

## BHARATIYA VIDYA BHAVAN, KOCHI

### DEVELOPMENT OF COMPETENCY BASED QUESTION BANK

CLASS: XII

Subject: Biology

#### Chapter 10: Biotechnology and its Applications Teacher-Soniamol T C

##### Learning Outcome:

- Students list out the role of cry genes.
- Students realizes the importance of cry genes.
- Students explain the steps involved in the production of genetically engineered insulin.
- Students describe about Adenosine deaminase deficiency.

##### Assertion-and-Reason Type

- I. Each question consists of two statements, namely, Assertion (A) and Reason (R). For selecting the correct answer, use the following code:
  - a) Both Assertion (A) and Reason (R) are the true and Reason (R) is a correct explanation of Assertion (A).
  - b) Both Assertion (A) and Reason (R) are the true but Reason (R) is not a correct explanation of Assertion (A).
  - c) Assertion (A) is true and Reason (R) is false.
  - d) Assertion (A) is false and Reason (R) is true.
1. Assertion: Cellular defence mechanism in eukaryotes is RNAi.  
Reason: RNAi is silencing of a specific tRNA.
2. Assertion: Using biotechnology human insulin can be produced into bacterial cells.  
Reason: To produce human insulin A, B and C polypeptides of the human insulin are produced in the bacterial cells, separately extracted and combined by creating disulfide bonds.
3. Assertion: Due to less synthesis of gene for adenosine deaminase ADA deficiency disorder is caused.  
Reason: It affects the human immune system.
4. Assertion: Cry proteins are named so because they are crystal proteins.  
Reason: Bt toxin gene has been cloned from the bacteria and been expressed in plants to provide resistance to insects without the need for insecticides.

##### Case based Questions

5. Plants having foreign genes in their genome through genetic engineering are called transgenic plants. Genes can be incorporated either through a vector or through direct introduction of DNA. Bt cotton is a genetically modified ~~organism~~ <sup>plant</sup> which is pest resistant.

- a. What are cry genes?
  - b. Name the specific type of gene that is incorporated in a cotton plant to protect the plant against cotton boll worm infestation.
  - c. Mention the source organism of the gene, cryIAb and its target pest.
- OR
- c. Bt toxins are released as inactive crystals in the bacterial body. What happens to it in the cotton bollworm body that it kills the bollworm?

*How does it act inside the body of cotton boll worm?*

### ANSWER KEY

#### Assertion-Reason

1. (c) Assertion (A) is true and Reason (R) is false.
2. (c) Assertion (A) is true and Reason (R) is false.
3. (d) Assertion (A) is false and Reason (R) is true.
4. (b) Both Assertion (A) and Reason (R) are the true but Reason (R) is not a correct explanation of Assertion (A).

#### 5. Case based

- a. The genes which code for the Bt toxin proteins are called cry genes.
  - b. cryIAc and cryIIAb
  - c. Bacillus thuringiensis is the source organism. Corn borer is its target pest.
- OR
- c. It becomes activated in the alkaline pH of the gut of the insect. The activated toxin binds to the surface of midgut epithelial cells, create pores that cause swelling and lysis of the cells and eventually cause death of the insect.

Competency based questions

Class XII Biology

Topic – Molecular Basis of Inheritance

Learning outcome

- Students would be able to Understand the location and chemical composition of DNA.
- Students would be capable of Explaining the process of protein synthesis
- Students would analyze the functions and sequence of genes in the Human Genomic project which provide information for various genetic diseases
- Appreciate the role of DNA to initiate and guide the process of protein synthesis

Assertion Reason based

In the following questions, a statement of Assertion is followed by a statement of Reason. -

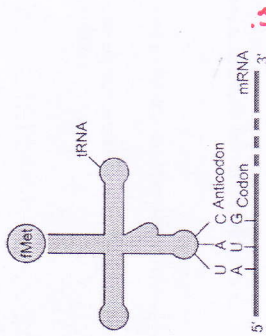
- A) Both assertion and reason are true and the reason is the correct explanation of the assertion
- B) Both assertion and reason are true but the reason is not the correct explanation of the assertion
- C) Assertion is true but the reason is false
- D) Assertion is false but the reason is true

Q1	Assertion : Heterochromatin does not code for Proteins . Reason: Heterochromatin lacks genes.	
Ans: C		
Q2	Assertion : Histones are basic in nature Reason : Histones are rich in amino acids Lysine and Arginine	
Ans A		
Q3	Assertion: Eukaryotic hnRNA contains introns that are removed during RNA processing Reason: Splicing of exons suggests the dominance of the RNA world.	
Ans C		

Case based study questions –

Following are the case-based questions. Each question has 3 subparts with internal choice in one subpart.

Q1.



Given is the diagram for Translation in bacteria. study the same and Answer the questions:

- (1) On which end of tRNA amino acid is attached ?
- (2) At which side of bacterial ribosome does a peptide bond formation occur?
- (3) Why is tRNA called Adapter molecule ? Name the scientist who called tRNA an adaptor molecule.

OR

What is charging of tRNA in eukaryotes? *(Direct question)*

Ans : 1) 3' end

- 2) A site (amino acyl site)
- 3) tRNA attaches itself via initiation and elongation factors to the ribosome- mRNA complex which facilitates the incorporation of the correct amino acid to the growing polypeptide chain by its specific anticodon to the mRNA codon. Francis Crick called the tRNA as adaptor molecule

OR

The cognate amino acid for a tRNA is the one specified by its anticodon. Attaching this amino acid is called charging the tRNA.

Q2. As we know, 99.9% of nucleotide bases are the same in all humans. However, there are some differences in DNA sequences among people, which make them unique. This is their DNA fingerprint. This technique involves identifying differences in the repetitive DNA regions. The peaks on a density gradient centrifugation help to separate the repetitive part from the bulk DNA. Satellite DNA is classified into micro-satellites and mini-satellites based on multiple factors such as – base composition (A:T rich or G:C rich), number of repetitive units, length of segment etc. These sequences, don't code for any protein but are abundant in the human genome. They also show a high degree of polymorphism

Q1. What is meant by DNA polymorphism ?

Q2. The probability of DNA polymorphism is higher non coding sequence. Give one reason to prove the statement.

Q3. Write two applications of DNA fingerprinting

**BHARATIYA VIDYA BHAVAN, KOCHI**  
**DEVELOPMENT OF COMPETENCY BASED QUESTION BANK**

**Class XII**

**Subject : Biology**

**Unit / Chapter 9 : BIOTECHNOLOGY : PRINCIPLES AND PROCESSES**

**Teacher- MEERA VENUGOPAL**

**Learning Outcomes:**

- Explains the use and functioning of restriction enzymes in rDNA technology
- Describes the ways to identify transformants by using selectable markers.
- Summarizes the steps of the process of recombinant DNA technology.
- Explains the steps of genetic modification
- Explores the contributions of scientists in the field of biotechnology
- Appreciates technological applications and processes in Biology towards the improvement in the quality of life and sustainable development.

**Assertion-and-Reason Type:**

Each question consists of two statements, namely, Assertion (A) and Reason (R). For selecting the correct answer, use the following code:

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- (b) Both Assertion (A) and Reason (R) are the true but Reason (R) is not a correct explanation of Assertion (A).
- (c) Assertion (A) is true and Reason (R) is false.
- (d) Assertion (A) is false and Reason (R) is true.

1. **Assertion:** Restriction enzymes cut the strand of DNA a little away from the centre of the palindromic sites, but between the same two bases on the opposite strands and results in single stranded portions called the sticky ends.

**Reason:** They form hydrogen bonds with their complementary cut counterparts.

2. **Assertion:** Exonucleases remove nucleotides from the ends of the DNA

**Reason:** Endonucleases make cuts at specific positions within the DNA

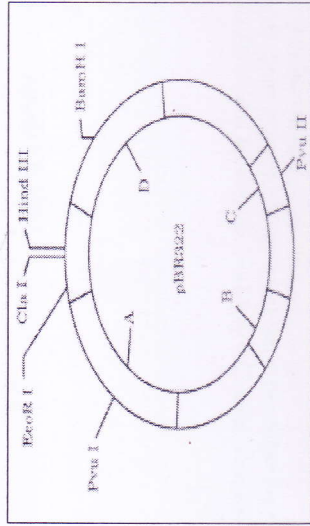
3. **Assertion:** The DNA fragments can be separated by a technique known as gel electrophoresis.

**Reason:** DNA fragments are positively charged molecules that can be separated by forcing them to move towards the anode under an electric field through a medium.

**Case based Question:**

A cloning vector is a small piece of DNA that can be stably maintained in an organism, and into which a foreign DNA fragment can be inserted for cloning purposes. A large number of cloning vectors are available, and choosing the vector may depend upon a number of factors, such as the size of the insert, copy number and cloning method. Origin of replication, selectable marker and cloning sites are the features that are required to facilitate cloning into a vector.

With reference to the diagram of E. coli cloning vector pBR322 answer the following questions.



- i) Bacteriophages are a better vector than the plasmids-Comment. (1)
  - ii) Identify A, B, C and D and explain their role in the cloning vector. (2)
  - iii) A foreign gene segment 'N' is to be introduced into the region of D by using the restriction endonuclease BamHI. Explain how this insert will aid in recombinant DNA technological processes? (2)
- OR**
- iii) What would happen if a recombinant DNA is inserted within the coding sequence of an enzyme,  $\beta$ -galactosidase? (2)

3. Assertion: Pollination by water is quite rare in flowering plants and is limited to about 30 genera, mostly monocotyledons.

Reason: Water pollinated flowers are not very colourful and do not produce nectar. (1)

4. Assertion: The endosperm is always triploid and it is formed as a result of syngamy.

Reason: It develops from the primary endosperm nucleus formed by fusion of haploid male gamete and two haploid polar nuclei. (1)

1. Ans: (a) Both Assertion (A) and Reason (R) are the true and Reason (R) is a correct explanation of Assertion (A). (1)
2. Ans: (d) Assertion (A) is false and Reason (R) is true. (1)
3. Ans: (b) Both Assertion (A) and Reason (R) are the true but Reason (R) is not a correct explanation of Assertion (A). (1)
4. Ans: (d) Assertion (A) is false and Reason (R) is true. (1)

### Set 3

1. Assertion: Cleistogamous flowers have an assured seed set.  
Reason: Cleistogamous flowers are invariably autogamous and do not depend on any pollinating agents.

2. Assertion: Continued self-pollination results in inbreeding depression.  
Reason: Self-incompatibility prevents inbreeding depression.

3. Assertion: If the tapetum is malfunctioning in an anther, the male gametophytes often become sterile.  
Reason: Tapetum nourishes the developing pollen

### ANSWERS

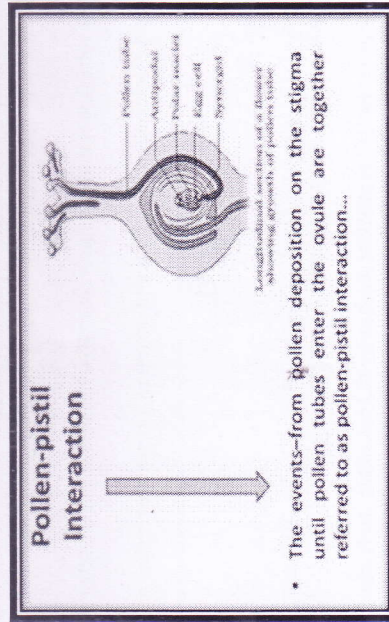
1. A Both Assertion (A) and Reason (R) are the true and Reason (R) is a correct explanation of Assertion (A).
2. b Both Assertion (A) and Reason (R) are the true but Reason (R) is not a correct explanation of Assertion (A).
3. a Both Assertion (A) and Reason (R) are the true and Reason (R) is a correct explanation of Assertion (A).

### Case based Questions:

SET 1

(4x1=4)

Pollen-pistil interaction is the group of events that occur from the time of pollen deposition on the stigma to the time of pollen entry to the ovule. It is a dynamic process which has checks at several places for promotion or inhibition of pollen growth. Pollen-pistil interaction is a safety measure to ensure illegitimate crossings do not occur. Compatibility and incompatibility of the pollen-pistil is determined by special proteins. The compatible pollen can absorb water and other nutrients from the surface of stigma. They germinate to produce pollen tube. Pollen tubes grow into the style. Their growth and path through the style is determined by certain chemicals.



1. Which of the following part of the gynoecium determines the compatible nature of pollen?
  - a. Style b. stigma c. ovary d. Ovule
2. Geitonogamy referred as genetic autogamy is seen in these plants.
  - a. Papaya and Nutmeg b. Papaya and Pea c. Mustard and Maize- Castor and Maize
3. Select the incorrect statement.