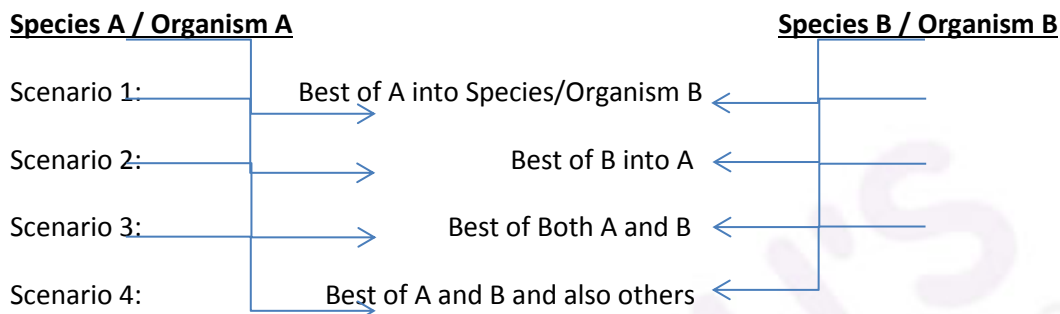


## Biotechnology

**Biotechnology is defined** as any technique that uses living organisms or their products to make or modify a product to improve plants and animals or to develop microorganisms for specific uses.

To put in other words



The above scenarios typically show that biotech is basically aimed at bringing in best of something into best of something else.

Earlier decades, when there was absence of technological superiority, still the desired features and desired characteristics were got with the use of techniques like **Selective Breeding**.

This give rise to different types of BT. Based on how BT is achieved, we have

- a. Non-gene BT
- b. Gene BT

Selective breeding is an example of Non-gene BT.

## Transgenic and Cisgenic Organisms

If genetic material is taken from different species, then the resultant product is called Transgenic organisms.

On the other hand, if the genetic material is taken from the same species but from a different organism, then the resultant product is a Cisgenic organism.

## Tools to achieve Biotechnology

### 1. Genetic Engineering

It is an area of molecular biology that involves manipulating the structure of genetic material known as DNA.

### 2. Recombinant DNA

It is a strand of DNA that has been manipulated by scientists. In this the DNA strand is got by recombining fragments of DNA that has been obtained from others.

## Types of Biotechnology

1. Green Biotechnology
2. Red Biotechnology
3. White Biotechnology
4. Blue Biotechnology

## Green Biotechnology

It is the field of where Biotech principles are used in **agricultural** purposes.

### BT Cotton

Gene **CRY1ac** has been taken from soil bacterium **Bacillus Thuringiensis**, which has been inserted into cotton. This gene has been identified to produce a toxin that is potent to many pests. Once this gene is inserted into cotton plants, then we get a cotton plant that fights pests on its own. This reduces the use of Pesticides.

In India, BT Cotton was used on a wide scale from 2002. Over a decade now, the positives and negatives are properly documented.

### Negatives

- Bollworm pests that the BT toxin is designed to fight, is becoming BT resistant. This is a major issue, since this scenario was not anticipated and there is virtually no solution as of now to this issue.
- BT toxin is destroying microflora.
- BT plants are not able to produce BT toxin throughout their lifespan.

### BT Brinjal

**Brinjal or Eggplant** is a plant species native to India. It was started to be cultivated in India 4000 years ago. In India, it is majorly grown in West Bengal, Orissa, Bihar, Andhra Pradesh, Tamil Nadu and Uttar Pradesh.

Any altering of this species at the genetic level might result in losing the native species once and for all.

**Is organic food coming under threat from GM crops?** Recently, there was a curious case in Australia, where GM crop grown in a farm "Contaminated" (**Genetic Pollution**) its neighbouring farm and this resulted in this farm losing the "Organic Farm" status.

**This is not** the only way GM food is threatening organic food. GM food companies like Monsanto, Dupont are aggressively undervaluing their bids in order to sell GM seeds to a vast population, which is seen as a major threat to organic foods.

### Genetic Pollution

It is a term used by scientists where there is an uncontrolled gene flow into the Native species, which results either in altering the native species at the genetic level or in the worst case that native species is lost forever.

### Uses of Green BT

1. Agricultural yield is more in less time.
2. Reducing vulnerability of crops to environmental stresses including drought and excessive salinity. For ex: Cotton had vulnerability with bollworm pests.
3. Reduces fertilizer use.

### Concerns about GM Food

- **Going against Nature:** GM foods research is considered by many to go against Nature. And the fear of unknown combined has become a major aversive force for people to go for GM Foods.
- **Food Contamination:** There is always a fear of native seeds being contaminated by GM seeds and that the threat of losing the native seed species completely, is real.
- **Pesticide resistant** crops could be toxic to non-target organisms and also the threat of promotion of development of **BT resistant** insect populations
- **Genetic Pollution**

### Red Biotechnology

It is the field of where Biotech principles are used in **medical** purposes.

Eg: Gene Therapy, DNA Finger printing, Biogenics

#### Biogenics

Therapeutic products based on genetically engineered or RDNA technology.

For ex: Recombinant Insulin

#### Gene Therapy

It is one of the revolutionary form of treatment of genetic disorder which is caused by some of the key gene becoming defective or misplaced. Therefore, gene therapy aims at either modifying or replacing the defective genes by right sequence of genes.

### White Biotechnology

It is the field of where Biotech principles are used in **industrial** purposes.

Industrial biotech is also used for the preparation of vitamins, antibiotics and alcohols by the manipulation of microorganism.

For ex: Vaccines are nothing but, disease causing organisms in its weak state.

### Blue Biotechnology

It is the field of where Biotech principles are used in **marine or fresh water areas**.

This field concerns with use of marine or fresh water organisms and their derivatives to increase sea food supply or to harness medicinal products.

