

BIOCHEMISTRY- BP203T

UNIT: 1 BIOENERGETICS

CLASS: 6

TOPIC: ENTHALPY, ENTROPY, AND REDOX POTENTIAL1. Enthalpy (ΔH)

- Definition: Enthalpy is the total heat content of a system at constant pressure.
- Units: Joules (J) or kilojoules (kJ)
- Interpretation:
 - $\Delta H > 0$: Endothermic reaction (absorbs heat)
 - $\Delta H < 0$: Exothermic reaction (releases heat)
- Formula:

$$\Delta H = \Delta U + P\Delta V$$

Where ΔU is the change in internal energy, P is pressure, and ΔV is change in volume.

2. Entropy (ΔS)

- Definition: Entropy is a measure of the disorder or randomness of a system.
- Units: Joules per kelvin (J/K)
- Interpretation:
 - $\Delta S > 0$: Increased disorder (more probable state)
 - $\Delta S < 0$: Decreased disorder
- Role in spontaneity: Combined with enthalpy in Gibbs free energy:

$$\Delta G = \Delta H - T\Delta S$$

where $\Delta G < 0$ indicates a spontaneous process.

3. Redox Potential (Electrode Potential, E°)

- Definition: Redox potential is a measure of a substance's tendency to gain or lose electrons (i.e., to be reduced or oxidized).
- Symbol: E°
- Unit: Volts (V)
- Key Concept:
 - A positive E° indicates a strong tendency to be reduced (gain electrons).
 - A negative E° indicates a tendency to be oxidized (lose electrons).
 - Redox reactions involve two half-reactions: one for oxidation and one for reduction.

Gibbs Free Energy:

$$\Delta G = \Delta H - T\Delta S$$

- Where ΔG is the change in Gibbs free energy.
- A negative ΔG indicates a spontaneous reaction.

Also, in redox chemistry:

$$\Delta G = -nFE^\circ$$

Where:

- n = number of electrons transferred
- F = Faraday constant ($\sim 96,485$ C/mol)
- E° = standard redox potential