**The Cell**

* **Cell Theory**:
  1. All living things are made of cells.
  2. Cells are the basic unit of life.
  3. All cells come from pre-existing cells.
* **Prokaryotes**: No nucleus (e.g., bacteria).
* **Eukaryotes**: Have a nucleus + organelles (plants, animals, fungi).

**Key Organelles:**

* Nucleus → DNA storage, control center
* Mitochondria → ATP (energy) production
* Ribosomes → Protein synthesis
* Chloroplasts → Photosynthesis (plants only)
* Cell Membrane → Controls what enters/exits

**2. Genetics**

* **DNA**: Double helix, made of nucleotides (A-T, C-G).
* **Genes**: Segments of DNA coding for proteins.
* **Mitosis**: Cell division → growth & repair (2 identical cells).
* **Meiosis**: Produces gametes (sperm/egg) → genetic diversity.
* **Punnett Squares**: Predict inheritance of traits.

**3. Evolution**

* **Natural Selection** (Darwin): Organisms best adapted survive & reproduce.
* **Evidence**: Fossils, homologous structures, DNA comparisons.
* **Speciation**: Formation of new species due to isolation + adaptation.

**4. Ecology**

* **Levels of Organization**: Organism → Population → Community → Ecosystem → Biosphere.
* **Energy Flow**:
  + Producers (plants) → Primary consumers (herbivores) → Secondary/Tertiary (carnivores/omnivores).
  + Energy decreases up food chain (10% Rule).
* **Cycles**: Water, Carbon, Nitrogen cycles recycle matter.

**5. Human Body Systems**

* **Circulatory** → Heart, blood, vessels (transport oxygen/nutrients).
* **Respiratory** → Lungs (gas exchange: O₂ in, CO₂ out).
* **Digestive** → Breaks down food → nutrients absorbed.
* **Nervous** → Brain, spinal cord, nerves (control & response).
* **Immune** → Defends against pathogens.