

**ADVANCED GENETIC ENGINEERING
(BIOT 5101)**

Time Allotted : 3 hrs

Full Marks : 70

Figures out of the right margin indicate full marks.

*Candidates are required to answer Group A and
any 5 (five) from Group B to E, taking at least one from each group.*

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

**Group – A
(Multiple Choice Type Questions)**

1. Choose the correct alternative for the following: **10 × 1 = 10**
- (i) Choose the right combination of components required to set up a polymerase chain reaction from the following
(a) Template DNA, two primers, dNTPs and DNA ligase
(b) Template DNA, two primers, NTPs and DNA ligase
(c) Template RNA, two primers, NTPs and DNA polymerase
(d) Template DNA, two primers, dNTPs and DNA polymerase
- (ii) In an experiment of prokaryotic gene expression analysis by PCR, starting amount DNA was 3×10^5 copies. If the efficiency of the PCR thermalcycler was 85% and the yield was 2×10^{10} copies of DNA, then how many numbers of cycles we ran the PCR?
(a) 17 cycles (b) 2 cycles (c) 18 cycles (d) 17.8 cycles.
- (iii) A plasmid can be transformed into *Agrobacterium* by
(a) CaCl_2 -phenol mediated gene delivery (b) Tri-Parental mating
(c) Electroporation (d) All of these
- (iv) In a qRT-PCR experiment for quantitation of unknown RNA from a COVID19 patient sample, the C_T value was 12. What was amount of RNA copies present in the unknow sample?
(a) 4.096 copies (b) 2048 copies (c) 8192 copies (d) 4096 copies.
- (v) One physical method for gene transfer technique for animal is
(a) Ca-phosphate mediated gene delivery (b) Sonication
(c) Electroporation (d) Liposome-mediated
- (vi) Which of the following can be used for transferring the DNA into the host cells?
P. Transformation Q. Sonication R. Transfection S. Electroporation
(a) Only P can be used (b) Only Q & R can be used
(c) Only Q, R & S can be used (d) Only P, R & S can be used.

3. (a) Write the name of the techniques by which a cloned DNA can be sequenced without the electrophoresis but using bioluminescence. Describe that technique of DNA sequencing by label diagram.
- (b) Write the enzymatic reaction based on which the above methods of DNA sequencing were developed.
- (c) Describe the features of YAC and BAC vectors with labelled diagram.
- (d) The restriction endonuclease EcoRI recognizes the sequence GAATTC. If a 40.96 kb genomic DNA with random sequence digested with EcoRI, theoretically how many fragments will be produced? (Presume that 50% GC content in the genomic DNA).

$$(3 + 1) + 2 + (2 + 2) + 2 = 12$$

Group – C

4. (a) What are the problems of cloning DNA into a vector, when DNA and vector both will be digested with single restriction enzyme? How these problems can be solved? Describe with diagram.
- (b) Describe one selection technique for positive clones containing of insert DNA.
- (c) Write the names of different techniques to clone DNA without the use restriction enzyme and DNA ligase. Describe any one technique by labelled diagram only.

$$(2 + 2) + 4 + (1 + 3) = 12$$

5. (a) Describe the steps of making cDNA library.
- (b) Describe a technique for screening of cDNA library.
- (c) Describe the general features of expression vector with a labelled diagram.

$$4 + 4 + 4 = 12$$

Group – D

6. (a) Describe the process of developing transgenic mice with a flow chart.
- (b) Compare the advantages and disadvantages of the following methods for raising both transgenic plants and animals:
(i) PEG-mediated protoplast fusion, (ii) Microinjection

$$6 + (3 + 3) = 12$$

7. (a) What are *vir* genes? Discuss their role in transfer of T-DNA.
- (b) Compare and contrast the advantages and disadvantages of Agro-mediated gene delivery with Particle bombardment.

$$(2 + 6) + 4 = 12$$

Group – E

8. (a) Discuss the aims and objectives of Human Genome Project.
(b) Describe the two methods of genome sequencing used for HGP.

6 + 6 = 12

9. Write short notes about of the following:
(i) In vivo gene therapy with an example
(ii) Protein based diagnosis of corona virus
(iii) Production of peptide based recombinant vaccine against corona virus.

4 + 4 + 4 = 12

Department & Section	Submission Link
BT	https://classroom.google.com/c/MjM3NTQ0MzE0MTIz/a/MjkxNDM5MzQ2Mjg2/details