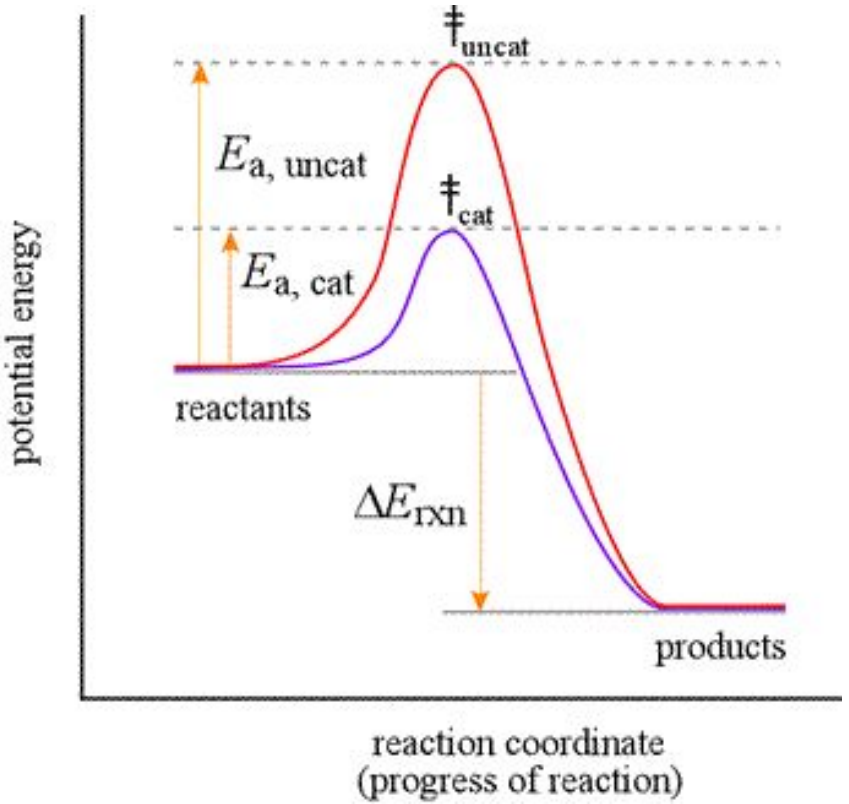
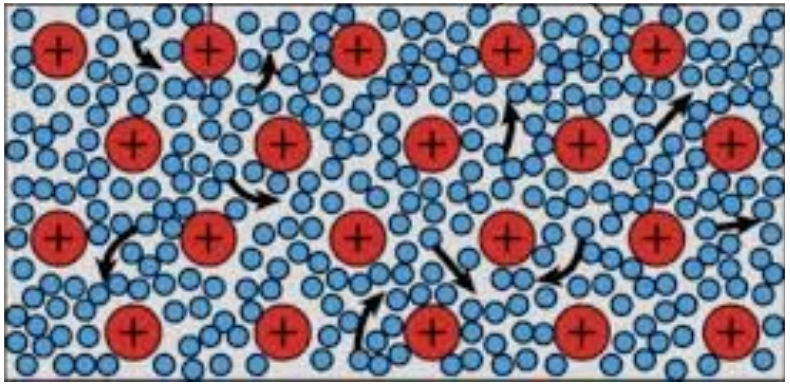
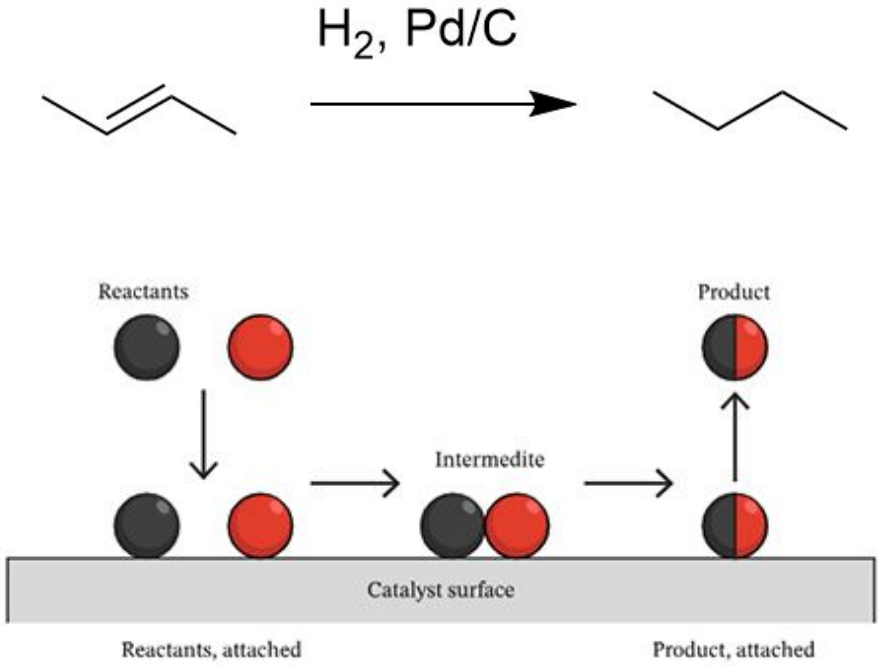
# Catalysis

- Speed up rate of reaction by lowering the energy barrier of the transition state
- Does not get consumed throughout the reaction
- Catalysts can be chemically altered by are restored to work in a cycle

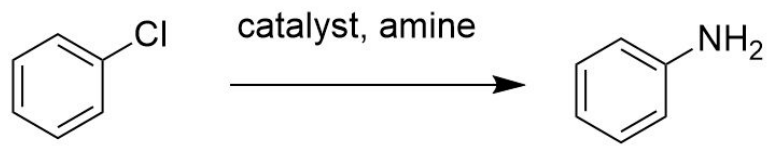


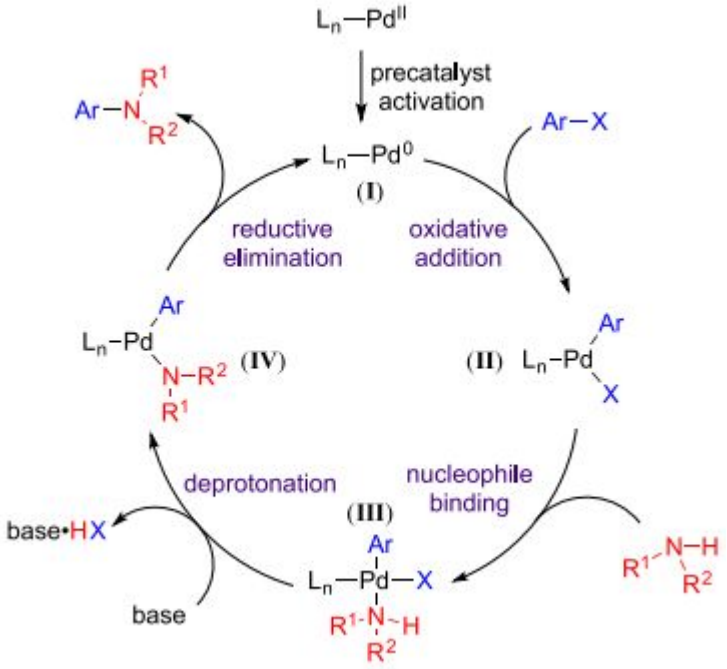
# Metals as catalysts



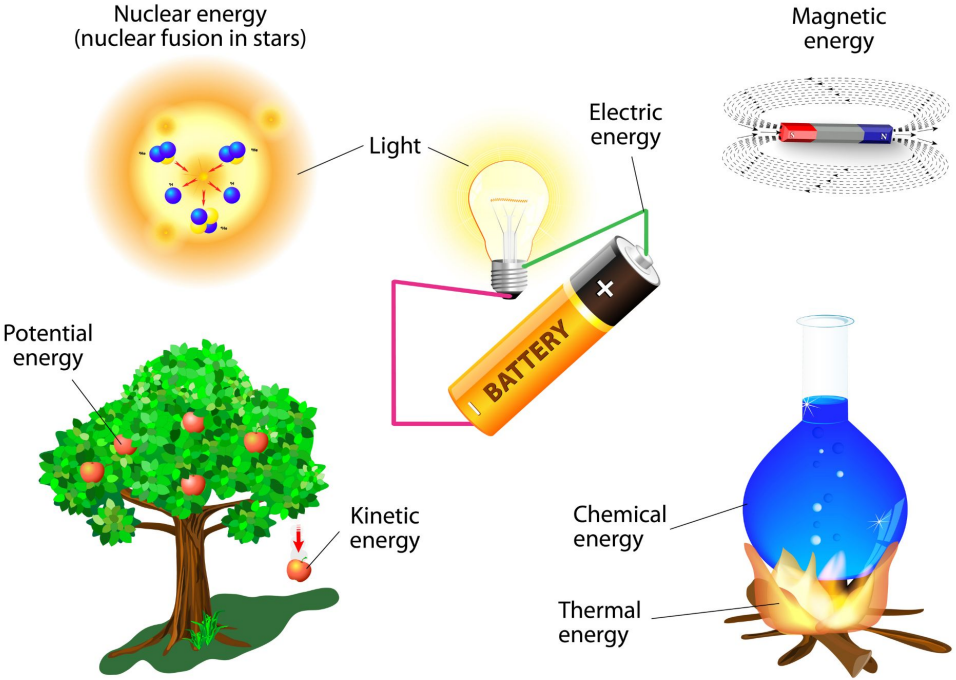


# Metals as catalysts



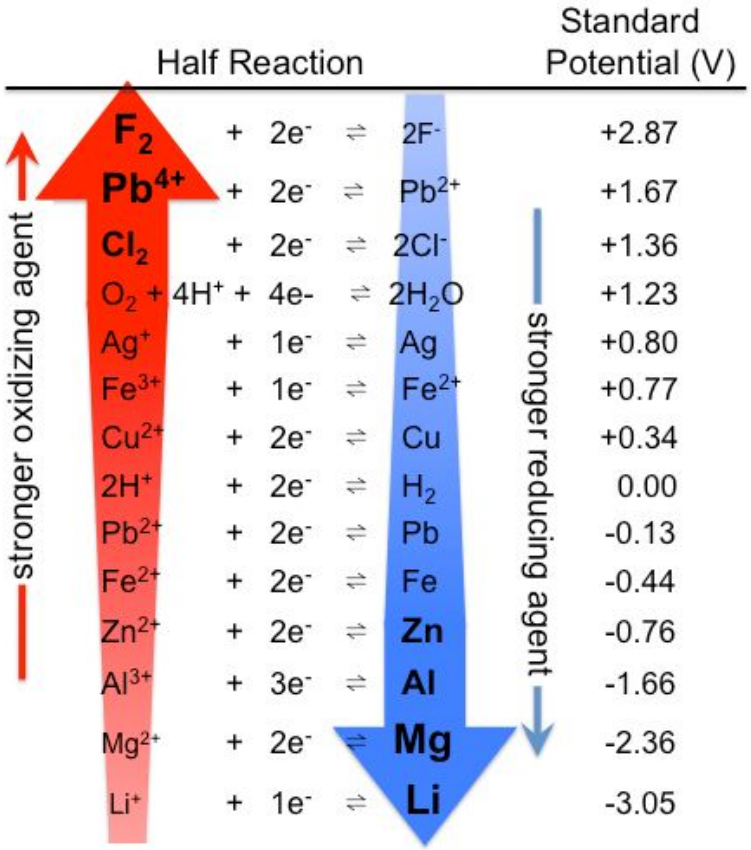



# Energy Storage

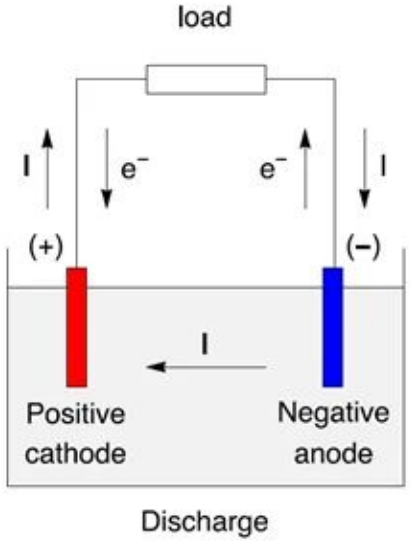


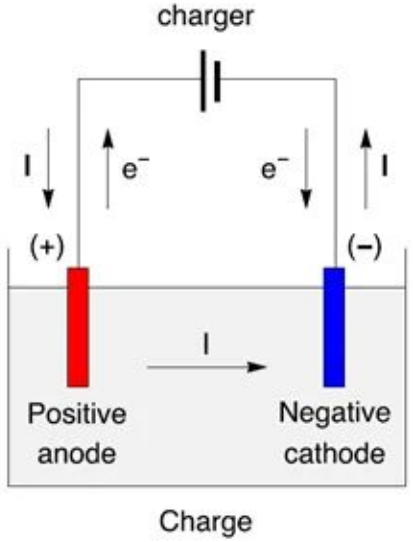
# Reduction and oxidation (redox)

- Oxidation is losing electrons
- Reduction is gaining electrons
- Oxidizing agents get reduced
- Reducing agents get oxidized



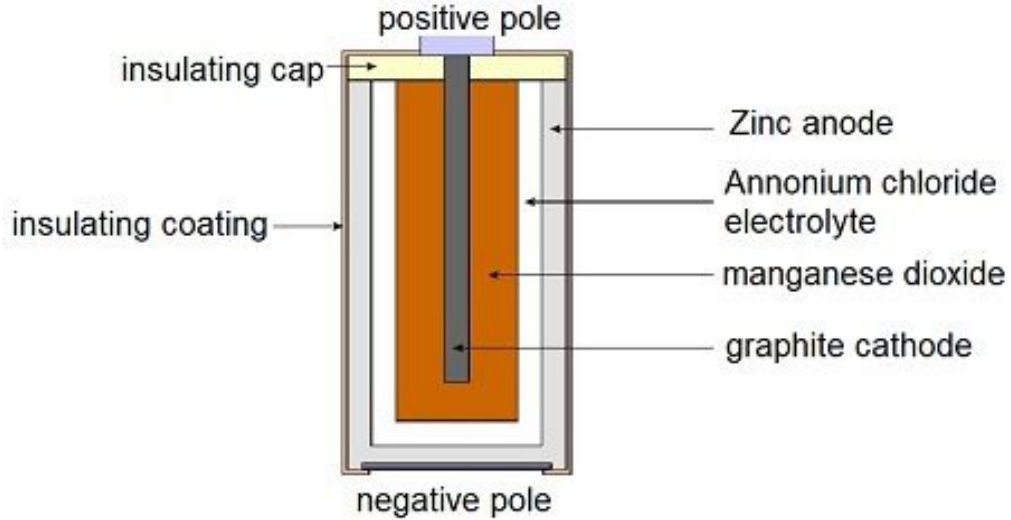
# Electricity



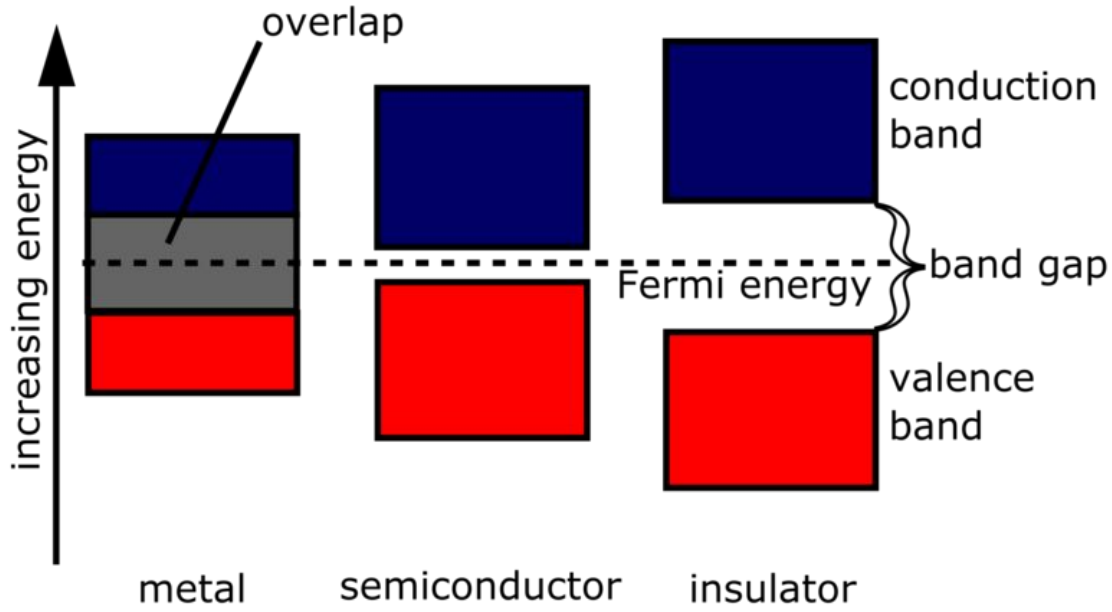

- Electrons want to flow towards positive charges
- To charge batteries, the opposite is true

# Batteries




- Insulators help keep energy contained
- Electrolyte helps ions to flow
- Electrons flow from the anode to the cathode for energy

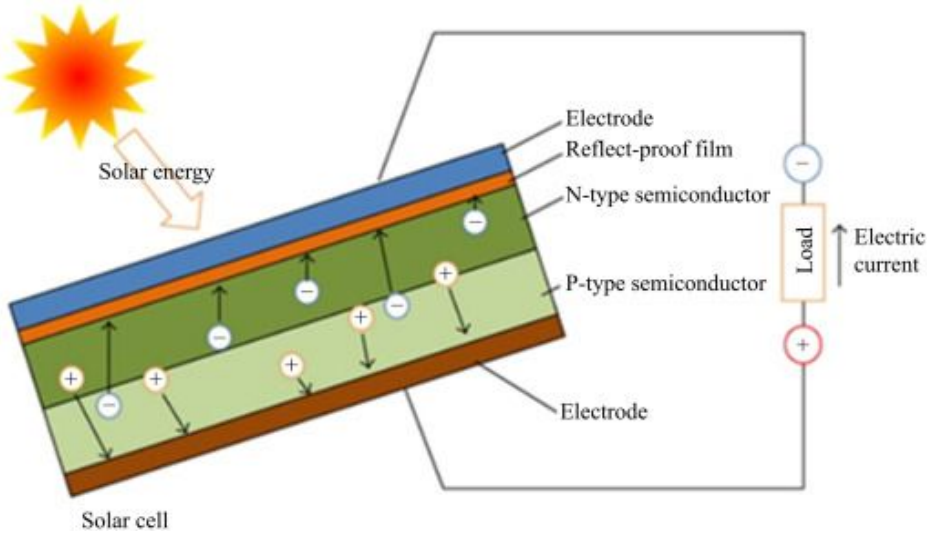
# Bandgap




- Bandgap: lowest amount of energy required to excite electrons from valence to conduction band
- When this energy is overcome, the electron is free to move through the cell with the electrical field

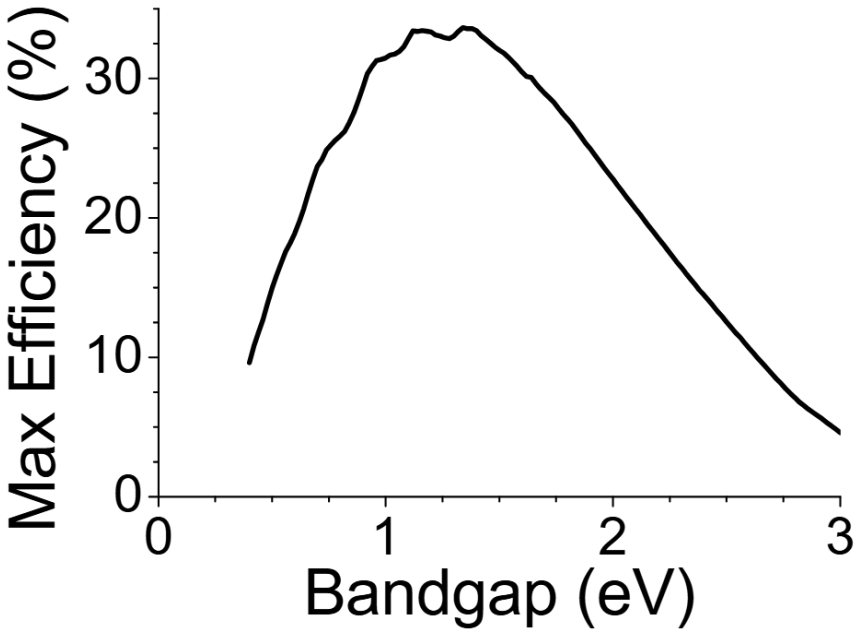
# Solar Cells

1. Sunlight hits the solar cell
2. The cell absorbs the light's energy
3. The energy knocks electrons loose from their atoms
4. The electrons flow through the cell generating electrical current
5. Current is captured by metal grid and transferred to circuit

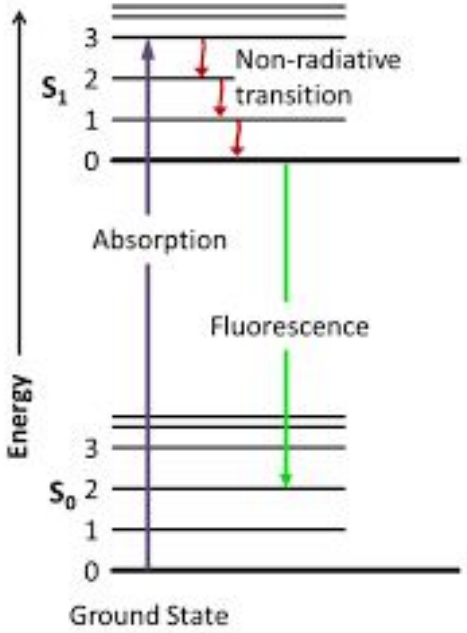


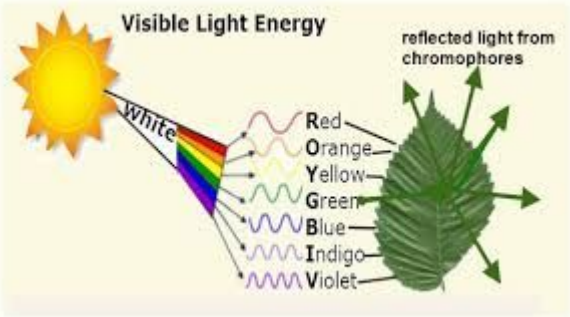
# Limitations

Shockley-Queisser limit: an ideal solar cell with an ideal band gap can convert 33.7% of light to electrical energy

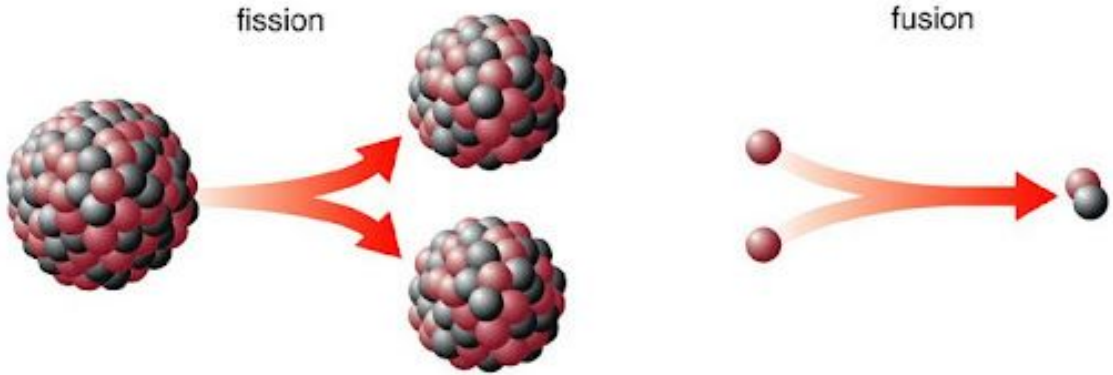


# Chromophores

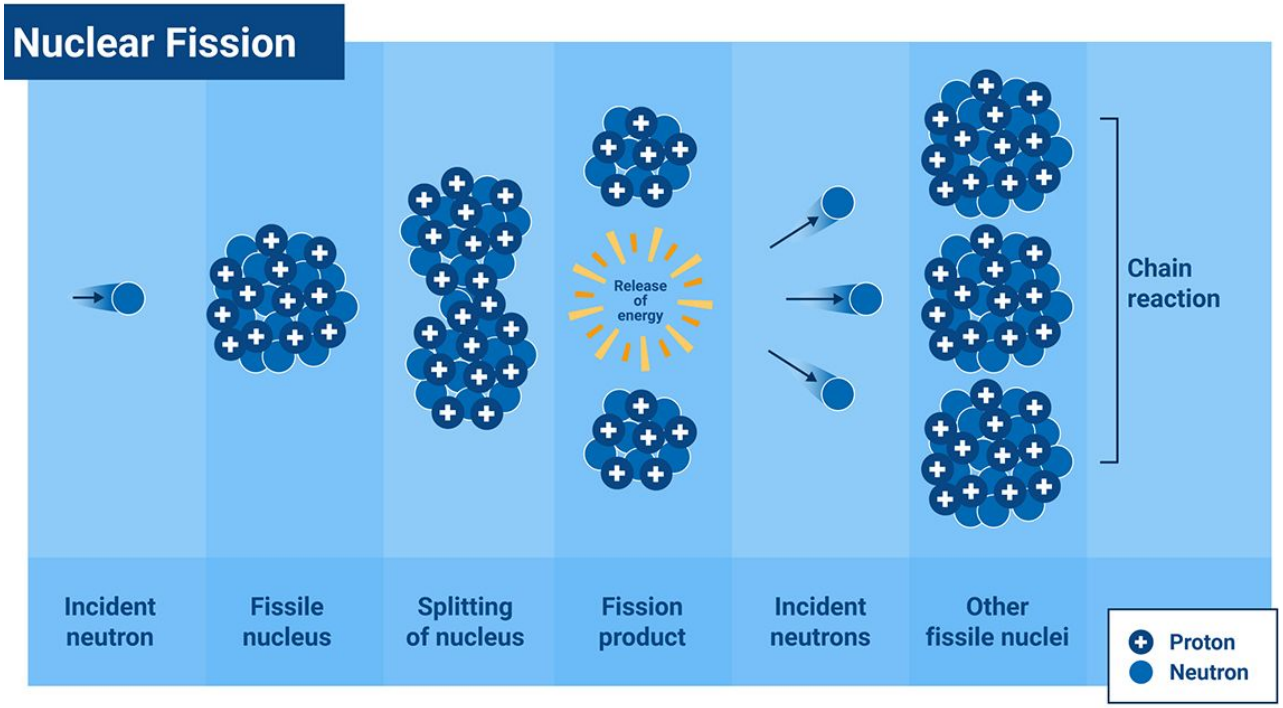


# Fission vs fusion



# Nuclear energy



# Nuclear energy