

- (vi) The basis for blue-white screening with pUC vectors is ____.
- (a) extra-genic suppression (b) inter-genic complementation
(c) intra-allelic complementation (d) intra-genic suppression
- (vii) *Agrobacterium* can incorporate _____ copies but gene gun can incorporate _____ copies of the transgene
- (a) One or two / multiple (b) Multiple / one or two
(c) One / two (d) One or two / one or two
- (viii) One chemical method for gene transfer to animals is
- (a) Ca-phosphate mediated (b) Sonication
(c) Electroporation (d) Liposome mediated

- (ix) Biopharmaceuticals are classified into groups. Match the Group-I and group-II

Group-I	Group-II
(P) Protein therapeutics with enzymatic or regulatory activity	(1) Hepatitis B surface antigen
(Q) Protein therapeutics with special targeting activity	(2) Insulin aspart
(R) Protein vaccines	(3) Secretin
(S) Protein diagnostics	(4) Transtuzmab

Which one of the following options represents correct match of group-I and Group-II?

- (a) P - 4; Q - 1; R - 3; S -2 (b) P - 3; Q - 4; R - 2; S-1
(c) P - 1; Q - 2; R - 3; S-4 (d) P - 2; Q - 4; R - 1; S-3
- (x) The first humanized monoclonal antibody approved for the treatment of breast cancer is?
- (a) Rituximab. (b) Herceptin. (c) Cetuximab. (d) Bevacizumab

Fill in the blanks with the correct word

- (xi) In western blotting hybridization nature of the probe is _____.
- (xii) In the kinetics of end point of PCR deviates from linearity after _____ cycle
- (xiii) One gene transfer method to ES cells is _____.
- (xiv) One example of reporter gene _____.
- (xv) In SDS PAGE to reduce disulphide bond of proteins the chemical used, is _____.

Group - B

2. (a) Describe a method of preparation of random, 5'-end and 3'-end labelled radioactive probe only by label diagram. [[CO3](Analyse/IOCQ)]
- (b) PCR typically used to amplify DNA that lies between two known sequences, then how you will amplify the two end sequences of DNA whose internal sequences is known to you. [[CO2](Remember/LOCQ)]
- (c) A cloned DNA was sequenced with a method sequencing without the electrophoresis but using bioluminescence. Describe that technique of DNA sequencing by label diagram? [[CO2](Apply/IOCQ)]

- (d) The restriction endonuclease *EcoRI* recognizes the sequence GAATTC. If a 85 kb genomic DNA with random sequence digested with *EcoRI*, theoretically what will be the minimum size of a fragment and how many fragments will be produced? (Presume that 50% GC content in the genomic DNA). [[CO2](Apply/HOCQ)]
3 + 3 + 4 + 2 = 12
3. (a) Avidin has specific affinity with biotin. Form this observation a chromogenic detection method for blotting and hybridization was developed. You explain the steps of that chromogenic detection method by label diagram. [[CO1](Analyse/IOCQ)]
 (b) Write the names of different types ELISA. Describe the steps of ELISA techniques with labelled diagram. [[CO4](Remember/LOCQ)]
 (c) Calculate the amount of different component will be required for the standard ligation reaction with the following supplied samples and conditions (write in the tabular format). Linear *SmaI* digested 2.686kb vector DNA supplied (0.2µg /10 µl), *SmaI* digested 1.5kb insert DNA (0.5µg/µl) and final volume of reaction should be 60 µl. T4-DNA ligase enzyme (10U/10 µl) and 10X T4-DNA ligase buffer. [[CO6](Apply/HOCQ)]
4 + (1 + 3) + 4 = 12

Group - C

4. (a) Explain the steps for the cloning of a gene-X from prokaryotic organism into PUC18 vector using with single restriction enzymes, with labelled diagram. [[CO4] (Remember/ LOCQ)]
 (b) Why the efficiency of getting positive clone by above method will be low? What are the different ways you can improve the cloning efficiency of this method? Describe with labelled diagram. [[CO4] (Explain/ IOCQ)]
 (c) You are interested to make a genomic library of a model organism. Its genome size is 4×10^8 kb. The average size of its library fragment is 15,000 bp. The genomic library was created in vectors that were transformed into bacterial cells. If there is a 94% probability of the transformation, how many recombinant bacterial colonies will have to be screened to find this particular gene? [[CO6] (Evaluate/ HOCQ)]
4 + (2 + 3) + 3 = 12
5. (a) Describe the steps of making cDNA library of a eukaryotic cell. [[CO3](Analyse/HOCQ)]
 (b) Describe a technique for screening of cDNA library? [[CO4](Remember/LOCQ)]
 (c) Describe the steps of DNA cloning in BAC vector with a labelled diagram. [[CO2](Apply/IOCQ)]
4 + 4 + 4 = 12

Group - D

6. (a) Discuss the molecular mechanism of transfer of T-DNA to plants. What is the role of *vir* genes here? [[CO5](Understand/HOCQ)]
 (b) Compare biolistic method with the other gene delivery techniques. [[CO5](Apply/IOCQ)]
(5 + 3) + 4 = 12

7. (a) How microinjection technique has been successfully used in developing transgenic mice? Elaborate the steps with a flow diagram. [[CO5](Analyse/HOCQ)]
- (b) Compare the development process of the following:
 (i) Cointegrate vector
 (ii) Binary vector. [[CO5](Apply/IOCQ)]
- (3 + 3) + (3 + 3) = 12**

Group - E

8. (a) Explain steps of the cloning of human insulin gene into a vector for production of recombinant insulin in prokaryotic cell with diagram. [[CO6](Analyse/IOCQ)]
- (b) Explain principle two detection methods for identification of pathogenic virus with RNA genome, with diagram? [[CO4](Remember/IOCQ)]
- (c) Describe the steps to cure macular dystrophy by *ex vivo* gene therapy with diagram. [[CO6](Apply/IOCQ)]
- 4 + 4 + 4 = 12**
9. (a) What is DNA finger printing? Describe AFLP techniques with labelled diagram. [[CO6](Analyse/IOCQ)]
- (b) What are advantages of AFLP over RFLP? What are different applications of DNA finger printing? [[CO6](Remember/LOCQ)]
- (c) Write about principle, steps and application in genetic engineering of the of the following: (i) RNAi technology, (ii) ELISA. [[CO6](Apply/IOCQ)]
- (1 + 3) + (2 + 2) + (2 + 2) = 12**

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	19.79	54.16	26.04