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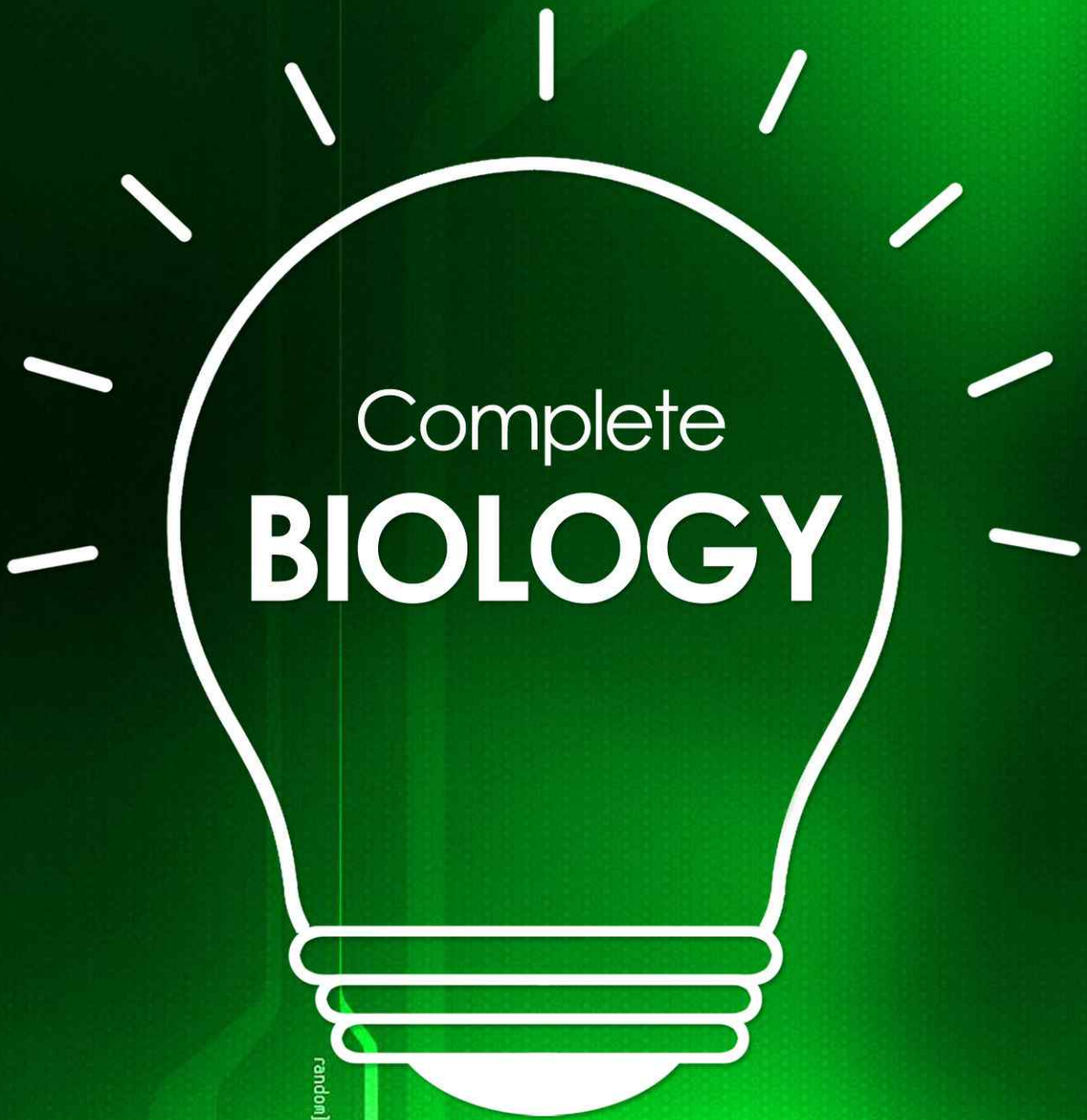

Complete BIOLOGY

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Biotechnology: Principle & Process

01. Introduction

What is Biotechnology?

Biotechnology is technology based on biology, especially when used in agriculture, food science and medicine.

The **European Federation of Biotechnology (EFB)** has given a definition of biotechnology that encompasses both traditional view and modern molecular biotechnology.
Which states that the Integration of natural science and organisms, cells, parts thereof, and molecular analogues for products and services.

I. Principles of Biotechnology

Among many, the two core techniques that enabled us to combine the genetic elements of two or more living cells or that enabled birth of modern biotechnology are :

(i) **Genetic Engineering :** Techniques to alter the chemistry of genetic material (DNA and RNA), to introduce these into host organisms and thus change the phenotype of the host organism.

(ii) **Maintenance of Sterile Conditions :** Microbial contamination-free ambience in chemical – engineering process to enable growth of only the desired microbe/eukaryotic cell in large quantities for the manufacture of biotechnological products like antibiotics, vaccines, enzymes, etc.

In these techniques functioning length of DNA can be taken from one organism and placed into the cells of another organism.

Knowledge Cloud

What is gene cloning?

(i) A fragment of DNA, containing the gene to be cloned, is inserted into a circular DNA molecule called a vector, to produce a recombinant DNA molecule.

(ii) The vector transports the gene into a host cell, which is usually a bacterium although other types of living cell can be used.

(iii) Within the host cell the vector multiplies, producing numerous identical copies, not only of itself but also of the gene that it carries.

(iv) When the host cell divides, copies of the recombinant DNA molecule are passed to the progeny and further vector replication takes place.

(v) After a large number of cell divisions, a colony, or clone, of identical host cells is produced. Each cell in the clone contains one or more copies of the recombinant DNA molecule; the gene carried by the recombinant molecule is now said to be cloned.

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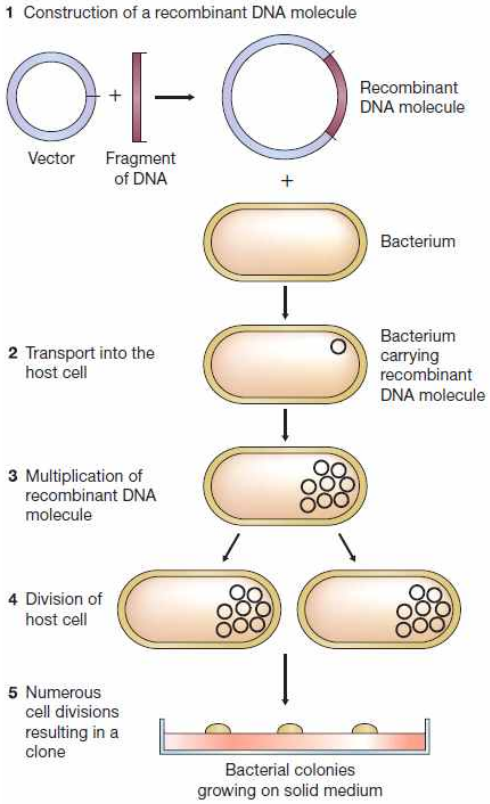
Basic Steps in Gene Cloning



Therefore, **cloning is making multiple identical copies of any template DNA.**

The construction of the first recombinant DNA emerged from the possibility of linking a gene-encoding antibiotic resistance with a native **plasmid** (autonomously replicating circular extra-chromosomal DNA) of *salmonella typhimurium*)

II. Tools of Recombinant DNA Technology

Tools required to accomplish genetic engineering include :

(i) DNA manipulative enzymes
  (a) Restriction enzymes
  (b) Polymerase enzymes
  (c) Ligases enzymes
(ii) Vectors
(iii) Host organism

Restriction Enzymes (RE)

In the year 1963, the two enzymes responsible for restricting the growth of bacteriophage in *E.coli* were isolated. One of these added methyl groups to DNA (methylase), while the other cut DNA. The later was called **restriction endonuclease**.

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