Seat No. : _____

NB-116

November-2021

B.Sc., Sem.-V

CC-301 : Biotechnology
(Molecular Biology)
(New)

Time : 2 Hours] **[Max. Marks : 50**

Instructions : (1) **All** questions in **Section – I** carry equal marks.

(2) Attempt any **THREE** questions in **Section – I**.

(3) Question – **9** in **Section – II** is **COMPULSORY**.

(4) Draw figures where necessary. Show question number against each answer.

(5) Figures in right are marks.

Section – I

1. (A) What is the significance of genome mapping ? Write a brief note on cytogenetic map. **7**

   (B) Discuss role of molecular markers in genetic mapping. **7**

2. (A) Illustrate genetic map of *Saccharomyces cerevisiae*. **7**

   (B) Discuss applications of human Genome project. **7**

3. (A) Explain DNA sequencing Maxam Gilbert method. **7**

   (B) Write a note on mRNA isolation and cDNA preparation. **7**

4. (A) Write a detail note on plasmid isolation from Bacteria. **7**

   (B) Discuss Fluorescent *in situ* hybridization and its applications. **7**

5. (A) What is an artificial chromosome ? Describe YAC in brief. **7**

   (B) What are restriction enzymes ? Discuss their role in rDNA technology. **7**

6. (A) Write a note on gene library and list out differences between cDNA and gene library. **7**

(B) Discuss outline of recombinant DNA technology. **7**

7. (A) What is Operon ? Explain negative control in lac operon with suitable diagrams. **7**

(B) Explain attenuation regulation in operons stating suitable example. **7**

8. (A) What are exons and introns ? Describe regulation of gene expression by methylation of DNA and histone in eukaryotes. **7**

(B) Explain regulatory mechanism in bacteriophages. **7**

Section – II

9. Answer the following : (any **eight**) **8**

(1) What is the unit of a genetic map ?

(a) Centimeter (b) Nanometer

(c) Angstrom (d) Centimorgan

(2) International Human Genome Project was initiated by

(a) National Institute of Health (NIH)

(b) Celera genomics

(c) US Department of Energy (DoE)

(d) NOH and US DoE

(3) The variation in the restriction lengths of DNA fragment between individuals of a species is called-

(a) AFLP (b) RFLP

(c) SSR (d) RAPD

(4) The lactose represser is encoded by _____

(a) Lac-1 (b) Lac-A

(c) Lac-Y (d) Lac-Z

(5) Where does a represser bind an operon ?

(a) Operator (b) Promoter

(c) Inducer (d) Catabolite activator site

(6) The lac represser has which of the following DNA-binding motif ?

(a) Helix-turn-helix (b) Zinc finger

(c) Homeodomain (d) Leucine zipper

(7) Which of the following types of RNA occurs in largest amount amongst cell RNAs ?

(a) mRNA (b) tRNA

(c) sRNA (d) rRNA

(8) Ligase enzyme is used for

(a) joining bits of DNA

(b) splitting DNA thread into small bits

(c) denaturation

(d) None of the above

(9) A gene for insulin has been inserted into a vector for the purpose of obtaining its protein product only. Such a vector is called

(a) expression vector

(b) suppression vector

(c) storage vector for genomic library

(d) None of the above

(10) Transfer of recombinant plasmid into E. Coli cells to make them competent needs

(a) heat treatment (b) UV rays treatment

(c) $CaCl_2$ treatment (d) lysis

(11) Which of the following statement about a vector is correct ?

(a) All vectors are plasmids only.

(b) Plasmids, phages can be used as vectors.

(c) Fungi can also be used as vectors.

(d) Cyanobacteria can also be used as vectors.

(12) Restriction endonucleases cut DNA at a specific site called

(a) ligation site (b) ori

(c) recognition sequence (d) replication site

(13) VNTR is -

(a) variable nucleotide triplet repeat

(b) 2. variable nucleoside tandem repeat

(c) variable nucleoside triplet repeat

(d) 4. variable number of tandem repeats

(14) Which one of the following statements about human genome project is NOT correct ?

(a) It helps in identifying the exact location of genes on chromosomes.

(b) The information gathered from this project helps in curing genetic diseases.

(c) This helps in developing artificial organs.

(d) It helps in determining the sequence of 3 billion base pairs that makes up human genome.

(15) A Lac represser is a tetramer repressed when bound to the inducer. The trp represser is a _____.

(a) Dimer inactivated when bound to the inducer

(b) Dimer activated on inducer binding

(c) Tetramer inactivated on inducer binding

(d) Tetramer activated on inducer binding

(16) When uncharged tRNA concentration is low what will you expect as the activity of tryptophan operon ?

(a) Low (b) Medium

(c) High (d) Very high

(17) In which microorganism will you find attenuation by alternate loop formation due to ribosomal stalling ?

(a) *S. aureus* (b) *E. coli*

(c) *S. typhimurium* (d) *B. subtlis*

(18) Molecules used for quorum sensing in Gram-positive bacteria are-

(a) Allo inducer (b) Auto inducer

(c) Exo inducer (d) None of the above

(19) A state in which specialized cells are produced within a biofilm. These cells are not actively growing or dividing cells, they are not susceptible to antibiotics and are specialized survivor cells-

(a) persistor cell (b) recalcitrant cell

(c) sensitive cells (d) None of the above

(20) Differential expression of the genetic material depending on its parentage of inheritance gives_____.

(a) Penetrance (b) Expressivity

(c) Imprinting (d) Non-penetrance

(21) Choose the wrong statement in the regulation of imprinting.

(a) Methylation of the C residues are seen in the CpG islands.

(b) The methylation prevents binding of the RNA polymerase.

(c) Genes are methylated at random.

(d) Deletion of gene with methylated CpG islands will have no effect.

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Instructions : (1) Draw figures wherever necessary.

(2) Write question number against each answer.

(3) Answer any **three** out of initial **eight** main questions. Question **9** is **compulsory**.

Section – I

1. (A) Write applications of genome mapping. **7**

   (B) Explain different types of mapping of genes. **7**

2. (A) Give a brief account of Human genome project. **7**

   (B) Explain genetic map of E.coli with a diagram. **7**

3. (A) Describe Maxam-Gilbert method of DNA sequencing. **7**

   (B) Explain different steps to construct cDNA and its uses. **7**

4. (A) Discuss in brief about different molecular markers. **7**

   (B) Write about DNA fingerprinting and its applications. **7**

5. (A) Discuss in detail about pBR322 with a diagram. **7**

   (B) Outline the steps of rDNA technology. **7**

6. (A) Explain the role of DNA modifying enzymes in rDNA technology. **7**

   (B) Write about procedure for detection and expression of cloned gene in host cell. **7**

7. (A) Write about Trp negative and attenuation control. **7**

(B) Discuss lysogeny control in lambda phage. **7**

8. (A) Explain cis-trans regulatory elements in eukaryotes. **7**

(B) Explain prokaryote and eukaryotic gene regulation. **7**

9. Answer any **eight** of the following : **8**

(1) What is synteny ?

(2) How many chromosomes are present in Arabidopsis ?

(3) Define linkage map.

(4) What is contribution of Craig Venter ?

(5) What is genome size of yeast in terms of base pairs ?

(6) What is DNA foot printing ?

(7) What is MALDI-TOF ?

(8) What is FISH ?

(9) Write bases present in DNA sequence.

(10) Give two examples of artificial chromosome vectors.

(11) What is shot gun method ?

(12) What are gene libraries ?

(13) Give two examples of restriction enzymes.

(14) Write mechanism of DNA ligase.

(15) What is shuttle vector ?

(16) Differentiate intron and exon.

(17) What is catabolic repression ?

(18) Write importance of DNA methylation.

(19) What is dorsal protein ?

(20) What is post-transcriptional modification ?