

Important Questions On Transgenic animals and plants, molecular approaches to diagnosis and strain identification.

Q1. Match the following-

COLUMN A (Transgenic plants)	COLUMN B (Application)
a. B. thuringensis	i. insecticidal resistance
b. Flavr slavr tomato	ii. bacterial insecticide
c. Bt corn	iii. slow ripening
d. Golden rice	iv. nutritional value

- A. a-ii, b-iv, c-i, d-iii
- B. a-i, b-iii, c- ii, d-iv
- C. a-iii, b-ii, c-i, d-iv
- D. a-ii, b-i, c- iii, d-iv

Q2. With the help of rDNA technology, plants can be genetically modified either by inserting new gene in host plant or by modifying the gene expression to produce protein with altered expressions. These plants are known as GMOs (genetically modified organisms). GMO being used in India is-

- A. cotton
- B. wheat
- C. rice
- D. potato

Q3. Virus induced cell transformation is the change in growth, phenotype, or indefinite reproduction of cells caused by the introduction of inheritable material. The term can also be understood as DNA transfection using a viral vector. Given below the steps involved in this process. Find out the correct one.

- A. attachment, penetration, uncoating, replication, assembly, and release
- B. attachment, penetration, replication, uncoating, assembly, and release
- C. attachment, uncoating, penetration, replication, assembly, and release
- D. penetration, attachment, uncoating, replication, assembly, and release

Q4. Given below are some amplification techniques for DNA. Match each technique with their corresponding use-

- a. PCR i. Evolutionary studies
 - b. RACE ii. DNA/ cDNA amplification
 - c. RAPD iii. 5' / 3' end analysis of cDNA
 - d. AFLP iv. Invivo DNA/ gene expression
- A. a-ii, b-iii, c-i, d-iv
 - B. a-i, b-iii, c- ii, d-iv
 - C. a-iii, b-ii, c-i, d-iv
 - D. a-ii, b-i, c- iii, d-iv

Q5. ARS (Autonomously replicating sequence) is a conserved origin of replication site present in genome which is generally required for the replication of the DNA fragment. ARS is a feature of which vector?

- A. Phage vector**
- B. E. coli vector**
- C. Yeast vector**
- D. Plasmid vector**

Q6. What is not common between an expression vector and cloning vector

- A. Origin of replication**
- B. Restriction sites**
- C. Marker genes**
- D. Promoter**

Q7. Chromosome painting used to detect chromosome translocation is also called:

- A. Probing**
- B. FISH**
- C. M-FISH**
- D. Karyotyping**

Q8. The uptake of external DNA into bacterial cell is facilitated in the presence of

- A. Calcium chloride**
- B. Polymerase**
- C. Endonuclease**
- D. Plasmid**

Q9. Which of the following vector contains telomeric sequences?

- A. Plasmid vector**
- B. Lambda vector**
- C. M13 vector**
- D. Yeast vector**

Q10. Gene silencing is the regulation of gene expression in a cell to prevent the expression of a certain gene. Gene silencing can occur during either transcription or translation and is often used in research. An example of gene silencing is

- A. Bt-cotton**
- B. Flavr savr tomato**
- C. Transgenic maize**
- D. Transgenic rice**

ANSWERS

- | | | | |
|-----------|------------|-----------|-----------|
| 1. Ans- B | 2. Ans- A | 3. Ans- A | 4. Ans- A |
| 5. Ans- C | 6. Ans- D | 7. Ans- C | 8. Ans- A |
| 9. Ans- D | 10. Ans- B | | |

SOLUTIONS

Solution-1

COLUMN A (Transgenic plants)	COLUMN B (Application)
a. <i>B. thuringensis</i>	i. insecticidal resistance
b. Flavr slavr tomato	iii. slow ripening
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Solution 2

Genetically modified Bt cotton is the only permitted GM crop grown in India. Bt cotton is modified genetically to introduce pest resistance against the ball worm. It is modified by inserting gene from microbe *Bacillus thuringensis* to combat ball worm. Bt cotton expresses toxin crystals due to insertion of transgene leading to death of pest.

Solution-3

During virus transformation process, first step is attachment in which a virus attaches to a specific receptor site on the host cell membrane via some attachment proteins in the capsid or glycoproteins embedded in the viral envelope. Then, viruses enter a host cell either with or without the viral capsid via penetration. After this they replicate, and the replication mechanism depends on the viral genome. DNA viruses generally use host-cell proteins and enzymes to replicate the viral DNA and to transcribe viral mRNA, which is used to direct viral protein synthesis. The viral mRNA directs the host cell to produce viral enzymes and capsid proteins and assemble new virions and are finally released. Hence, A is right option.

Solution 4:

The correct match is as given below-

- a. PCR ii. DNA/ cDNA amplification
- b. RACE iii. 5' / 3' end analysis of cDNA
- c. RAPD i. Evolutionary studies
- d. AFLP iv. In vivo DNA/ gene expression

Solution 5:

ARS (Autonomously replicating sequence), a conserved origin of replication site present in genome of yeast. YAC (yeast artificial chromosome) is generally used as cloning vector which contains ampicillin resistance gene, origin of replication (Ori), ARS, CEN4 (centromere sequence) and TEL (telomere sequence) required for chromosomal stability. Hence, C is correct option.

Solution-6

The cloning vectors are used when there is need to increase the copy number of DNA fragment of interest. Thus, cloning vector should have the capability to replicate to produce multiple copies of transgene inserted in vector. However, the expression vectors are employed when expression of the transgene is required either in form of mRNA or proteins. Thus, for expression vectors, additional features are required in their vector to allow the transcription and translation of the transgene. One of such features is presence of promoter. In order to transcribe the transgene, a suitable host specific promoter is required. Hence, promoter regions are important for expression of gene cloned in cell. Hence, D is the correct option.

Solution-7

Chromosome painting is a technique in which different fluorescently labeled probes, complimentary to specific DNA or segment of genes on chromosomes, are used to observe chromosomes or their segments through in situ hybridization. This method is highly useful in determining numerical as well as structural aberrations which may be present in chromosomes. Chromosomes at interphase and metaphase can be visualized.

Solution-8

In molecular biology, calcium chloride is used during the process of bacterial transformation as it enhances foreign DNA uptake by cell. The calcium (Ca^{2+}) being positively charged, bind to DNA molecules (negatively charged) as well as to LPS layer of bacterial cell wall, thus increases the proximity between DNA and cell wall, enabling the uptake of DNA by bacteria for its transformation. Upon heat shock, the competent cells easily take up the DNA molecule, thus increasing the efficiency of transformation process. Hence, A is the right option.

Solution-9

Telomeric sequences are present at the end of linear chromosome in eukaryotic cells. Since yeast vector is derived from yeast (*Saccharomyces cerevisiae*), it contains telomeric sequence. Telomere (TEL) shields the line DNA from action of nucleases.

Other sequence features of yeast vectors -

CEN - centromere

ARS - replication origin

Two selectable markers with unique restriction sites Plasmid vector, M13 vector and lambda vector are derived from prokaryotes and they are circular in nature, thus, they all lack telomeres. Hence, D is the right option.

Solution-10

The Flavr Savr tomato are genetically modified tomatoes which are developed by gene silencing. They were introduced as the first genetically engineered whole food in 1994. The commercial event was sequenced and found to contain two contiguous, linked, transfer DNA insertions, which results from transformation with an antisense expression cassette of the endogenous *polygalacturonase* gene. The Flavr Savr tomato has helped in increasing storage life through silencing of the tomato *polygalacturonase* (*PG*) gene, resulting from transformation of an antisense expression cassette of the *PG* cDNA (pCGN1436). Hence, B is right option.

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