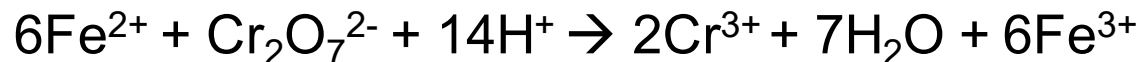
Which half-reaction is reduction? Which is oxidation?



Oxidation:



x 6



BALANCING REDOX REACTIONS

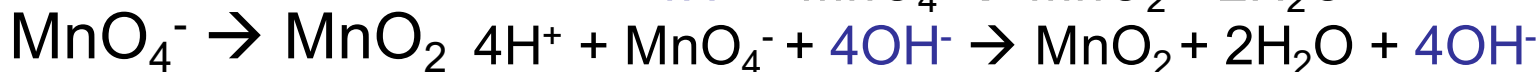
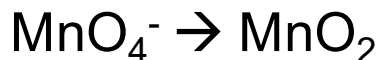
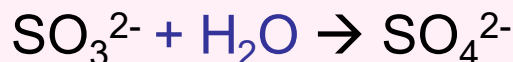
Example #6

Balance the following redox reaction which occurs in a basic solution:



Which half-reaction is reduction? Which is oxidation?

Separate into two
skeleton half
equations



BALANCING REDOX REACTIONS

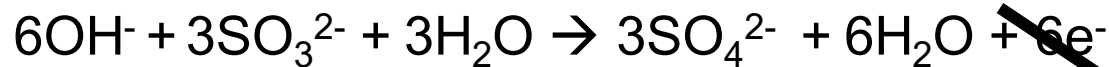
Example #6

Balance the following redox reaction which occurs in a basic solution:



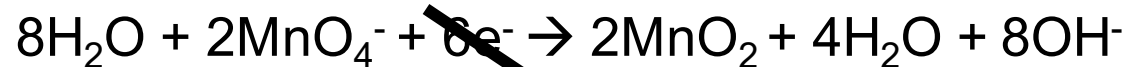
Which half-reaction is reduction? Which is oxidation?

Oxidation:



x 3

Reduction:



x 2

