



CBSE NCERT Based Chapter wise Questions (2025-2026)

Class-XII

Subject: Biology

Chapter Name : Molecular Basis of Inheritance (Chap : 5)

Total : 9 Marks (expected) [MCQ-2 Mark, AR-1, SA-2, CBQ-4 Marks]

Level - 2

MCQ Type :

1. The polarity of DNA strands during replication is maintained because
 - (A) DNA polymerase can add nucleotides only at 3' end
 - (B) RNA primase works only at 5' end
 - (C) DNA ligase joins fragments at 5' end
 - (D) Helicase moves only in one direction

Hint: DNA replication

2. Which statement best explains why Okazaki fragments are formed?
 - (A) DNA polymerase works discontinuously on both strands
 - (B) DNA polymerase synthesizes DNA only in 5' → 3' direction
 - (C) DNA ligase cannot work on leading strand
 - (D) Helicase unwinds DNA in fragments

Hint: DNA replication

3. In Meselson–Stahl experiment, DNA extracted after one generation showed intermediate density due to
 - (A) Conservative replication
 - (B) Semi-conservative replication
 - (C) Dispersive replication
 - (D) Random replication
4. Which of the following enzymes removes RNA primer and replaces it with DNA in prokaryotes?
 - (A) DNA polymerase III
 - (B) DNA polymerase I
 - (C) DNA ligase
 - (D) Primase

Hint: DNA replication

5. The wobble hypothesis explains
 - (A) Degeneracy of genetic code
 - (B) Universality of genetic code
 - (C) Start codon specificity
 - (D) Non-overlapping nature of genetic code
6. Which feature of genetic code prevents frame-shift mutations?
 - (A) Degeneracy
 - (B) Commaless nature
 - (C) Universality
 - (D) Non-overlapping nature

Hint: Characteristics of genetic code

7. The enzyme that synthesizes RNA using DNA as template is
 - (A) DNA polymerase
 - (B) RNA polymerase
 - (C) Reverse transcriptase
 - (D) RNA ligase
8. Sigma factor in prokaryotes is required for
 - (A) Chain elongation
 - (B) Chain termination
 - (C) Promoter recognition
 - (D) RNA processing
9. Which RNA is NOT involved in translation?
 - (A) mRNA
 - (B) tRNA
 - (C) rRNA
 - (D) snRNA

Hint: Types of RNA, functions of each type

10. In eukaryotic transcription, TATA box is present in
(A) Coding region (B) Terminator region (C) Promoter region (D) Enhancer region

Hint: Transcription unit

11. Post-transcriptional modifications in eukaryotic mRNA include all EXCEPT
(A) Poly-A tailing (B) Capping (C) Splicing (D) Methylation of introns
12. Which mutation does NOT change the amino acid sequence?
(A) Missense (B) Nonsense (C) Silent (D) Frame-shift
13. Lac operon is switched ON when
(A) Glucose is present, lactose absent (B) Glucose absent, lactose present
(C) Both glucose and lactose present (D) Both absent
14. The repressor of lac operon binds to
(A) Promoter (B) Operator (C) Structural genes (D) Regulator gene
15. Which RNA polymerase synthesizes tRNA in eukaryotes?
(A) RNA pol I (B) RNA pol II (C) RNA pol III (D) RNA pol IV

Assertion and Reason:

Directions: Read the following questions and choose any one of the following four responses.

- A: Assertion and Reason both are correct and Reason is the correct explanation of Assertion.
B: Assertion and Reason both are correct and Reason is not the correct explanation of Assertion.
C: Assertion is correct but Reason is wrong.
D: Assertion is wrong but Reason is correct.

1. **Assertion (A):** DNA replication is discontinuous on one strand.

Reason (R): DNA polymerase synthesizes DNA only in 5' → 3' direction.

- (A) A (B) B (C) C (D) D

Hint: Replication direction

2. **Assertion (A):** Genetic code is said to be degenerate.

Reason (R): More than one codon codes for the same amino acid.

- (A) A (B) B (C) C (D) D

Hint: Features of genetic code

3. **Assertion (A):** RNA primer is essential for DNA replication.

Reason (R): DNA polymerase cannot initiate synthesis de novo.

- (A) A (B) B (C) C (D) D

Hint: Mechanism of DNA replication

4. **Assertion (A):** In eukaryotes, transcription and translation are separated.

Reason (R): Ribosomes are present in the cytoplasm while transcription occurs in nucleus.

- (A) A (B) B (C) C (D) D

5. **Assertion (A):** Mutations are heritable changes.

Reason (R): Mutations always lead to harmful effects.

- (A) A (B) B (C) C (D) D

6. **Assertion (A):** Lac operon is an inducible operon.

Reason (R): Presence of lactose switches off transcription.

- (A) A (B) B (C) C (D) D

7. **Assertion (A)**: Introns are removed from primary transcript.

Reason (R): Introns do not code for proteins.

- Ⓐ A Ⓑ B Ⓒ C Ⓓ D

8. **Assertion (A)**: tRNA has an anticodon loop.

Reason (R): Anticodon pairs with codon on mRNA during translation.

- Ⓐ A Ⓑ B Ⓒ C Ⓓ D

9. **Assertion (A)**: DNA is more stable than RNA.

Reason (R): RNA has uracil instead of thymine.

- Ⓐ A Ⓑ B Ⓒ C Ⓓ D

Hint: Differences between DNA and RNA

10. **Assertion (A)**: Frame-shift mutation is more harmful than point mutation.

Reason (R): It alters the reading frame of codons.

- Ⓐ A Ⓑ B Ⓒ C Ⓓ D

Hint: Types of mutation

Very Short Answer Questions :

1. Why is DNA polymerase unable to initiate DNA synthesis without a primer?

Hint: DNA replication

2. Name the enzyme that joins Okazaki fragments and mention the bond it forms.

3. What is the significance of the 5' cap in eukaryotic mRNA?

Hint: Capping

4. Why does uracil replace thymine in RNA?

Hint: Structure of RNA

5. Which nitrogenous base pair has two hydrogen bonds in DNA?

6. What is meant by "wobble position" in a codon?

Hint: Genetic code

7. Name the operator gene of the lac operon.

8. Why is genetic code described as non-overlapping?

9. Which RNA polymerase transcribes rRNA in eukaryotes?

10. State one reason why RNA is less stable than DNA.

Hint: Comparison between DNA and RNA as genetic material

Short Answer Questions :

1. Explain why DNA replication is semi-discontinuous.

2. Differentiate between euchromatin and heterochromatin with respect to transcriptional activity.

3. Describe the role of sigma factor during transcription in prokaryotes.

4. Explain how a silent mutation occurs despite a change in nucleotide sequence.

5. How does lactose act as an inducer in the lac operon?

Long Answer Questions :

1. Describe the process of DNA replication in prokaryotes highlighting the role of different enzymes.
2. Explain transcription in eukaryotes, mentioning initiation, elongation and termination.
3. Describe the structure and function of tRNA with a labelled diagram.
4. Explain the regulation of gene expression in the lac operon with a neat diagram.
5. Describe the salient features of the genetic code and explain any four of them.

Case Based Questions.

1. Read the given lines and answer the following questions

During an experiment, a scientist observed that even in the absence of glucose, a bacterial culture failed to produce β -galactosidase despite the presence of lactose.

- a) Which operon is being studied here?
- b) Name the structural gene responsible for β -galactosidase synthesis.
- c) State the possible reason for non-production of the enzyme.
- d) Which component normally prevents transcription in the absence of lactose?

Hint: Large operon

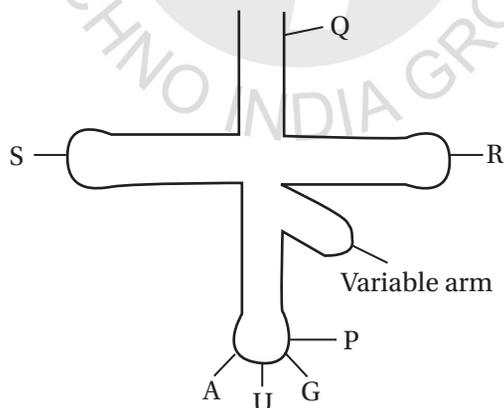
2. Read the given line and answer the following questions

A mutation in a gene caused insertion of a single nitrogenous base, leading to a completely non-functional protein.

- a) Identify the type of mutation.
- b) Why does this mutation have a more drastic effect?
- c) Which property of genetic code is affected here?
- d) State one consequence of such mutation at protein level.

Hint: Mutation

3. Given below is a clover-leaf structure of tRNA.



- a) Identify regions labelled P, Q, R and S.
- b) Which region binds to the amino acid and which region recognizes the codon?
- c) Why is tRNA called an adaptor molecule?
- d) Mention one post-transcriptional modification in tRNA.

Hint: tRNA

ANSWER

MCQ

1. (A)	3. (B)	5. (A)	7. (B)	9. (D)	11. (D)	13. (B)	15. (C)
2. (B)	4. (B)	6. (B)	8. (C)	10. (C)	12. (C)	14. (B)	

ASSERTION-REASON

1. (A)	3. (A)	5. (C)	7. (B)	9. (B)
2. (A)	4. (A)	6. (C)	8. (A)	10. (A)

