

CHAPTER-WISE TEST CH 6 MOLECULAR BASIS OF INHERITANCE

Class 12 - Biology

Time Allowed: 3 hours

Maximum Marks: 70

General Instructions:

1. All questions are compulsory.
2. The question paper has five sections and 33 questions. All questions are compulsory.
3. Section–A has 16 questions of 1 mark each; Section–B has 5 questions of 2 marks each; Section– C has 7 questions of 3 marks each; Section– D has 2 case-based questions of 4 marks each; and Section–E has 3 questions of 5 marks each.
4. There is no overall choice. However, internal choices have been provided in some questions. A student has to attempt only one of the alternatives in such questions.
5. Wherever necessary, neat and properly labeled diagrams should be drawn.

Section A

1. Autoradiogram of VNTR probe gives many band of different size. It differ from individual to individual except: **[1]**
 - a) Heterozygotic twins
 - b) Real brothers
 - c) Monozygotic twins or identical twins
 - d) Real sisters
2. In human beings 99.9% of genome sequence are same in all individuals only 0.1% of genome differ that: **[1]**
 - a) make every individual similar in phenotypic appearance.
 - b) make every individual genetically similar.
 - c) make every individual unique in phenotypic appearance.
 - d) make a genetic variation for evolution.
3. E. coli cells with a mutated Z gene of the lac operon cannot grow in medium containing only lactose as the source of energy because: **[1]**
 - a) They cannot synthesize functional beta galactosidase.
 - b) In the presence of glucose, E.coli cells do not utilize lactose.
 - c) They cannot transport lactose from the medium into the cell.
 - d) The lac operon is constitutively active in these cells.
4. The human chromosome with the highest and least number of genes in them are respectively: **[1]**
 - a) Chromosome 21 and Y
 - b) Chromosome 1 and Y
 - c) Chromosome X and Y
 - d) Chromosome 1 and X
5. Semiconservative replication of DNA was first demonstrated in: **[1]**
 - a) *Salmonella typhimurium*
 - b) *Streptococcus pneumoniae*
 - c) *Drosophila melanogaster*
 - d) *Escherichia coli*

6. The genetic and physical maps on genome was generated using information on: [1]
- a) Variable number of tendon repeats. b) Amplification
c) Junk DNA d) Polymorphism of restriction endonuclease recognition sites.
7. Process used for amplification or multiplication of DNA for finger printing is [1]
- a) Sesslerisation b) Southern blotting
c) Polymerase chain reaction d) Northern blotting
8. In biochemical genetics the term gene is being replaced by [1]
- a) Anticodon b) Genome
c) Template d) Cistron
9. The fact that a purine base always pairs through hydrogen bonds with a pyrimidine base in the DNA double helix leads to: [1]
- a) the semiconservative nature b) uniform length in all DNA
c) the antiparallel nature d) uniform width throughout DNA
10. DNA fingerprinting or genetic finger printing is the process of: [1]
- a) Matching the fingerprint of different persons. b) Analyzing VNTR samples of DNA obtained from body fluid or cells.
c) Finding similarities of finger shapes of different individuals. d) Comparing the DNA of two individuals.
11. Depending on the base composition, length of segment and number of repetitive units, the satellite DNA is classified into many categories such as [1]
- a) Mega satellites and artificial satellites b) Micro satellites and mini satellites
c) Mini satellites and mega satellites d) Small satellites and large satellites
12. Human genome project was closely associated with the rapid development of a new area in biology called as [1]
- a) Bioinformatics b) Genetic engineering
c) Biotechnology d) Genomics
13. **Assertion (A):** Z-DNA follows a zig-zag course. [1]
Reason (R): Z-DNA is left-handed.
- a) Both A and R are true and R is the correct explanation of A. b) Both A and R are true but R is not the correct explanation of A.
c) A is true but R is false. d) A is false but R is true.
14. **Assertion (A):** In an operon, the regulator and operator genes are not associated with the constitutive genes. [1]
Reason (R): Constitutive genes need not be repressed.
- a) Both A and R are true and R is the correct explanation of A. b) Both A and R are true but R is not the correct explanation of A.
c) A is true but R is false. d) A is false but R is true.

15. **Assertion:** DNA has evolved from RNA with chemical modifications for the storage of genetic information. [1]
Reason: RNA being a catalyst was reactive and hence unstable so DNA evolves from it which is more stable and preferred for the storage of genetic information.
- a) Assertion and reason both are correct statements and reason is correct explanation for assertion. b) Assertion and reason both are correct statements but reason is not correct explanation for assertion.
- c) Assertion is correct statement but reason is wrong statement. d) Assertion is wrong statement but reason is correct statement.
16. **Assertion (A):** tRNA acts as an adapter molecule. [1]
Reason (R): tRNA recognizes codon sequence of mRNA during translation.
- a) Both A and R are true and R is the correct explanation of A. b) Both A and R are true but R is not the correct explanation of A.
- c) A is true but R is false. d) A is false but R is true.

Section B

17. What do you understand by the antiparallel arrangement of DNA strands? [2]
 OR
 What are structural genes? Name the three structural genes present in the lac operon of *Escherichia coli*?
18. Give a schematic diagram of a DNA molecule showing three lap. (nucleotide pairs) [2]
19. Certain molecular processes are given in column (A). Provide the terms given to these processes in column (B), [2]
 after selecting them from the terms: Recombination, gene regulation, prokaryotic, transcription, eukaryotic transcription, translation, replication, gene transfer, DNA fingerprinting.

	Column A	Column B
(i)	DNA → DNA	
(ii)	DNA → hnRNA	
(iii)	hnRNA → Protein	
(iv)	Repressor Protein + Operator → No transcription	

20. Make a simple diagrammatic sketch to show a polynucleotide chain. [2]
21. It is established that RNA is the first genetic material. Explain giving three reasons. [2]

Section C

22. The enzyme DNA polymerase in *E.coli* is a DNA dependent polymerase and also has the ability to proof-read the DNA strand being synthesised. Explain. Discuss the dual polymerase. [3]
23. You are repeating the Hershey-Chase experiment and are provided with two isotopes: ^{32}P and ^{15}N (in place of ^{35}S in the original experiment). How do you expect your results to be different? [3]
24. Why is DNA considered a better hereditary material than RNA? [3]
 OR
 How is a polypeptide chain synthesis terminated during protein synthesis?
25. Define transformations in Griffith's experiment. Discuss how it helps in the identification of DNA as the genetic material. [3]
26. Give an account of post-transcriptional modifications of a eukaryotic mRNA. [3]

27. Would it be appropriate to use DNA probes such as VNTR in DNA fingerprinting of a bacteriophage? [3]

OR

Differentiate between Prokaryotic DNA and Eukaryotic DNA.

28. Explain the dual function of AUG codon. Give the sequence of bases it is transcribed from and its anticodon. [3]

Section D

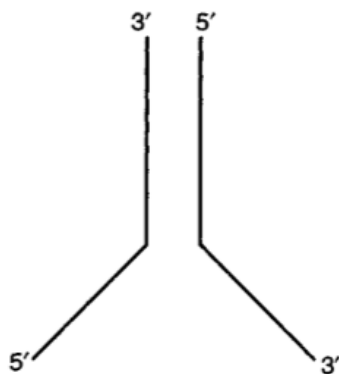
29. Read the text carefully and answer the questions: [4]

Study the schematic representation of the genes involved in the lac operon given below and answer the questions that follows:

p	i	p	o	z	y	a
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- Identify and name the regulatory gene in this operon. Explain its role in 'switching off the operon.'
 - Why is lac operon's regulation referred to as negative regulation?
 - Name the inducer molecule and the products of the genes z and y of the operon.
 - Write the function of these gene products.
30. Read the text carefully and answer the questions: [4]

Study the image below:



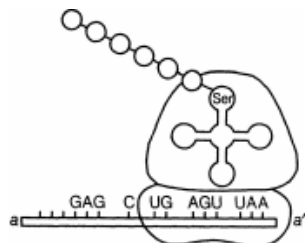
- Identify the structure shown above.
- Redraw the structure as a replicating fork and label the parts.
- Write the source of energy for this replication and list the enzymes involved in this process.
- Mention the difference in the synthesis based on the polarity of the two template strands.

Section E

31. Explain the mechanism of DNA replication with the help of a replication fork. What role does the enzyme DNA- [5]
ligase play in a DNA replication fork?

OR

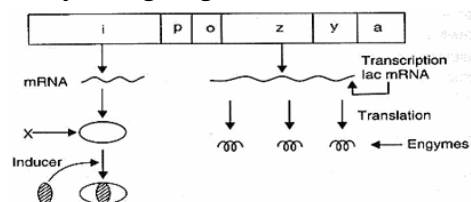
Study the figure and answer the following questions:



- Identify the polarity from a to a', in the diagram below and mention how many more amino acids are expected to be added to this polypeptide chain.
- Mention the DNA sequence coding for serine and the anticodon of tRNA for the same amino acid.
- Why are some untranslated sequence of bases seen in mRNA coding for a polypeptide? Where exactly are they present on mRNA?

32. Study the figure given below and answer the following questions:

[5]



- Name the molecule 'X' synthesized by 'i' gene. How does this molecule gets inactivated?
- Which one of the structural genes codes for β -galactosidase?
- When will the transcription of this gene stop?

OR

Name the scientists who proved experimentally that DNA is the genetic material. Describe their experiment.

33. There is a paternity dispute for a child'. Which technique can solve the problem. Discuss the principle involved. [5]

OR

During the course of evolution why DNA was chosen over RNA as genetic material? Give reasons by first discussing the desired criteria in a molecule that can act as genetic material and in the light of biochemical differences between DNA and RNA.