

SMART SKILLS
SYLLABUS 2017-18
BIOTECHNOLOGY



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Chapter 1 Recombinant DNA Technology

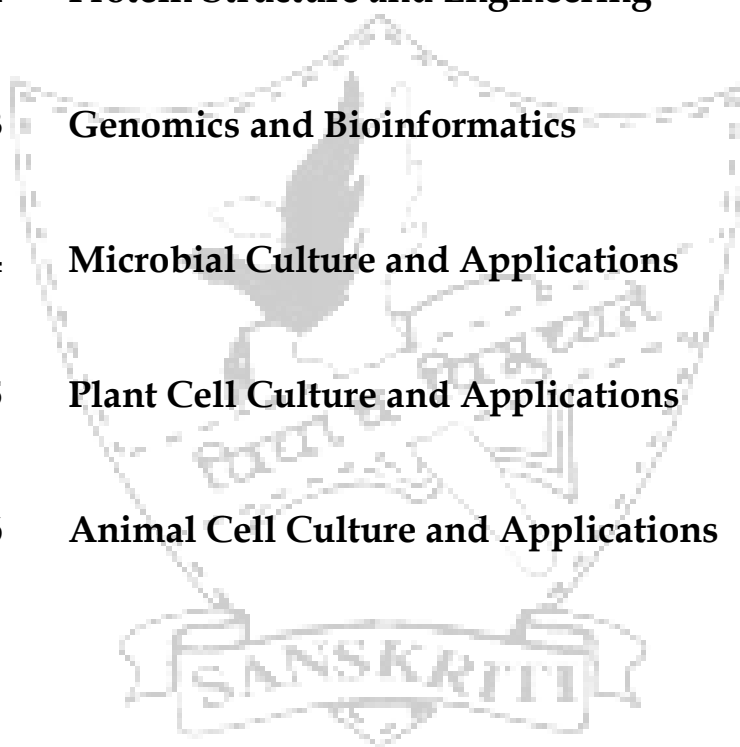
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Chapter 1

RECOMBINANT DNA TECHNOLOGY

1 mark each

- 1) Give the full form of BAC and YAC.
- 2) Define Palindrome.
- 3) Name the source of EcoRI. What type of ends does it create?
- 4) What is meant by a recombinant DNA?
- 5) Give the meaning of Cosmids.

2 marks each

- 1) Describe Restriction Modification System.
- 2) Differentiate between blunt and sticky ends.
- 3) What are restriction enzymes? Give their types and use in genetic engineering.
- 4) Discuss the importance of expression and shuttle vectors.
- 5) Discuss the commonly used host cells in the area of rDNA technology. What are the advantages of using Yeast as host cells?

3 marks each

- 1) Differentiate between a Genomic and cDNA library.
- 2) Explain briefly the use of M13 as a vector.
- 3) All vectors are plasmids but not all plasmids are vectors. Discuss highlighting the desirable features of a vector.
- 4) Discuss the method and importance of RFLP.
- 5) Describe Insertional inactivation as a method of selection of transformed cells.

5 marks each

- 1) Describe the various steps and applications of PCR.
- 2) Discuss briefly the various methods of introducing rDNA into the host cell.
- 3) Explain the method and applications of Southern Hybridization.
- 4) Describe Sanger's method of DNA sequencing. Why is it that the sequence we read is not the sequence of the original strand?
- 5) Make a flow chart of construction of an rDNA molecule *in vitro*.

Chapter 2

PROTEIN STRUCTURE AND ENGINEERING

1 mark each

- 1) Give the full form of SCID and GRAS.
- 2) What are Interferons? Where are they used?
- 3) Define intra cellular and extra cellular proteins.
- 4) Name the proteins involved in breathing and protection from antigens.
- 5) Give 1 functional property and its application of whey proteins.

2 marks each

- 1) Describe briefly BV and PER.
- 2) Differentiate between essential and non essential amino acid giving 2 examples under each category.
- 3) What are Nutraceutical proteins?
- 4) Number of genes and number of proteins share a nonlinear relationship. Explain.
- 5) Write a short note on Prions.

3 marks each

- 1) What is meant by molecular pharming? What are the advantages?
- 2) Discuss the technique of aqueous two phase partition.
- 3) Describe the cause and method of detection of a molecular disease.
- 4) Differentiate between MALDI and ESI.
- 5) Discuss taking an example, designing proteins by protein engineering
- 6) Make a flow chart of the downstream processing of an Intracellular metabolite.

5 marks each

- 1) Describe in detail the structure function relationship in proteins.
- 2) Discuss any five areas of applications of protein based products.
- 3) a) A bacterium produces a protein of interest (Mol.Wt. =6000D) at the rate of 2000 molecules /cell. To purify 4 Gms of protein how many cells would be needed?

(b) Assuming that the bacterium is a cylinder ($d=2\mu\text{m}$, $h=6\mu\text{m}$) calculate the packed cell volume for the production of 6 Gms of protein, and the volume of the fermentor if the maximum cell concentration is 6%.

Chapter 3

GENOMICS AND BIOINFORMATICS

1 mark each

- 1) What is PAM?
- 2) Define and give 1 example of a data retrieval tool.
- 3) Name the scientist who sequenced the human genome.
- 4) What is meant by genome?
- 5) Give the full form and location of TIGR.
- 6) What is Philadelphia chromosome?

2 marks each

- 1) Differentiate between structural and functional genomics.
- 2) Give the 2 properties of biological data that played a key role in the development of Bioinformatics.
- 3) Describe the method of directed sequencing of BAC contigs.
- 4) What is random shotgun sequencing?
- 5) In Bioinformatics, how do we determine whether a given sequence is DNA, RNA or protein?

3 marks each

- 1) Discuss the principle, procedure and applications of SNP analysis.
- 2) Explain BLAST family of search tools.
- 3) Give the location and importance of EMBL and EBI.
- 4) Describe the concept of directionality in bioinformatics. Add a note on the importance of NCBI.

5 marks each

- 1) Describe taking an example the use of comparative cDNA Microarray.
- 2) Discuss in detail the various types of sequences that you can come across in the area of Bioinformatics.
- 3) Give any 5 kinds of analysis that is possible using the tools of Bioinformatics.

Chapter 4

MICROBIAL CULTURE AND APPLICATIONS

1 mark each

- 1) What is antifoam? Give 1 example.
- 2) Give the full forms of TSB and BHI.
- 3) Name the metabolic process of Yeast which is responsible for production of alcohol.
- 4) What is *in situ* sterilization? How is it done?

2 marks each

- 1) What are the carbon sources and growth factors for microbial cultures? What is their importance?
- 2) What is the importance of measuring and knowing the kinetics of microbial growth?
- 3) What is the importance of culture collection centers?
- 4) Explain briefly the method and importance of strain isolation.

3 marks each

- 1) Describe along with a diagram the structure and working of a fermentor.
- 2) Explain the types of microbial cultures.
- 3) How is microbial growth measured?
- 4) Discuss the methods and importance of strain improvement.
- 5) Make a flow chart of downstream processing of an intracellular metabolite.

5 marks each

- 1) Describe the applications of microbial cell culture technology.
- 2) Describe the various ethical issues related to microbial culture technology.
- 3) Taking an example, describe the various equations used to calculate the specific growth rate.

Recombinant insulin is produced at the rate of 100mg/L by *E.coli* at a cell concentration of 1g/L. Calculate the size of fermentor needed to produce 2 Kg of insulin when the cell concentration is 50mg/L and insulin production is 100mg/gm of cells.

Chapter 5

PLANT CELL CULTURE AND APPLICATIONS

1 mark each

- 1) What is a Callus?
- 2) Define Totipotency.
- 3) Give the full form and importance of Ti plasmid.
- 4) What is micropropagation?
- 5) Give the source and use of Vincristine.
- 6) What is a gene gun?
- 7) Give the full form and importance of PHB.
- 8) What are antifreeze proteins? How are they useful?

2 marks each

- 1) What are somaclonal variations? How are they different from gametoclonal variations?
- 2) Differentiate between somatic hybrids and cybrids.
- 3) Discuss briefly artificial seeds and embryo rescue.
- 4) Explain the 2 plant regeneration pathways.
- 5) Write a short note on the types of plant cultures.

3 marks each

- 1) Discuss the various steps of plant tissue culture technique.
- 2) Taking an example discuss the concept and importance of inducing and restoring male sterility in plants.
- 3) Discuss briefly : Golden rice ,Flavr Savr Tomato , Pomato
- 4) Define germplasm.Explain the 2 methods of germplasm conservation.
- 5) Describe molecular breeding. What are the 3 types of markers used in the area?

5 marks each

- 1) Describe in detail the commonly used vector mediated gene transfer method in plants. What is meant by disarming of the vector?
- 2) Explain the various ethical issues in the area of plant biotechnology.
- 3) Discuss any 5 beneficial traits for which transgenic plants have been created.

Chapter 6

ANIMAL CELL CULTURE AND APPLICATIONS

1 mark each

- 1) What are Interferons?
- 2) Define contact inhibition.
- 3) Give the full form and use of DMSO.
- 4) Define Pluripotent.
- 5) Give the full form and importance of PGDF.

2 marks each

- 1) Differentiate between monoclonal and polyclonal antibodies.
- 2) What are the two characteristic properties of stem cells?
- 3) Briefly explain microcarrier beads and roller bottle.
- 4) What is t-PA? What is its use?
- 5) Differentiate between anchorage dependent and anchorage independent cell cultures.

3 marks each

- 1) Discuss the Hybridoma technology.
- 2) Explain the importance of OKT3.
- 3) Describe long term marrow culture.
- 4) What is CFU-S? Describe the principle and procedure of the method.
- 5) What is a cell line? Briefly describe the two types of cell lines.

5 marks

- 1) What are ICM cells? Describe their properties and importance.
- 2) Discuss the ethical issues in the area of animal cell culture technology.
- 3) Discuss in detail the principle, method and importance of characterization of cell lines.