2013

MOLECULAR GENETICS

Time Allotted : 3 Hours Full Marks : 70

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

GROUP – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for any *ten* of the following :

10x1 = 10

i) Which of the following methods is most useful for enzymatic amplification of specific segment of DNA ?

a) Nucleotide sequencing

b) DNA hybridization

c) PCR

d) None of these.

ii) Gene expression is analyzed by

a) Southern blot b) Restriction digestion

c) Northern blot d) None of these.

iii) In sourthern blotting experiment, the binding of transferred DNA to the nylon membrane is …… type.

a) ionic b) covalent

c) hydrophobic d) van der Waals.

iv) DNA hybridization is a technique, which relies on the following properties of DNA, *except*

a) Double strandedness

b) sequence specificity

c) major and minor grooves

d) denaturation-renaturation properties.

v) For RNA detection which PCR is best ?

a) Nested PCR b) RT-PCR

c) ARMS-PCR d) MS-PCR.

vi) In Western blot the protein samples are run on

a) Agarose gel

b) polyacrylamide gel

c) formaldehyde-agarose gel

d) none of these.

vii) The stringency of a hybridization reaction depends on

all of the following, *except*

a) NaCl concentration

b) type of reporter molecule

c) nucleotide sequence of probe

d) pH.

viii) Ligase joins two DNA molecules together by forming a

covalent bond between

a) two PO_4

b) two OH

c) one PO_4 and one OH

d) Complementary nucleotides on opposite strands.

ix) β-lactum ring is present in

a) Tetracycline b) Ampicillin

c) Kanamycin d) Streptomycin.

x) Principal function of reporter molecule in DNA

hybridization assay

a) enhance the stringency of hybridization reaction

b) aid in base pairing

c) aid in the detection of probe target hybridization

d) bind the target DNA to the solid support.

xi) More stringent washing condition is selected when

a) Probe has lower affinity with the DNA

b) Probe has higher affinity with the DNA

c) Probe is radio-labelled

d) Prove is non-radio-labelled/enzyme labelled.

xii) Microsatellites are

a) frequently found in bacterial genomes

b) always smaller than 50 bp

c) used as DNA marker

d) movable DNA elements.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. 3x5 = 15

2. Write a short note on *c* DNA library.

3. Write the basic differences between capillary transfer and electro-transfer in sourthern blot.

4. Define cloning vector. What should be the properties of a good vector ? 2 + 3

5. Why Type-II restriction enzymes are considered to be the most useful in molecular biology ? How it is different from Type-I ? 3 + 2

6. What is MCS in a vector ? Why alkaline phosphatase treatment is needed in cloning ? What is linker ? How it differs from adapters ? 1 + 2 + 1 + 1

7. What is Directional Cloning ? When you use this ? Where it is different from conventional cloning ? 2 + 1 + 2

8. What do you mean by Restriction Modification System in bacteria ? Explain.

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. 3x15 = 45

9. What is the basic structure of plasmid vector ? Explain the regulation of expression vector. What are steps of gene cloning ? What are the characteristics of YAC and BAC ?

3 + 5 + 3 + 4

10. Write short notes on any *three* of the following : 3 5

a) Sanger and Coulson method for DNA sequencing

b) Protein Blotting

c) Microarray

d) Inverse PCR.

11. What is Agarose ? PCR amplification is based on which theory ? Briefly discuss the steps of PCR with suitable diagram. Write down the applications of PCR. Briefly explain the efficiency of PCR. 2 + 1 + 4 + 4 + 4

12. What is a probe ? How they are classified ? What is Dot Blot technique ? Briefly describe the technique of RFLP and Asymmetric PCR. 2 + 3 + 4 + 6

13. Write short notes on any *three* of the following : 3x5

a) RAPD b) M13 vector

c) Blue-White screening

d) T-DNA transfer technique

e) Southern Blotting.