

Electro Chemistry

→Is the branch of chemistry that deals with the interconversion of electrical energy and chemical energy.

Redox Reactions

Electro chemical processes are redox (oxidation-reduction)

In redox reactions electrons are transferred from one substance to

There are 2 types of redox reactions

In acidic medium

In acidic medium

In basic medium

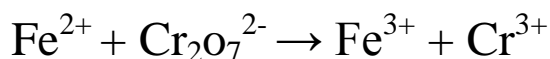
More complex redox reactions involving Oxo anions such as chromate (CrO_4^{2-}), di chromate ($\text{Cr}_2\text{O}_7^{2-}$), permanganate (MnO_4^-), NO_3^- and (SO_4^{2-}).

Example

The oxidation of Fe^{2+} ions to Fe^{3+} ions by $(\text{Cr}_2\text{O}_7^{2-})$ in acidic medium, the $(\text{Cr}_2\text{O}_7^{2-})$ ions are reduced to Cr^{3+} ions.

Balancing Redox Reactions

Step1: UN balanced equation

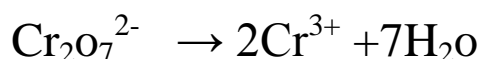
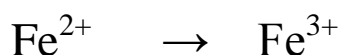


Step2: The two half reactions are

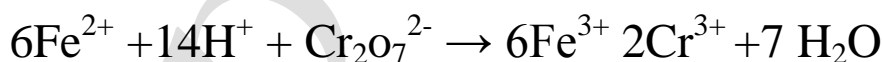
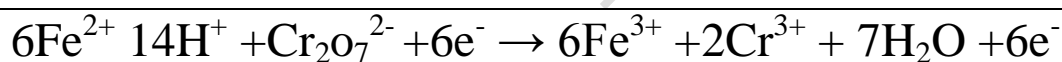
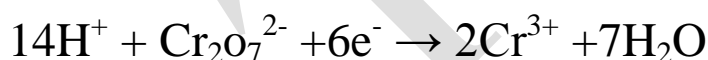
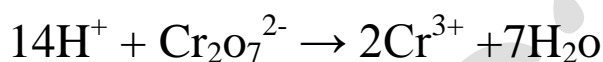


Step3:

For reaction in acidic medium add H₂O to balance the O atom and H⁺ to balance the H atoms.



To balance H atoms, we add 14H⁺ ions on the left hand side



The resulting equation is 'atomically' and 'electrically' balanced.

In basic solutions

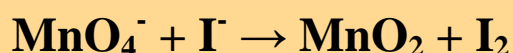
For every H^+ ion, we add an equal number of OH^- ions to both sides of equations.

Example

Oxidation of iodide ion (I^-) by permanganate ion (MnO_4^-) to yield molecular (I_2) and manganese (IV) oxide (MnO_2).

Balancing redox reactions

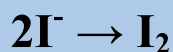
Step1: The unbalanced equation is



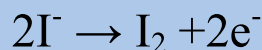
Step2: The 2 half reactions are



Step3: To balance each half reaction, we first balance I atoms.



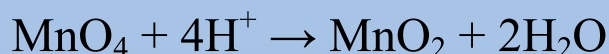
We add two electrons to the right hand side of the equation



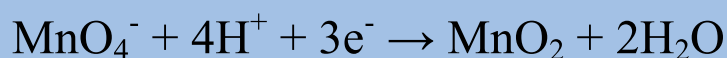
Reduction half reactions: To balance the O atoms, we add two H₂O molecules on the right



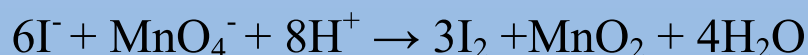
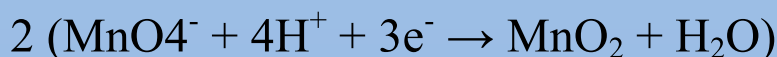
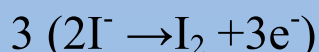
To balance atom, we add for H⁺ ions to the left



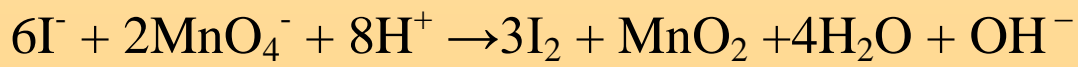
There are 3 net positive charges on the left, so we add three electrons to the same side to balance the charges



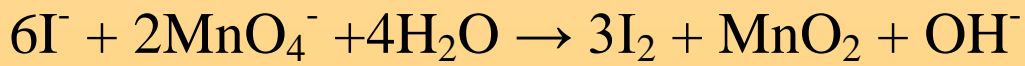
Step4: add the oxidation and reduction half reactions to give the overall reaction, multiplying the oxidation half reaction by 3 and the reduction half reaction by 2 as follows



Because the reaction carried out in a basic medium, we need to equal number of OH ions to both sides.



Finally, combining the H^+ and the OH^- ions to form water.



Equation is balanced in terms of both atoms and charges.

Examples

1) The branch of chemistry that deals with the inter conversion of electrical energy and chemical energy, is the definition of

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- A) **Electro chemistry** C) Organic chemistry
 B) General chemistry D) Analytical chemistry

2) Electrons are Transferred from one substance to another in

.....

- A) Oxidation reaction C) **Redox reaction**
 B) Reduction reaction D) None of al

3) There is a..... in oxidation number resulting from a gain of electrons by elements in reduction.

- A) Increase C) Stability
 B) **decrease** D) Both A and B

4) This reaction $\text{Fe}^{2+} \rightarrow \text{Fe}^{3+} + e^-$ represents reaction.

- A) **Oxidation** C) reduction
 B) redox D) None of all