Genetic Engineering and Genetically Modified Organisms (GMOs)

1. "Recombinant DNA technology is used to introduce the desired characters of an organisms to another organisms". Justify the statement by describing with various related steps. (4marks) (2080)

- Recombinant DNA technology also called genetic engineering.
- Used to introduce the desired characters of an organism to another organism through different stages.

Steps in Recombinant DNA technology:

i. Isolation of gene of insect (foreign DNA):

- First step in recombinant DNA technology ~~in~~ is to isolate the gene of interest or foreign DNA by using restriction endonuclease.
- Foreign DNA possesses sticky ends.

ii. Insertion of foreign DNA into plasmid:

- Plasmid is cut with the same restrictions endonuclease as that is used to generate

foreign DNA.
- Creates sticky ends which are complimentary to the sticky ends of foreign DNA.
- After isolation of plasmid, linearized plasmid and the foreign DNA are incubated with DNA ligase to form the recombinant plasmid.

iii. Transformation of host cell by the recombinant plasmid:
- Host cell (bacterial cell) take up the recombinant plasmid through transformation process.
- Foreign DNA is cloned in bacterium.

iv. Multiplication of foreign DNA:

- As host bacterium multiply, number of copies of foreign DNA also increases.
- Process is called cloning.

v. Detection of the cloned gene:

- Next step involves the detection of the host cells that contain the recombinant plasmid.
- Most plasmid has gene that code for resistance to antibiotics or drugs.
- When host cells are grown in medium containing particular antibiotics, only cells that have been transformed will survive.
- Rest host cells die and foreign DNA is expressed.

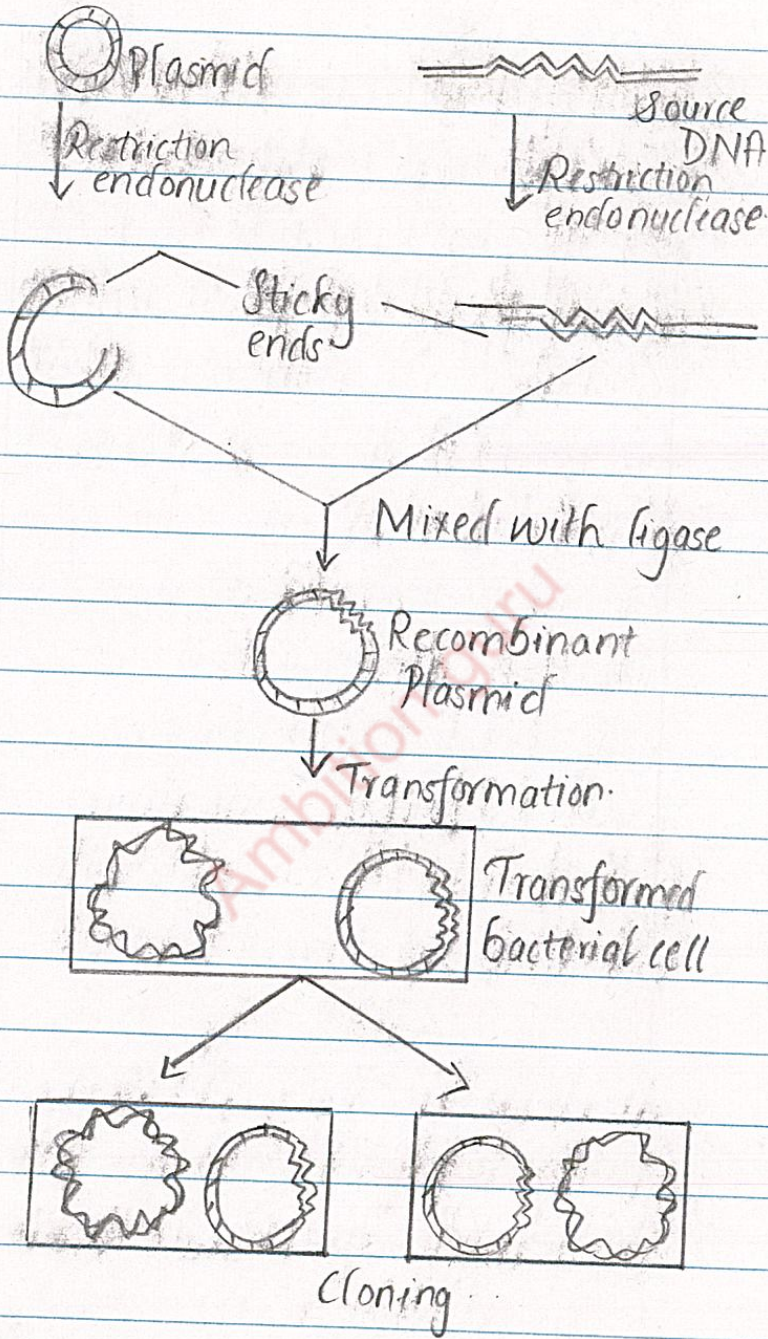

Fig: Steps in Genetic Engineering.

2. The application of genetic engineering revolutionize the various fields such as medicine and agriculture. Analyze the benefits and risks of genetic engineering in the field of medicine, taking into account the ethical and social concerns involved. (2+2=4)
(2080)

Genetic Engineering:

- Science of adding, removing or replacing genetic units so as to produce individuals which are far better than the original organisms in various aspects.
- Application of genetic engineering revolutionize the various fields such as medicine and agriculture.

Benefits of Genetic Engineering:

i) Used in the production of human insulin.

ii) Used in the production of interferon against viral diseases, second generation vaccines, antibiotics like penicillin, etc.

iii) Various genetic diseases like cystic fibrosis have been treated.

iv) Used for production of different types of growth hormones for treatment of dwarfism.

Risks of genetic engineering:

- Risk of creation of germs that are resistant to all pres

ently known as antibiotics.
ii. May result in the production of new and several kind of diseases on earth.
iii. Risk if any genetically engineered microorganisms, which are potentially dangerous, accidentally escapes out of the laboratory into the open environment.
iv. Risk of introducing harmful genes into man when bacteria infect human.
Virus