

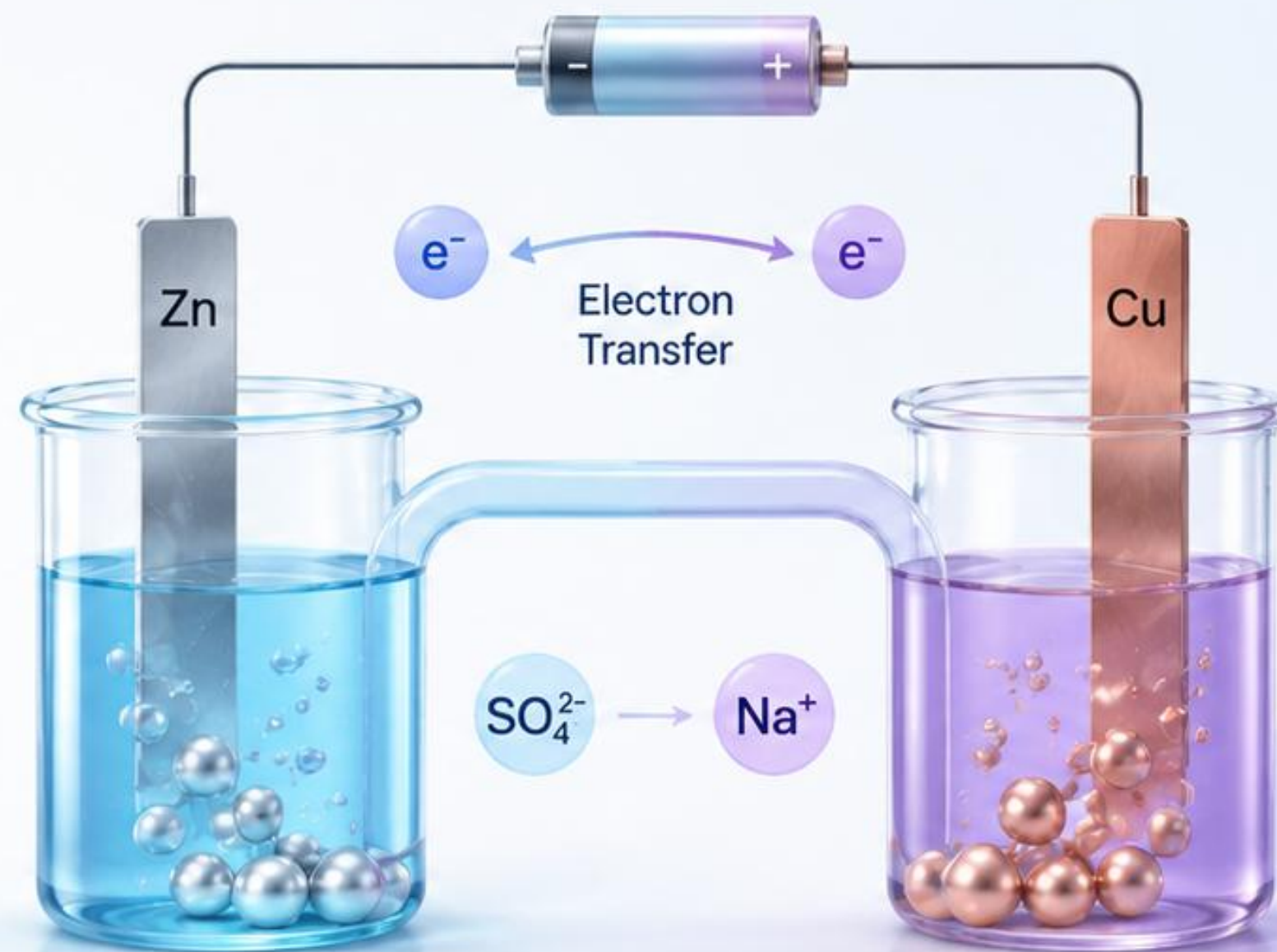
Unit 7



Redox Reactions



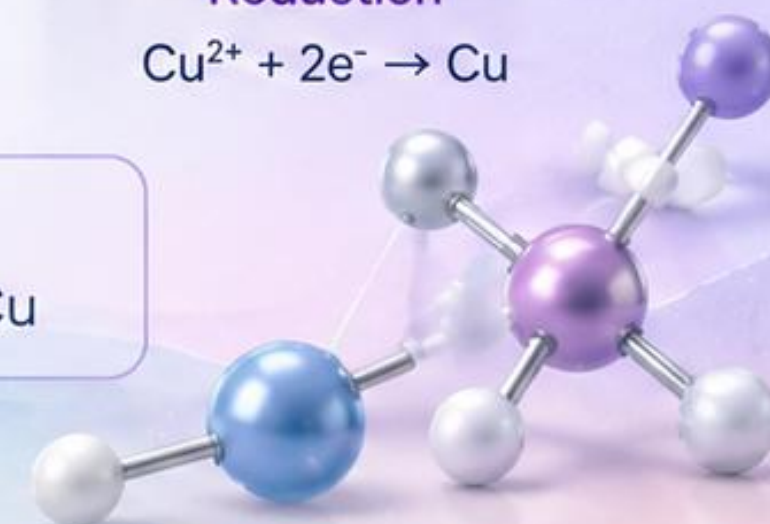
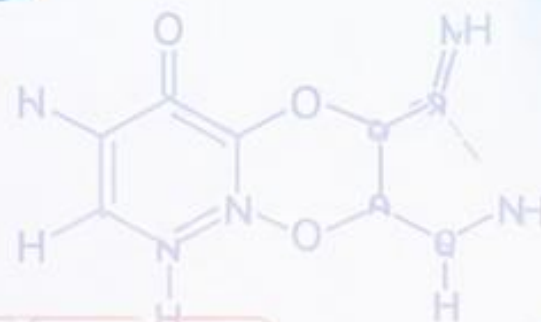
Chemistry Notes | Class 11



Oxidation
 $Zn \rightarrow Zn^{2+} + 2e^-$

Reduction
 $Cu^{2+} + 2e^- \rightarrow Cu$

Overall Reaction
 $Zn + Cu^{2+} \rightarrow Zn^{2+} + Cu$



1 H Hydrogen 1.008		2 He Helium 4.0026
3 Li Lithium 6.94	4 Be Beryllium 9.01	
11 Na Sodium 22.99	12 Mg Magnesium 24.31	
19 K Potassium 39.10	20 Ca Calcium 40.08	
21 Sc Scandium 44.96	22 Ti Titanium 47.87	23 V Vanadium 50.94
24 Cr Chromium 51.996	25 Mn Manganese 54.94	26 Fe Iron 55.85
27 Co Cobalt 58.93	28 Ni Nickel 58.69	29 Cu Copper 63.55
30 Zn Zinc 65.38		

REDOX REACTIONS: THE CORE IDEA

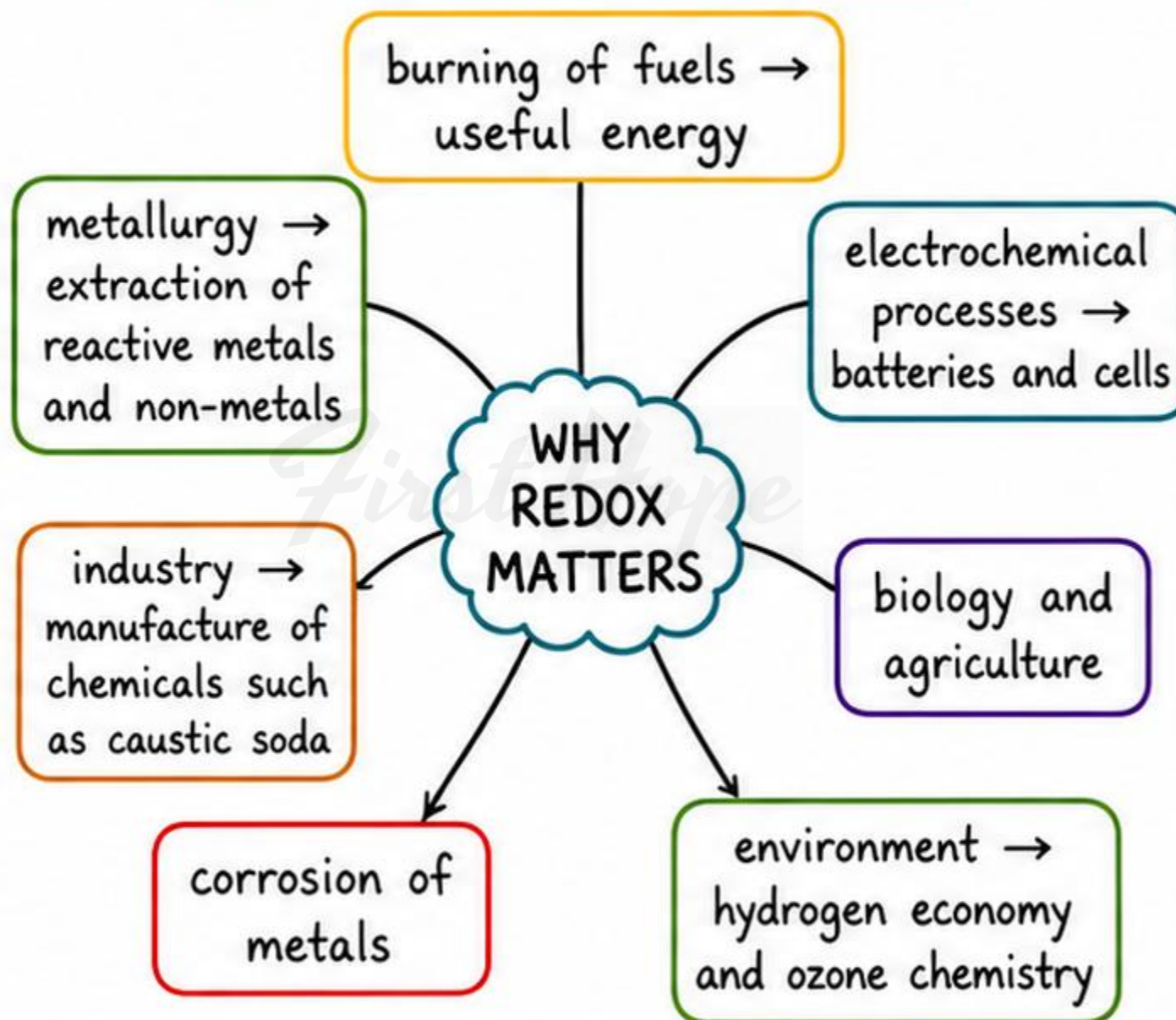
WHAT IS A REDOX REACTION?

- A redox reaction is a chemical reaction in which oxidation and reduction occur simultaneously.

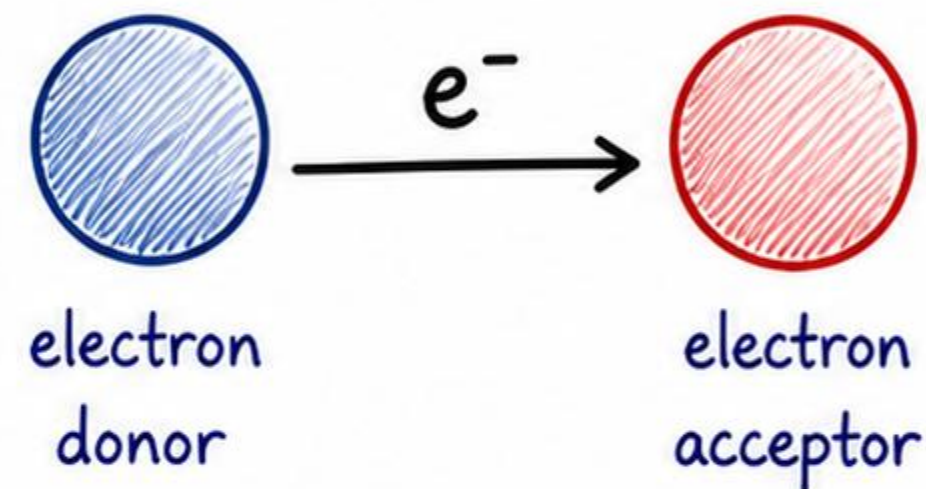
REDOX = REDUCTION + OXIDATION

- Oxidation cannot occur alone: electrons lost by one species are gained by another.

WHY REDOX MATTERS



THE CENTRAL IDEA



- Donor is oxidised.
- Acceptor is reduced.



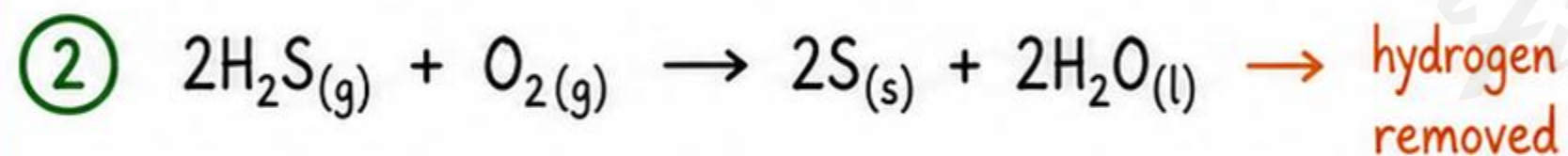
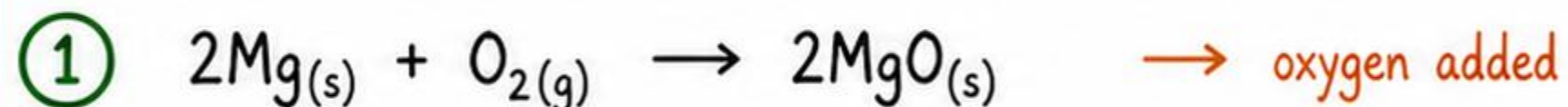
Where there is oxidation, there is always reduction.

CLASSICAL IDEA OF OXIDATION & REDUCTION

OXIDATION

Oxidation means:

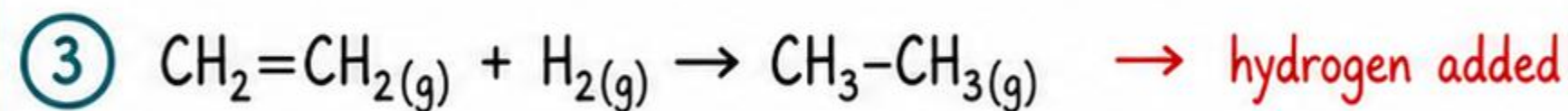
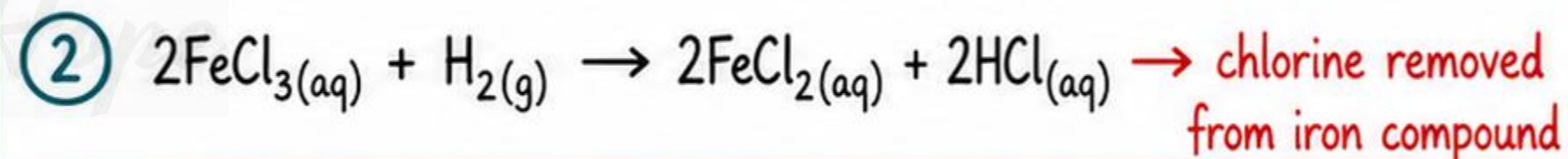
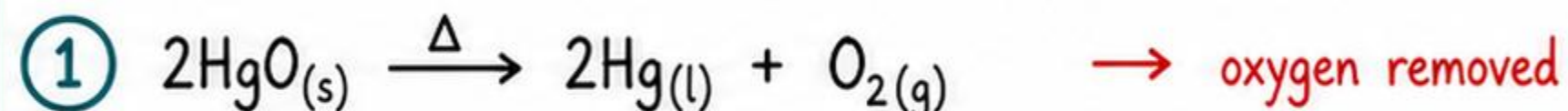
- addition of oxygen or another electronegative element
- removal of hydrogen or another electropositive element



REDUCTION

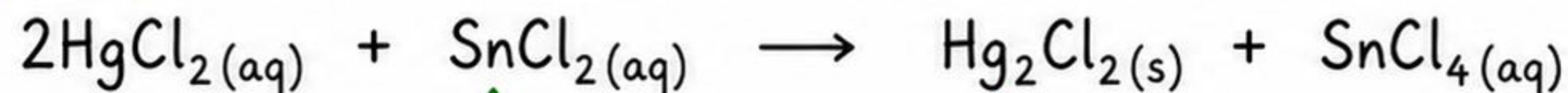
Reduction means:

- removal of oxygen or another electronegative element
- addition of hydrogen or another electropositive element



ALWAYS TOGETHER

In every complete redox reaction, oxidation and reduction occur at the same time.



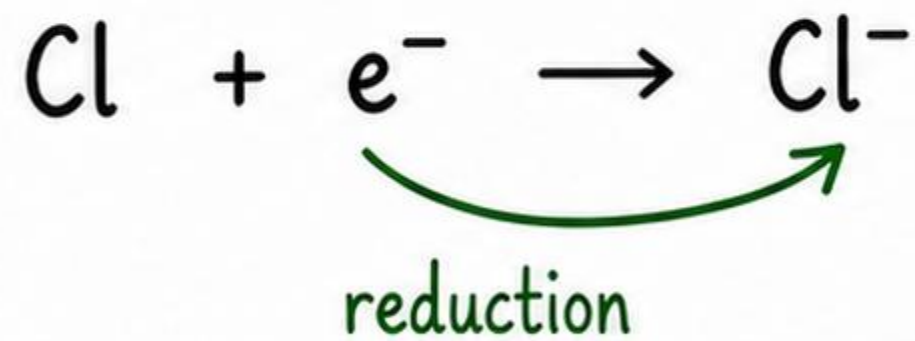
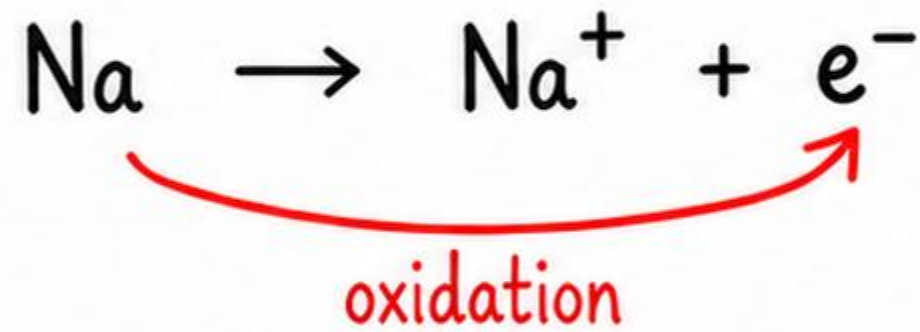
Sn(II) is oxidised to Sn(IV)

Hg(II) is reduced to Hg(I)

REDOX AS ELECTRON TRANSFER

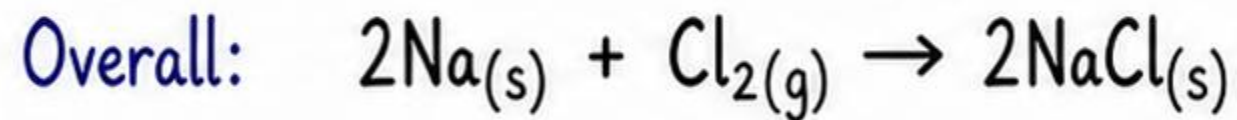
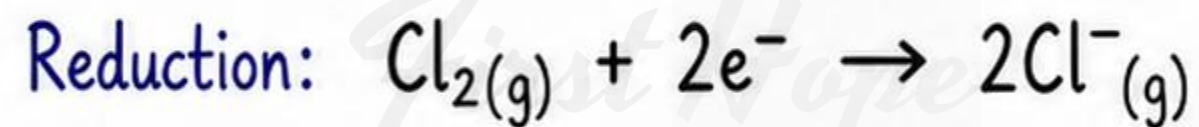
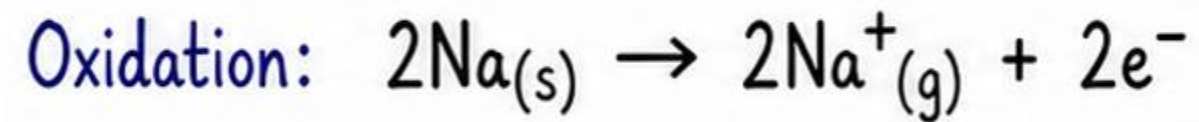
OIL RIG

Oxidation Is Loss of electrons.
Reduction Is Gain of electrons.



HALF-REACTIONS

A half-reaction shows electrons explicitly.



Electrons cancel; charge and atoms are conserved.

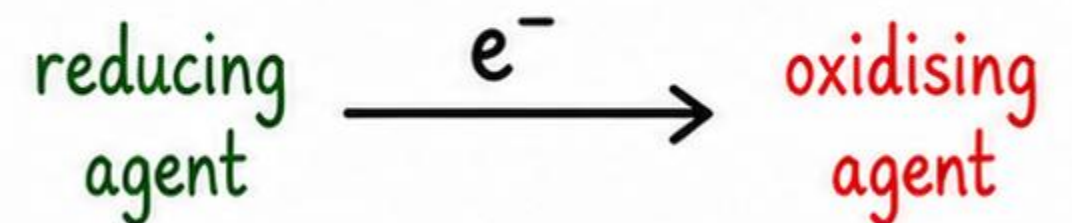
AGENTS

OXIDISING AGENT

- accepts electron(s)
- causes oxidation
- is itself reduced

REDUCING AGENT

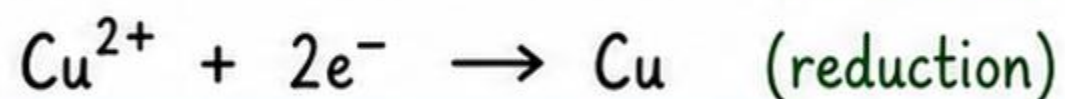
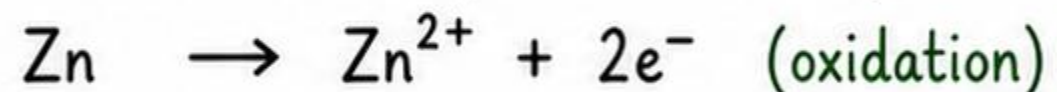
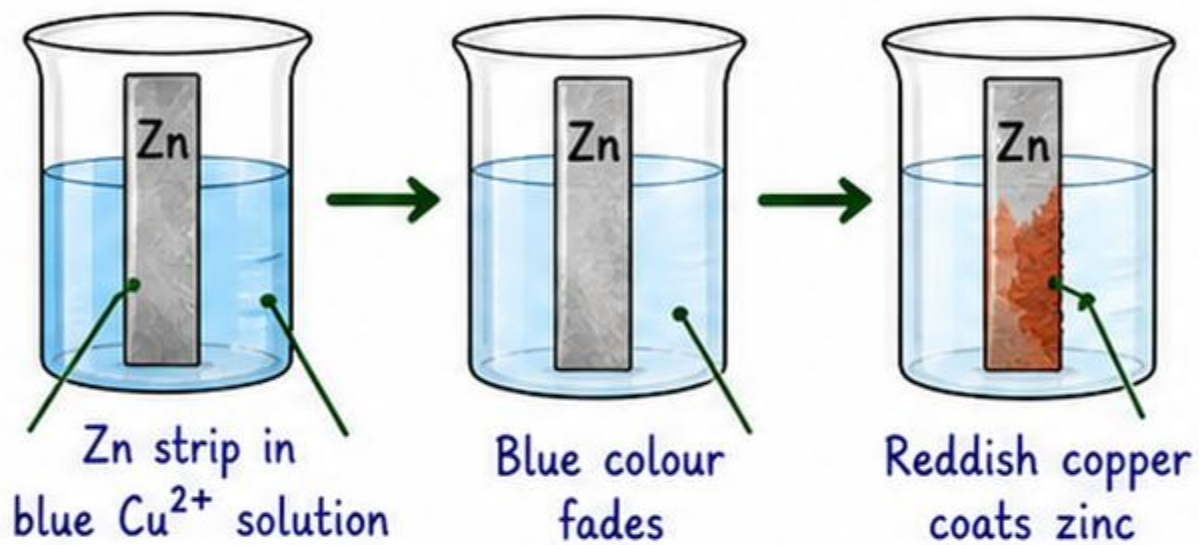
- donates electron(s)
- causes reduction
- is itself oxidised



Electron donor is oxidised; electron acceptor is reduced.

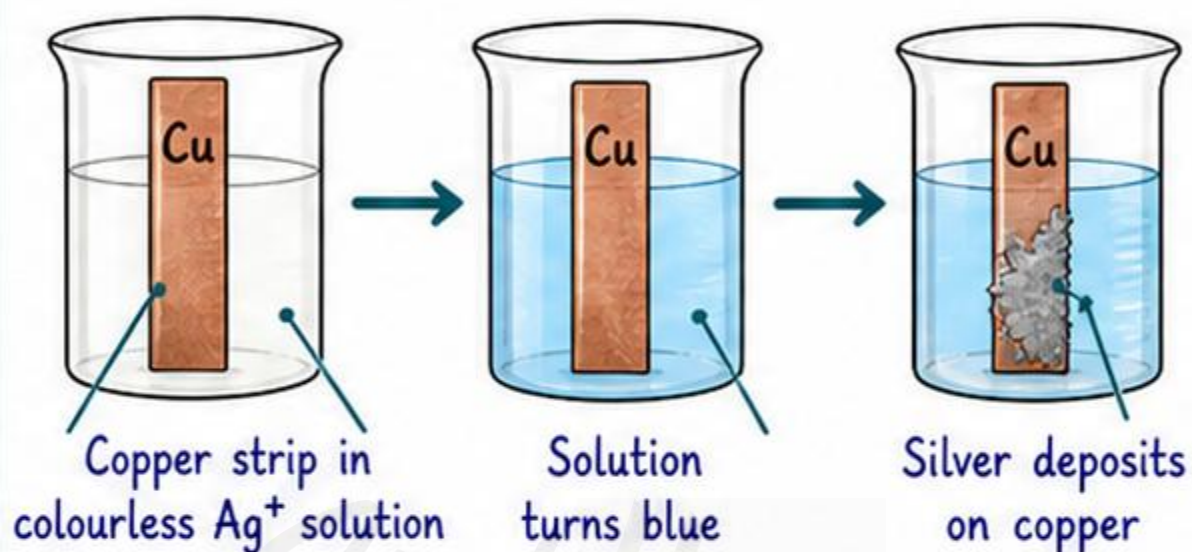
COMPETITIVE ELECTRON TRANSFER

ZINC DISPLACES COPPER



Equilibrium strongly favours products.

COPPER DISPLACES SILVER

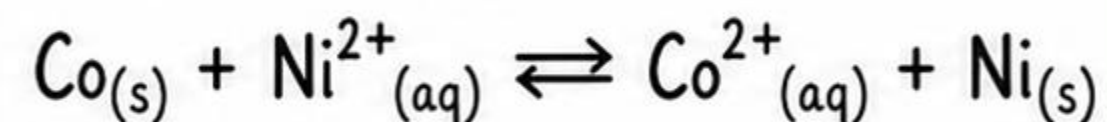


- Cu is oxidised.

- Ag^{+} is reduced.

Equilibrium strongly favours products.

COBALT & NICKEL



- Both Ni^{2+} and Co^{2+} remain at moderate concentrations.

- Neither side is greatly favoured.

Greater electron-releasing tendency = stronger reducing metal.



This comparison leads to the metal activity (electrochemical) series and to galvanic cells.



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