بِسْمِ ٱللَّهِ ٱلرَّحْمَٰنِ ٱلرَّحِيمِ

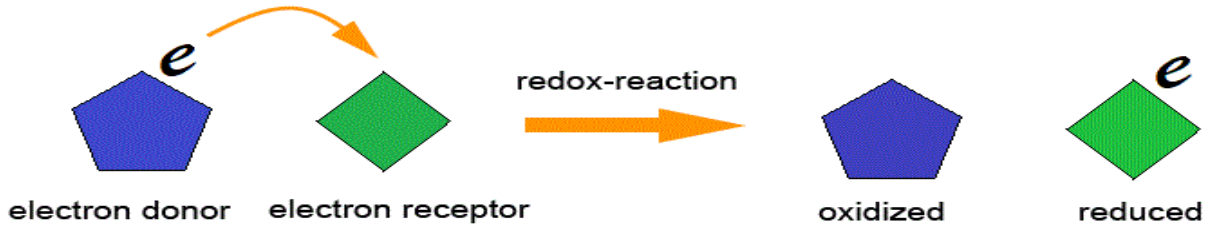
Oxidation and Reduction

Introduction

Oxidation-reduction, or redox, reactions are important types of reactions. A redox reaction involves electron transfer between two chemical species.

Oxidation is defined as a loss of electrons in the process. The oxidized element is known as a reducing agent when it reduces the other element by losing electrons.

There are several general rules in determining the oxidation states:



- The oxidation number of an atom in its elemental form is 0.

Ex: O2 =0, Fe = 0, H2 =0

- The Oxidation number of an ion is equal to its ionic charge.

Ex: $SO4^{2-}$ = -2

Q: find O.N. of S in $SO4^{2-}$ [O.N. of O = -2]

Solution:

S + (-2*4) = -2

S – 8 = -2

S= 6+

 The sum of Oxidation number values in a molecular or ionic compound is equal to zero.

Ex: HCl = 0

Q: find oxidation number of Cl in component HCl, oxidation number of H = +1

Solution:

+1+ X = 0

X = -1

 The sum of Oxidation number values for atoms in a polyatomic ion is equal to the charge of ion.

Reduction is the gain of electrons. The element that is being reduced is called the oxidizing agent since it causes the oxidation of another element by gaining electrons.

Oxidation	Reduction
Oxidation is a chemical process involving the loss of electrons by a molecule, atom, or ion, leading to the increase in the oxidation state of the chemical species	Reduction is a chemical process involving the gain of electrons by a molecule, atom, or ion, that leads to a decrease in oxidation states of the chemical species
Oxidation is addition of oxygen	Reduction is the removal of oxygen
Oxidation involves the loss of electrons	Reduction involves the gain of electrons
Oxidation is the removal of hydrogen	Reduction is the addition of hydrogen
There is an increase in oxidation state	There is a decrease in the oxidation state
Oxidation is caused by oxidizing agents	Reduction is caused by reducing agents

An example of oxidation is the oxidation of glucose during respiration	An example of reduction is the reduction of carbon dioxide during photosynthesis

Redox reactions can be considered to have two hypothetical half-reactions:

1- Define oxidation process and reduction process

2- Compare between oxidation and reduction process