3 Hours Total Marks: 100

1. Attempt **all** questions.
2. **All questions** carry **equal** marks.
3. Draw **neat labelled diagrams** wherever necessary.
4. Use of **log tables** and **non-programmable calculators** is **allowed**.

Q.1 a. Select the correct alternative: (Any Six) 06

1. Which organism is commonly used as a vector in the production of transgenic plants?
   A. *Escherichia coli*
   B. *Bacillus thuringiensis*
   C. *Saccharomyces cerevisiae*
   D. *Agrobacterium tumefaciens*
2. To express a novel gene in a plant system, _____ is the genetic element that is NOT required in gene construct.
   A. Promoter
   B. Gene of interest
   C. pUC 18 DNA fragment
   D. Marker genes
3. _____ device is used for mechanically induced fusion of protoplasts.
   A. Electric shock
   B. Electric signal
   C. Electroporator
   D. Micromanipulator
4. Which is the novel way to increase the lysine content in seed?
   A. Regulating the lysing biosynthetic pathway
   B. Deregulating the lysing biosynthetic pathway
   C. Regulated the synthesis
   D. Regulate the production
5. Which is the Direct gene transfer method?
   A. Electroporation
   B. *Agrobacterium tumefaciens* mediated gene transfer
   C. Viral-mediated gene transfer method
   D. Biological method
6. A protoplasm lacks _____.
   A. Cell wall B. Plasma membrane
   C. Cell membrane D. Vacuole
7. From the following given options select the appropriate direction of helium flow in particle bombardment method.
   A. Gas acceleration tube - rupture disk - Microcarrier launch assembly - Plant target
   B. Microcarrier launch assembly - gas acceleration tube - rupture disk - plant target
   C. Microcarrier launch assembly - gas acceleration tube - plant target - rupture disk
   D. Plant target - gas acceleration tube - Microcarrier launch assembly - rupture disk

8. The Biolistic (Gene gun) method is suitable for_____.
   A. Disarming pathogen vector
   B. Construction of recombinant vector
   C. Transformation of plant cell
   D. DNA fingerprinting
9. Which of the following plant viruses are effective plant vectors?
   A. Influenza virus
   B. Tobacco mosaic virus
   C. *Agrobacterium tumefaciens*
   D. Rotavirus

Q.1 b. Answer the following questions: (Any Two) **14**

1. Explain the liposome-mediated and protoplast fusion as mechanisms of gene transfer in plants.
2. Describe how the transformation of plants can be carried out with the Ti plasmid of *A.tumefaciens*.
3. Different plant viruses can be used as vectors for plant cells. Justify

Q.2 a. Select the correct alternative: (Any Six) **06**

1. Name the method in which DNA is microinjected into the Male pronucleus of fertilized egg of female mice.
   A. DNA microinjection method
   B. Retroviral vector method
   C. Embryonic stem cells method
   D. Transgenic method
2. In bacteriophage P1 genome, A lox Psite consists of two 13-base-pair_____ that are separated from each other by an 8-bp spacer sequence.
   A. Side repeats
   B. Inverted repeats
   C. Simple repeats
   D. Central repeats
3. Vasectomized male are_____ male.
   A. Fertile
   B. reproductive.
   C. sterile.
   D. neither reproductive nor fertile.
4. Which of the following proteins codes for the AFP gene from ocean pout?
   A. Molten protein B. Frozen protein
   C. Antifreeze protein D. Crystal protein
5. Medaka fish is also called the_____ fish.
   A. Japanese kill fish B. Rohu C. Salmon D. Ocean pout
6. In lentiviral transfer method PPT stands for?
   A. Purine protein tract
   B. Protein Purine tract
   C. Polypurine tract
   D. Protein protein tract

7. What type of cells were used to clone Dolly?
   A. Mammary (udder) cells
   B. Embryonic stem cells
   C. Skin cells
   D. Blood cells
8. After treatment with G418 and ganciclovir, all the cells with nonspecific integration of the input DNA that includes at least one of the thymidine kinase genes are _____.
   A. Killed
   B. Survive
   C. Alive
   D. Will not get killed
9. State the full form for YACs used as a vector for animal cells.
   A. Yeast Artificial Chromosomes
   B. Yeast artifact Chromosomes
   C. Yeast Applied Chromosomes
   D. Yeast Ancient Chromosomes

Q.2 b. Answer the following questions: (Any Two) **14**

1. Diagrammatically explain the Embryonic stem cell method of producing transgenic mice.
2. Describe transgenic fish in brief.
3. How can Transgenic mice help in studying diseases such as Alzheimer's ?

Q.3 a. Select the correct alternative: (Any Six) **06**

1. The marker gene in pUC vector is
   a. amp+ gene b. npt+ gene c. tet+ gene d. hpt+ gene
2. In red-white screening, while using YAC, the presence of insert is indicated by
   a. white colonies b. red colonies c. pink colonies d. no growth
3. A collection of clones of DNA copies of mRNAs isolated from cells.
   a. DNA library b. genomic library c. chromosome library d. cDNA library
4. MCS is also known as
   a. Polyadaptor b. Polylinker c. Both d. Neither
5. A vector which is a combination of phage and plasmid
   a. Cosmid b. Phagemid c. Both d. Neither
6. The procedure in which the denatured cDNA is added directly to the mRNA sample
   a. HRT b. HART c. HERT d. HTR
7. The media used to isolate host cells containing pUC vector is
   a. NA + amp + IPTG
   b. NA + amp + X-Gal
   c. NA + amp+ IPTG +X-Gal
   d. NA + amp + Y-Gal

8. The T7 RNA pol gene is introduced in the
   a. Host genome
   b. pETvector
   c. Helper plasmid
   d. Any of them

9. To increase the concentration of mRNAs in the cell extract, use a column lined with
   a. oligo A
   b. oligo T
   c. oligo G
   d. oligo C

Q.3 b. Discuss the following: (Any Two) **14**

1. Explain Western Blotting.
2. Describe a method to screen cDNA library.
3. How will you use YAC as a cloning vector?

Q.4 a. Select the correct alternative: (Any Six) **06**

1. What is the primary objective of DNA sequencing?
   A. To identify the sugar sequence in a DNA molecule
   B. To identify the phosphate sequence in a DNA molecule
   C. To identify the base sequence in a DNA molecule
   D. All of the above
2. What is the term used for loci in the human genome that vary by a single base alteration?
   A. Single nucleotide mutation
   B. Single nucleotide polymorphism
   C. RFLP
   D. Single nucleotide polymorphogenesis
3. What are the small fragments produced when double-stranded RNA is cut by the nuclease Dicer?
   A. Are they known as short interfering RNAs?
   B. Are they known as long interfering RNAs?
   C. Are they known as short interspersed RNAs?
   D. Are they known as long interspersed RNAs?
4. Which method can a researcher employ to suppress the expression of a specific target gene?
   A. qPCR
   B. RFLP
   C. RNAi
   D. DNA Sequencing
5. Which technique is commonly referred to as the "dideoxynucleotide chain termination method"?
   A. DNA Chip sequencing
   B. Edman's method
   C. Sanger's method
   D. Maxam-Gilbert method

6. Which type of organisms are known to secrete TALEs proteins?
   A. Are they plants?
   B. Are they bacteria?
   C. Are they animals?
   D. Are they viruses?
7. How many nucleotides does each Zinc finger motif generally interact with?
   A. 1 nucleotide
   B. 2 nucleotides
   C. 3 nucleotides
   D. 4 nucleotides
8. In which of the following sequencing techniques does premature chain termination NOT take place?
   A. Automated sequencing
   B. Sanger's sequencing method
   C. Maxam-Gilbert method
   D. All of the above
9. What function does the PAM sequence serve in genome editing?
   A. Does it act as a binding signal for Cas9?
   B. Does it function as a promoter sequence?
   C. Does it act as the TALEN binding site?
   D. Does it act as the ZFNs binding site?

Q.4 b. Give an account of the following questions: (Any Two) **14**

1. What is the Sanger sequencing method, and how is it applied in DNA sequencing?
2. Describe the function of RNA interference (RNAi) in gene silencing mechanisms.
3. How does the Human Genome Project (HGP) enhance the diagnosis and treatment of genetic disorders?

Q.5 Write Short notes on the following: (Any Four) **20**

a. Introduction of an appropriate transgene as a method of improvement of seed quality proteins.
b. Cloning livestock by nuclear transfer.
c. DNA microinjection for producing transgenic mice.
d. Expression vector.
e. Chromosome jumping.
f. Maxam Gilbert's method.
