CHANDIGARH UNIVERSITY

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INSTITUTE-UNIVERSITY INSTITUTE OF ENGINEERING

ACADEMIC UNIT-II

Computer Science Engineering

Subject Name-Biology For Engineers

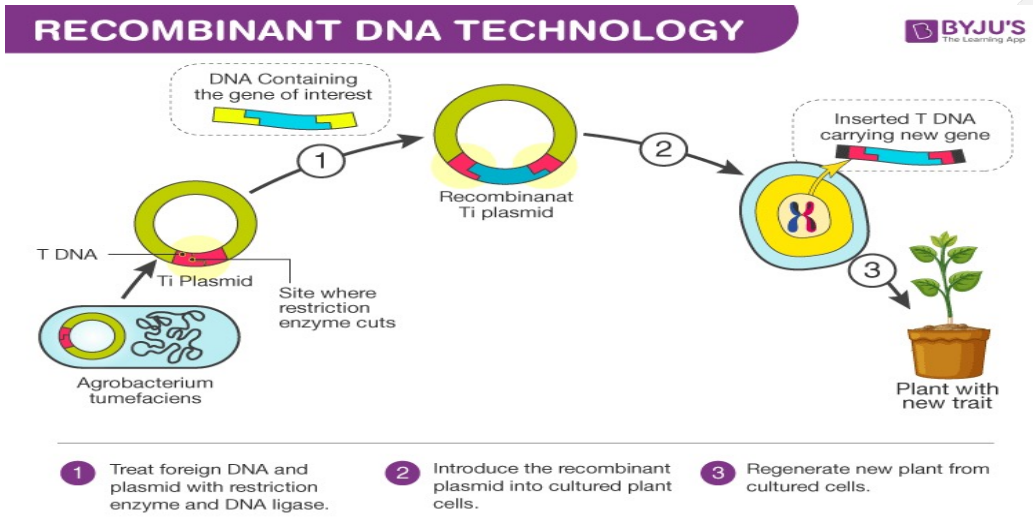
Subject Code- 20SZT148

VECTORS

VECTORS

Course Outcome

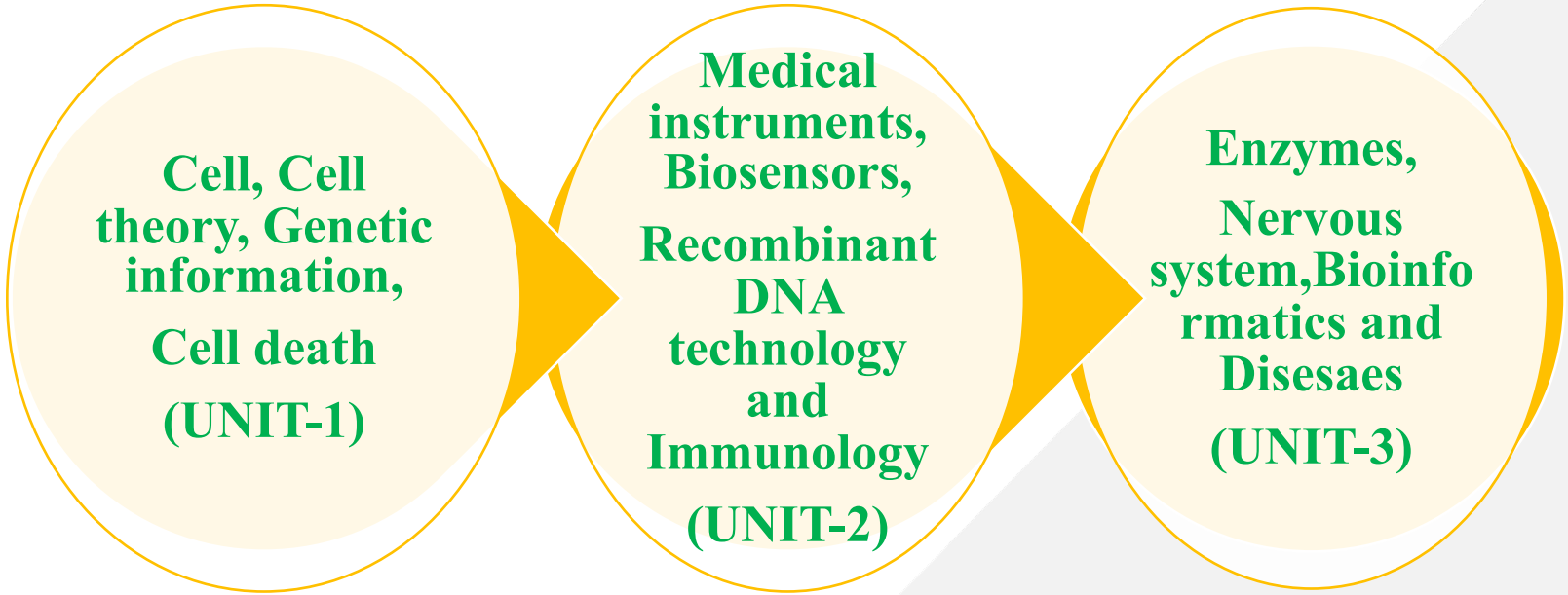
CO Number	Title	Level
CO1	It gives an idea about the about the basic cell biology.	**Understanding**
CO2	It deals with the idea of uses of biology in engineering.	**Understanding**
CO3	It provide knowledge about the uses of softwares in biology field.	**Remembering**



Will be covered in this lecture

https://byjus.com/biology/tools-recombinant-dna-technology/

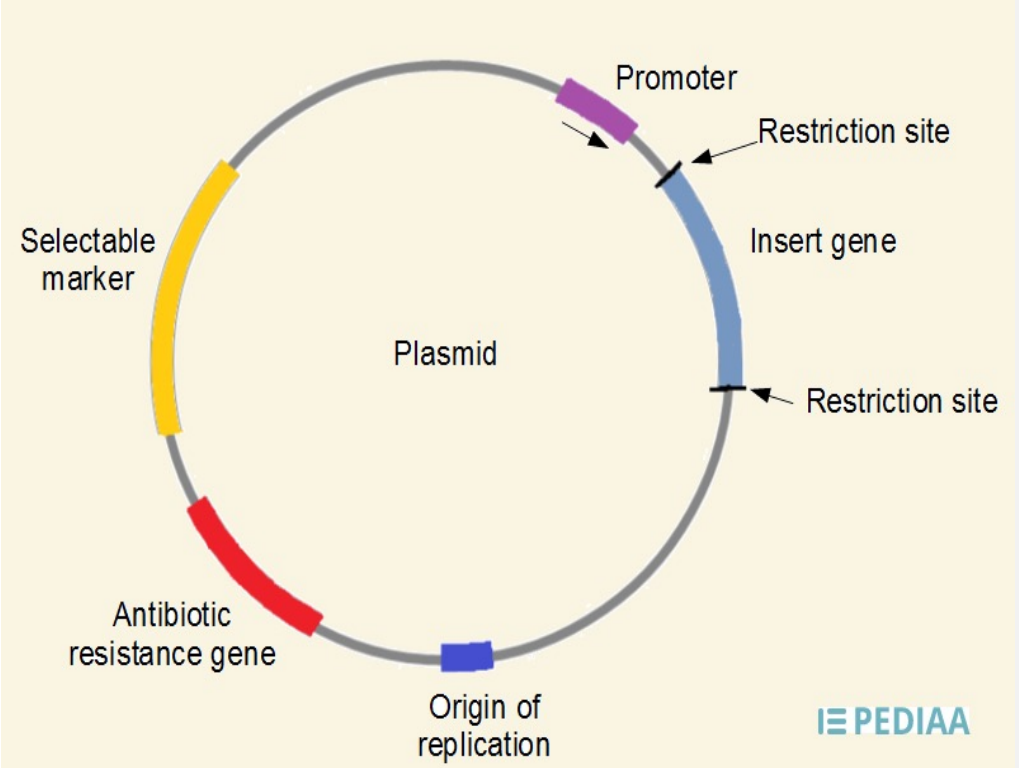
BIOLOGY FOR ENGINEERS



VECTORS

•By cloning, one can produce unlimited amounts of any particular fragment of DNA.

• In principle, the DNA isolated and cut pieces are introduced into a suitable host cell, usually a bacterium such as Escherichia coli, where it is replicated, as the cell grows and divides.



https://pediaa.com/difference-between-plasmid-and-cosmid/

VECTORS

- Vectors are those DNA molecules that can carry a foreign DNA fragment when inserted into it.
- A vector must possess certain minimum qualifications to be an efficient agent for the transfer, maintenance and amplification of the passenger DNA.

1. The vector should be small and easy to isolate.
2. They must have one or more origins of replication so that they will stably maintain themselves within host cell.
3. Vector should have one or more unique restriction sites into which the recombinant DNA can be inserted.

TYPES OF VECTORS

4. They should have a selectable marker (antibiotic resistance gene) which allows recognition of transformants.

5. Vector DNA can be introduced into a cell.

6. The vector should not be toxic to host cell.

- Based on the nature and sources, the vectors are grouped into bacterial plasmids, bacteriophages, cosmids and phagemids

(a) Plasmid: Plasmids are the extra-chromosomal, self-replicating, and double stranded closed and circular DNA molecules present in the bacterial cell. A number of properties are specified by plasmids such as antibiotic and heavy metal resistance, nitrogen fixation, pollutant degradation, bacteriocin and toxin production, colicin factors, etc.

TYPES OF VECTORS

- **Plasmids have following advantages as cloning vehicle (Cohen et a. 1973):**

1. It can be readily isolated from the cells.
2. It possesses a single restriction site for one or more restriction enzymes.
3. Insertion of foreign DNA does not alter the replication properties.
4. It can be reintroduced into cell.
5. Selective marker is present.
6. Transformants can be selected easily by using selective medium.
7. Multiple copy numbers are present in a cell.

TYPES OF VECTORS

- Some plasmid vectors are pBR 322, pBR 327, pUC vectors, yeast plasmid vector and Ti, Ri plasmids. Ti and Ri Plasmids are widely used in plant system for genetic transformation.

- Among higher plants, Ti plasmid of Agrobacterium tumefaciens or Ri plasmid of A. rhizogenes are the best known vectors. T-DNA, from Ti or Ri plasmid of Agrobacterium, is considered to be very potential for foreign gene transfer in cloning experiments with higher plants.

TYPES OF VECTORS

pBR 322 and pUC Vectors:pBR322 is a derived plasmid from a naturally occurring plasmid col El, composed of 4362 bp DNA and its replication may be more faster. The plasmid has a point of origin of replication (ori), two selectable marker genes conferring resistance to antibiotics, e.g., ampicillin (amp^r), tetracycline (tet^r) and unique recognition sites for 20 restriction endonucleases.

(b) Bacteriophage:

- The bacteriophage has linear DNA molecule, a single break will generate two fragments, foreign DNA can be inserted to generate chimeric phage particle. But as the capacity of phage head is limited, some segments of phage DNA, not having essential genes, may be removed. This technique has been followed in λ (Lambda) phage vectors to clone large foreign particle.

TYPES OF VECTORS

(c) Cosmid:

- Cosmids are plasmid particles, into which certain specific DNA sequences, namely those for cos sites are inserted which enable the DNA to get packed in X particle. Like plasmids, the cosmids perpetuate in bacteria without lytic development. The cosmids have high efficiency to produce a complete genomic library

(d) Phagemid:

- These are prepared artificially by combining features of phages with plasmids. One commonly used phagemid is pBluescript IIKs derived from pUC-19.

TYPES OF VECTORS

(e) Plant and Animal Viruses:

- A number of plant and animal viruses have also been used as vectors both for introducing foreign genes into cells and for gene amplification. Cauliflower Mosaic Viruses (CaMV), Tobacco Mosaic Viruses (TMV) and Gemini Virus are three groups of viruses that have been used as vectors for cloning of DNA segments in plant system. SV 40 (Simian Virus 40), human adenoviruses and retroviruses are potential as vectors for gene transfer into animal cells.

(f) Artificial Chromosomes:

- Yeast Artificial Chromosome (YAC) or Bacterial Artificial Chromosome (BAC) vectors allow cloning of several hundred kb pairs which may represent the whole chromosome. It can be cloned in yeast or bacteria by ligating them to vector sequences that allow their propagation as linear artificial chromosome.

CONCLUSION

- Recombinant DNA technology is the joining together of DNA molecules from two different species.
- The recombined DNA molecule is inserted into a host organism to produce new genetic combinations that are of value to science, medicine, agriculture, and industry.
- Recombinant DNA technology is used to make microbes, plants, and animals that carry genes from other species.
- Recombinant DNA technology can be used in the prenatal diagnosis of human genetic disease.

ASSESSMENT PATTERN

Assessment Pattern	Total Marks
1st Hourly Test	36
2nd Hourly Test	36
Surprise Test	12
Assignment (3)	10
Quiz	4
End Semester Examination	60

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THANK YOU

For queries
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