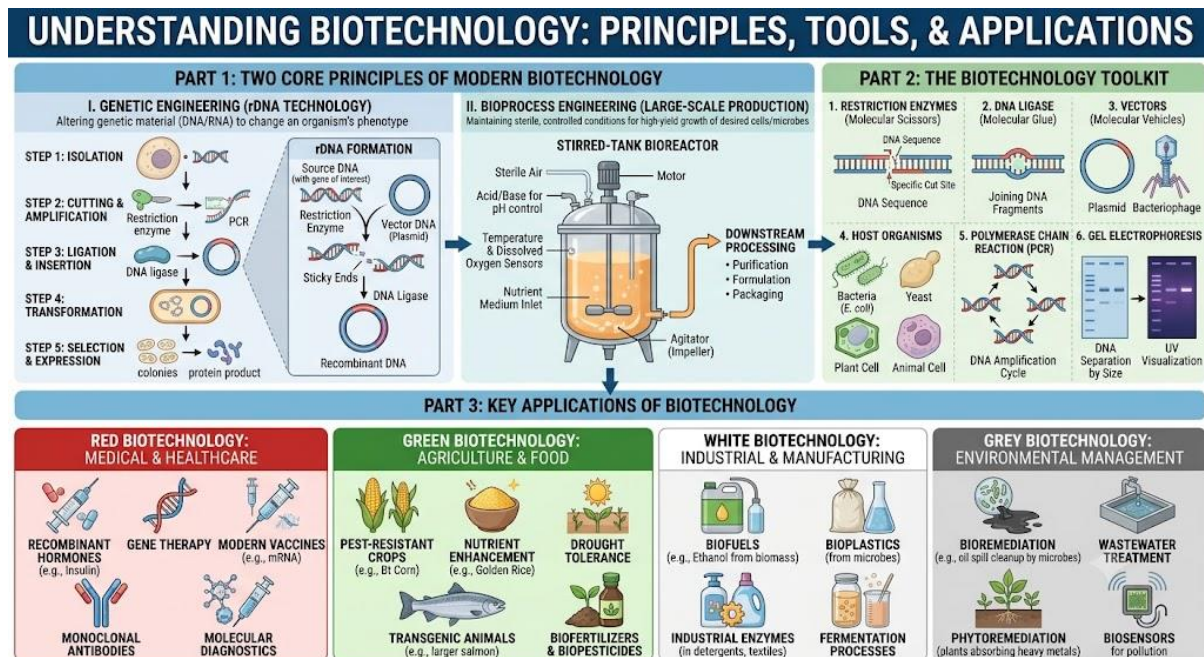




Basic Principles of Biotechnology

Biotechnology is the use of living organisms, cells, or their components to develop products and processes useful to humans — spanning agriculture, medicine, industry, and environmental management.



Based on the core principles and applications illustrated in the biotechnology diagram, here is the content broken down into 10 key points:

- Definition of Biotechnology:** It is the branch of science that utilizes living organisms, cells, or biological components to develop products and processes beneficial to human life.
- Genetic Engineering:** This core principle involves techniques to deliberately alter the chemistry of genetic material (DNA/RNA) to change the host organism's physical traits (phenotype).
- Bioprocess Engineering:** This principle focuses on maintaining ultra-sterile (aseptic) conditions to grow specific microbes or cells on a large scale without contamination.
- Molecular Slicing:** The genetic engineering process relies on restriction enzymes—acting as "molecular scissors"—to cut DNA at highly specific target sequences.

5. **Gene Amplification (PCR):** Once a gene of interest is isolated, Polymerase Chain Reaction (PCR) technology is used to rapidly create millions of exact copies of that specific DNA segment.
6. **Recombinant DNA Creation (Ligation):** The isolated gene is pasted into a molecular carrier (vector/plasmid) using DNA ligase ("molecular glue") to form a recombinant DNA molecule.
7. **Host Transformation & Expression:** The recombinant DNA is inserted into a host cell (like bacteria or yeast), which then reads the new instructions to produce the desired protein in large quantities.
8. **Medical Applications:** Biotechnology is vital for human health, enabling the creation of synthetic insulin, life-saving vaccines, antibiotics, and targeted gene therapy.
9. **Agricultural Applications:** It drives the development of Genetically Modified (GM) crops that are engineered to resist pests, tolerate harsh weather, and provide higher nutritional value.
10. **Environmental & Forensic Uses:** It provides innovative solutions for the planet through bioremediation (using microbes to clean up pollutants) and enhances justice systems through DNA fingerprinting.

By

Dr.A.T.Aji Jovitha,

Assistant Professor, Department of Biotechnology,

St. Joseph's College (Arts & Scirence),

Chennai - 600128