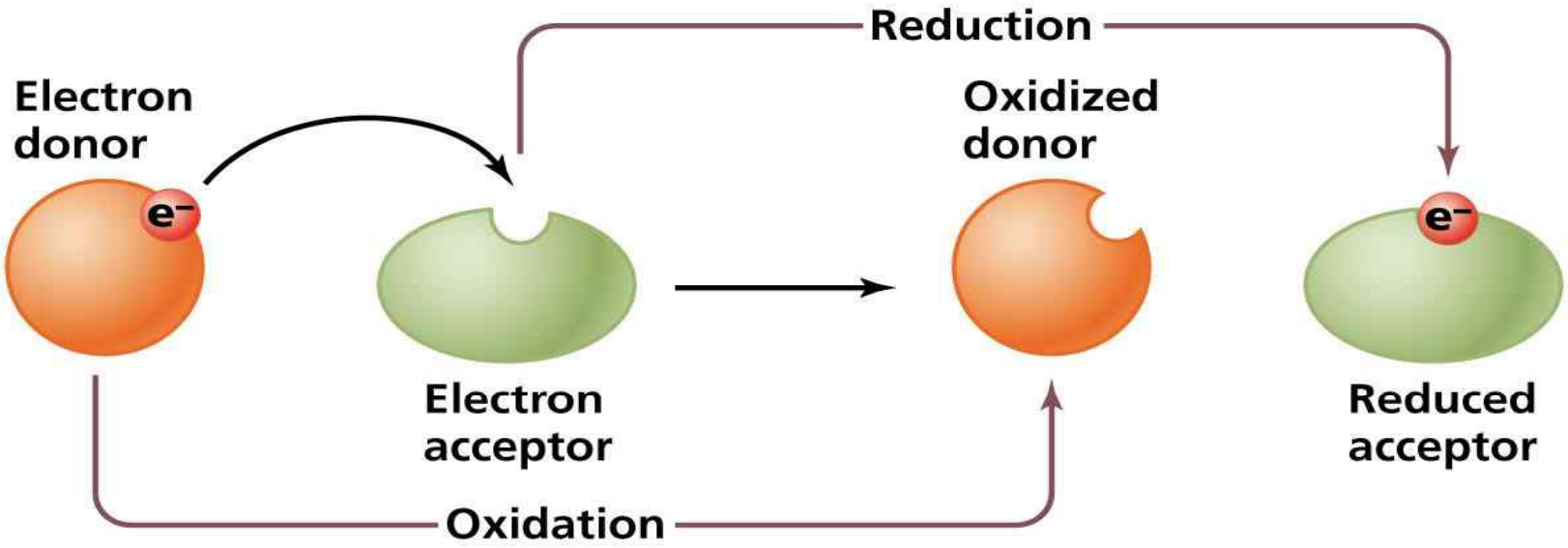
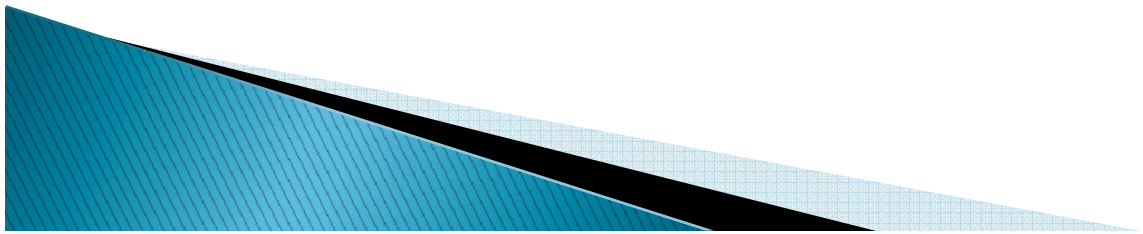
A Review on Oxidation – Reduction Reactions



- Oxidation-Reduction reactions (Redox reactions) of analysis involve a change in valance of reacting substance. There is always a transfer of electrons.

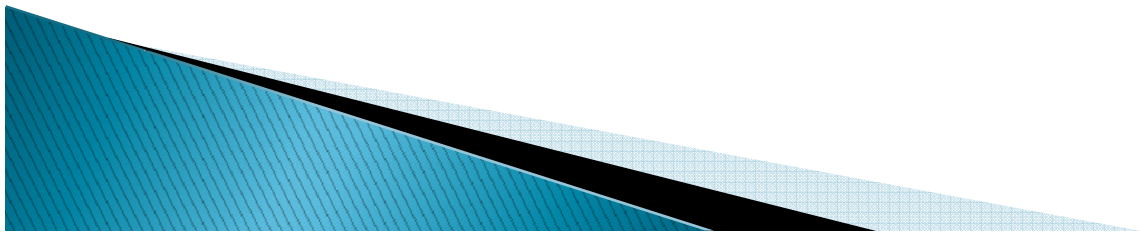
- Oxidation:

- addition of oxygen.
- loss of hydrogen.
- loss of electrons

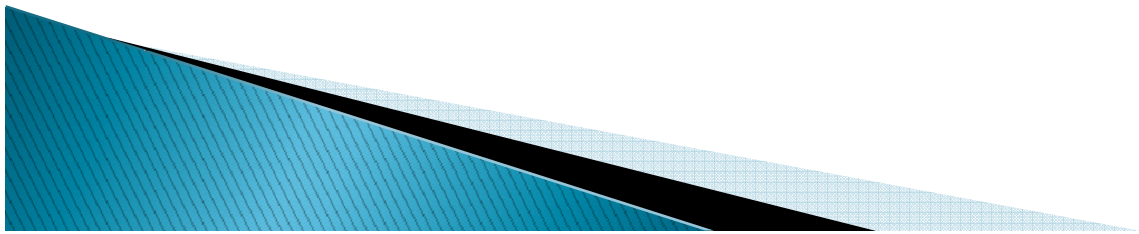


- While reduction is:

- loss of oxygen.
- addition of hydrogen.
- gain of electron.



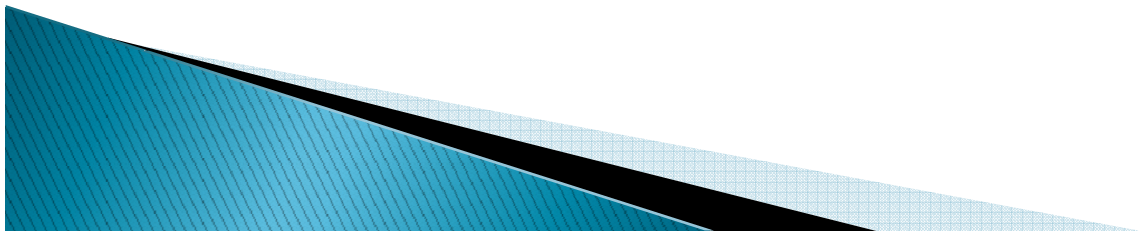
- In all oxidation-reduction reactions there will be a reactant undergoing oxidation and one undergoing reduction, since the two reactions are complementary to one another and occur simultaneously.



- Oxidizing agent (oxidant) ⟶ oxidation and it will be reduced (gain of electrons).
- e.g., $KMnO_4$ (potassium permanganate)

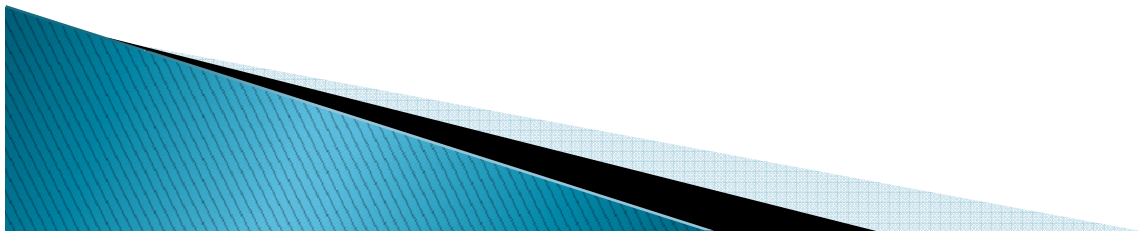
Reducing agent (reductant) ⟶ reduction and it will be oxidized (loses of electrons).

e.g., $Na_2C_2O_4$ (sodium oxalate)



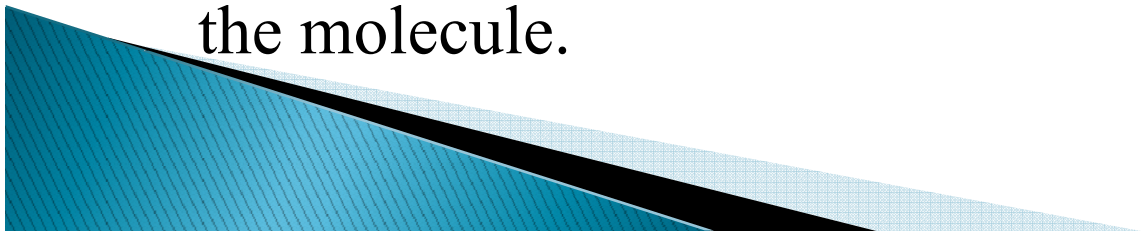
- **The oxidation number** of an element indicates the amount of oxidation or reduction which is required to convert one atom of the element from the **free state** to that in any compound. (Oxidation number is an indicator of the degree of oxidation of an atom in a chemical compound).

- The increase in oxidation number of an atom through a chemical reaction (net loss of electrons) is known as an oxidation; a decrease in oxidation number (net gain in electrons) is known as a reduction. For pure elements, the oxidation number is zero.



Determination of the oxidation numbers.

- for the free or uncombined element it is zero.
- for hydrogen (except in certain hydrides) has a value of 1+.
- for oxygen (except in peroxides) is 2-.
- for metals in compounds (except in hydrides) it is usually positive.
- For ions it is the value of its electronic charge with the correct sign attached. (- or +)
- for a compound it is always zero, and is determined by the sum of the oxidation numbers of the individual atoms each multiplied by the number of atoms of the element in the molecule.



Balancing oxidation- reduction equations:

- Write a skeleton equation for the reaction
- Assign oxidation numbers to atoms on both sides of the equation
- Determine which atoms are oxidized and which are reduced
- Divide the reaction into oxidation and reduction half-reactions and balance each half-reaction separately by balancing the atoms and the charges (you can add H^+, OH^-, or H_2O as nedded depending on the conditions of the reaction)
- Combine these half-reactions so that electrons are neither created nor destroyed