

REDOX REACTIONS

• What is a redox reaction?

Reactions that involve change in oxidation number or oxidation state of one or more atoms of the reactants.

→ Redox reactions take place between an electron donor (reducing agent) and an electron acceptor (oxidizing agent).

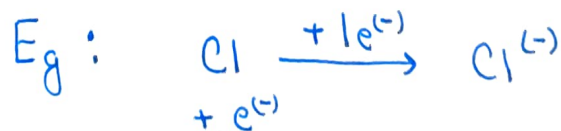
→ Redox reactions are enthalpy driven.

• Parts of a redox reaction :-

(i) Oxidation : Loss of electron resulting in decrease of oxidation number.



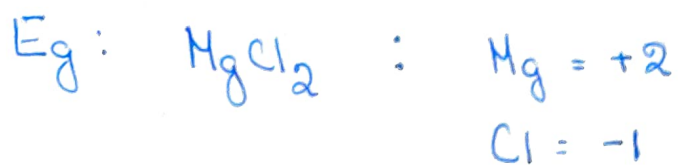
(ii) Reduction : Gain of electron resulting in increase in oxidation number.



• What is oxidation number?

The oxidation number of an element is equal to the charge which an atom of the element would acquire if the compound consisted only of ions.

→ For ionic compounds, the oxidation number is equal to the electrical charge.



→ For covalent compounds we assume a hypothetical ionic structure.

→ The oxidation numbers of atoms in free state is zero.

• Oxidation numbers of some common atoms :-
(O.N.)

1) For hydrogen it is mostly '+1' but in ionic hydrides like NaH or, LiH it is '-1'.

2) For oxygen it is mostly '-2' but in peroxides (Na_2O_2 , H_2O_2 , etc.) it is '-1', in superoxides (KO_2) it is '-1/2', in OF_2 it is '+2'.

3) H_2 , O_2 , F_2 , Cl_2 , N_2 , etc, it is '0'.
Also for free metals Na , Ag , Hg , etc., it is '0'.

• Calculation of oxidation numbers :-



$$(+1) + x + 4(-2) = 0$$

$$x = +7$$



$$2x(+1) + 2x + 7(-2) = 0$$

$$2 + 2x - 14 = 0$$

$$x = +6$$



$$2x + 4(-2) = -2$$

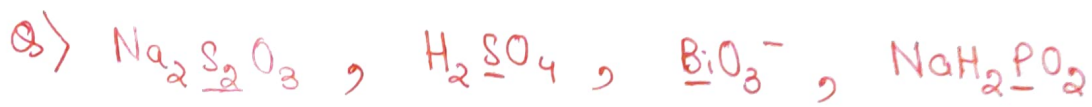
$$2x - 8 = -2$$

$$x = +3$$



$$(+1) + x + 3(-2) = 0$$

$$x = +5$$



• Finding out the oxidized and reduced atoms in a given reaction.



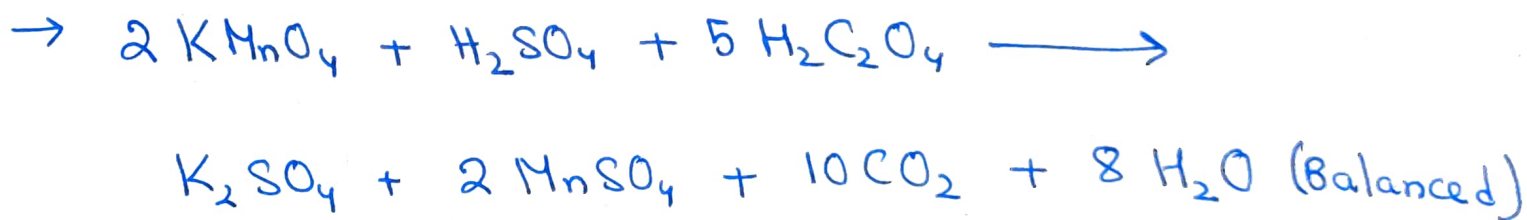
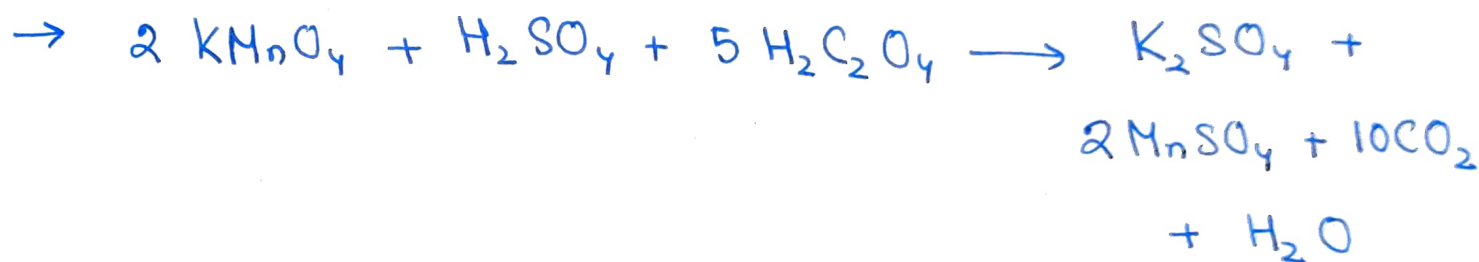
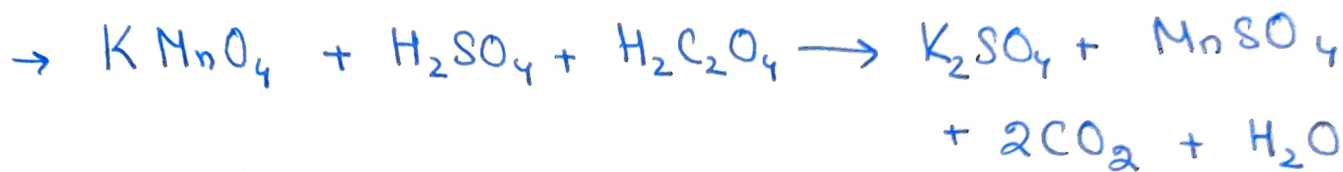
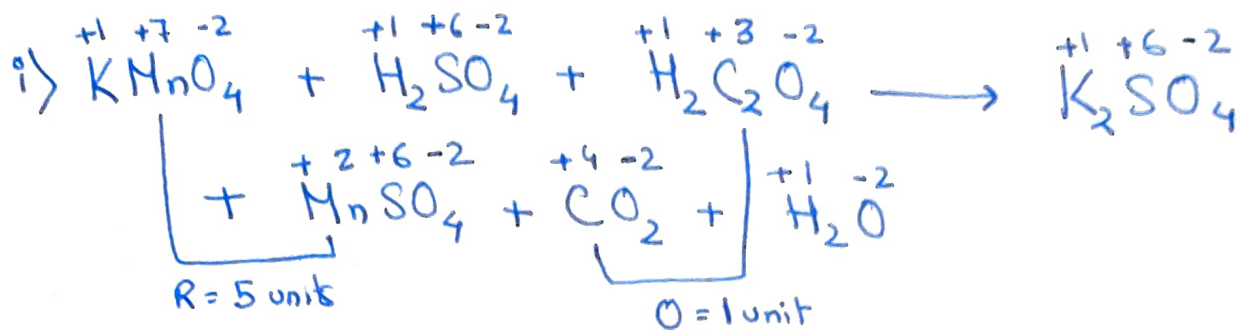
SnO_2 = Oxidizing agent

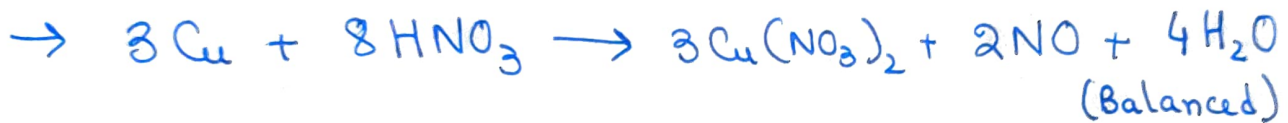
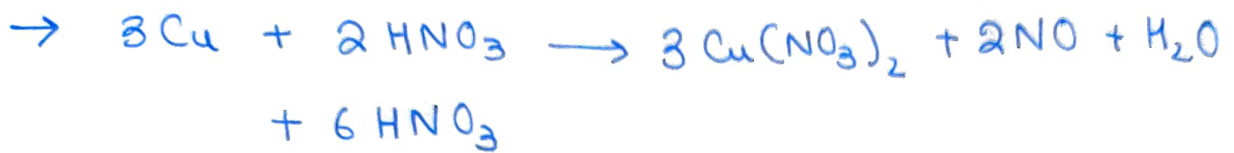
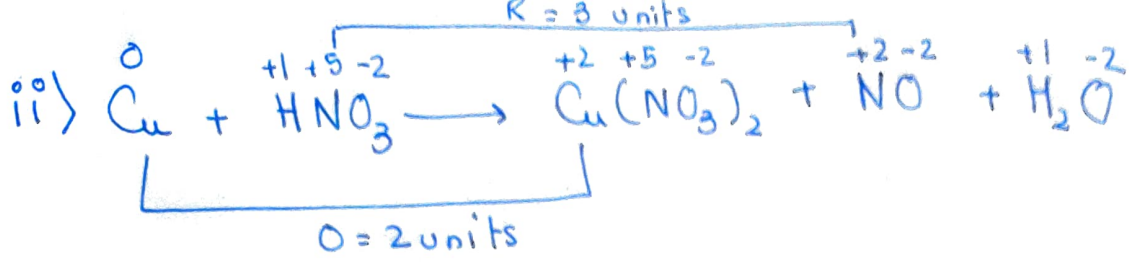
C = Reducing agent

Sn = Reduced product

CO = Oxidized product

Balancing redox equations by oxidation number method :-





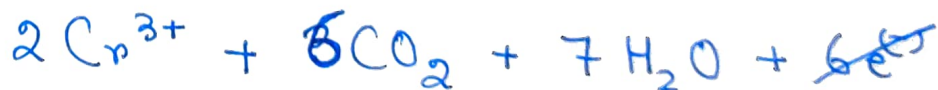
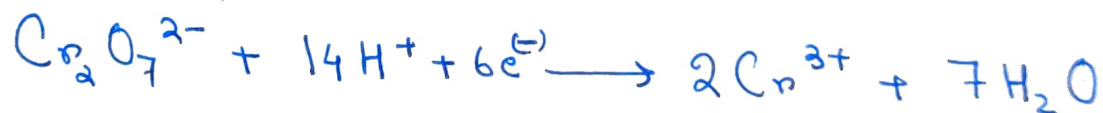
• Balancing redox equations by ion-electron method :-

(i)



(Acidic medium)

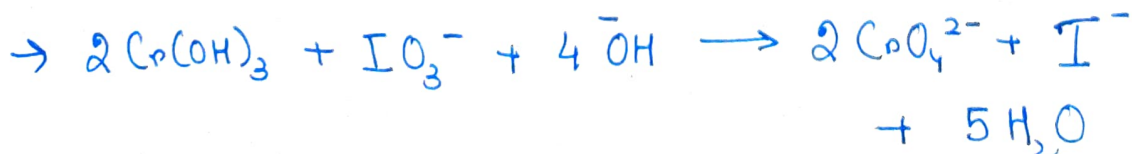
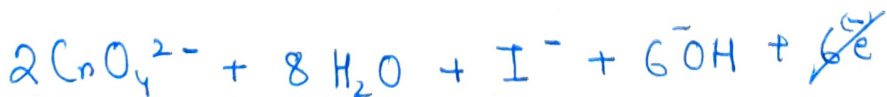
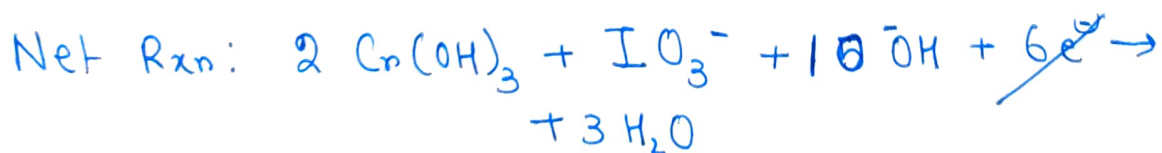
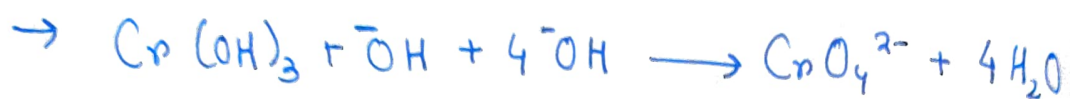
(i)



(Balanced)



(basic medium)



(Balanced)



• Disproportionation and comproportionation reactions :-

• Redox reactions in which oxidation number of an element shows both increase and decrease in the same reaction are called disproportionation reactions.



• The reverse of ~~comproportionation~~ disproportionation is comproportionation.

