Principles and Processes of Biotechnology Summary

- Biotechnology is the science of applied biological process in which there is a controlled use of biological agents such as microorganisms or cellular components for beneficial use.
- A Hungarian Engineer, Karl Ereky (1919) coined the term biotechnology. Biotechnology broadly categorized into traditional practices and modern practices.
- Traditional biotechnology includes our ancient practices such as fermentation. Single Cell Protein (SCP) organisms are grown in large quantities to produce goods rich in protein, minerals, fats, carbohydrates and vitamins. The modern biotechnology embraces all the genetic manipulations.
- The recombinant DNA technology is a technique of modern biotechnology in which transfer of DNA coding for a specific gene from one organism is introduced into another organism using specific agents like vectors or using instruments like electroporation, gene gun, liposome mediated, chemical mediated and micro injection. Other tools are enzymes and host organisms.
- The enzyme restriction endonuclease is a molecular scissor that cleaves DNA into fragments at or near specific recognition sites

with the molecule known as restriction sites. Other enzymes are DNA ligase and alkaline phosphatase.

- DNA ligase enzyme joins the sugar and phosphate molecules of double stranded DNA. Alkaline phosphatase is an enzyme which adds or removes specific phosphate group of double stranded DNA.
- A vector is a small DNA molecule capable of self replication and used as a carrier of DNA inserted in the host cell. Few examples of vectors are plasmid – pBR 322, cosmid – Lambda phage, M13, Phagmid , BAC, YAC, transposon, shuttle vector and expression vector.
- After production of recombinant DNA molecule has been generated is introduced into a suitable host cell. Type of host cell depends upon the cloning experiment. E.coli is the most widely used host organism.
- There are two kinds of gene transfer methods in plants. They are direct or vectorless gene transfer and indirect or vector mediated gene transfer. Direct gene transfer includes chemical mediated gene transfer, micro injection, electroporation. Gene gun method and Liposome mediated method of gene transfer. Indirect or vector mediated gene transfer is a method of gene transfer with the help of a plasmid vector. In this method Ti-plasmid from *Agrobactirum*

tumefeciens has been used extensively for vector mediated gene transfer.

- After the introduction of rDNA into a host cell, it is essential to identify those cells which have received the rDNA molecule. This process is called screening. One of the method of recombinant screening is blue white selection method Replica plating technique in which the pattern of colonies growing on a culture plate is copied.
- Electrophoresis is a separating technique used to separate different biomolecules.
- Blotting techniques are widely used tools for identification of desired DNA or RNA fragments from larger number of molecules.
- Some of the genetically modified crops are herbicide tolerant Basta, Dhara mustard, insects resistance – Bt crops, flavrSavr – Tomato, Golden rice. Biopolymers are polyhydroxybutyrate (PHB), polylactic acid (PLA) and green fluorescent protein (GFP) is used to make biosensors.
- Other applications are biopharming, bioprospecting, biomedication and biofuel, etc.