

Shri Shivaji Education Society, Amravati's
SHRI PUNDLIK MAHARAJ MAHAVIDYALAYA, NANDURA
Rly. DIST-BULDANA
B.Sc IIIrd (Sem-VI)
DEPARTMENT OF ZOOLOGY

SET-I

1. If the length of one helix in a DNA is 44 \AA , the type of DNA is:
 - a) Z-DNA
 - b) A-DNA
 - c) B-DNA
 - d) C-DNA

2. Among the following which cannot be the part of a gene?
 - a) UUUUUUUUU
 - b) CATCATCAT
 - c) GCGCGCGCG
 - d) AAAAAAAAAA

3. The distance between the neighboring base pairs in the DNA is:
 - a) 3.4 \AA
 - b) 34 \AA
 - c) 340 \AA
 - d) 19.8 \AA

4. The overall shape of Z-DNA is:
 - a) Elongated and wide
 - b) Short and narrow
 - c) Elongated and narrow
 - d) Short and wide

5. The genome of a virus has a composition of 25% G, 25% C, 25% A and 25%T. The genome is a:
 - a) ssDNA
 - b) ssRNA
 - c) dsRNA
 - d) dsDNA

6. The genome of a virus has a composition of 25% G, 25% C, 25% A and 25% T. The genome is a:
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7. What should be the complementary strand of 3'....ATGGCTTGA....5'?
- 3'....TACCGAACT....5'
 - 5'....TACCGAACT....3'
 - 3'....TAGGCAAGT....5'
 - 5'....TAGGCAAGT....3'
8. In a DNA double helix the bases are held together by hydrogen bonds. These hydrogen bonds are _____
- Covalent bonds
 - Non-covalent bonds
 - Ionic bonds
 - Van der Waals forces
9. It is easy to break the bond between A and T than in between G and C.
- True
 - False
10. Which of the following function of DNA is necessary for the purpose of evolution?
- Replication
 - Transcription
 - Translation
 - Mutation
11. Definite results proving DNA to be genetic material was given by _____
- Fredrick Griffith
 - Hershey and Chase
 - Avery, Macleod and MacCarty
 - Meselson and Stahl
12. Replication fork is the junction between the two _____
- Unreplicated DNA
 - Newly synthesized DNA
 - Newly separated DNA strands and newly synthesized DNA strands
 - Newly separated DNA strands and the unreplicated DNA
13. In the case of a circular DNA synthesis how many replication forks are observed?
- 1

- b) 2
 - c) 3
 - d) 4
14. Which of the following does not affect DNA replication?
- a) Antiparallel nature of DNA
 - b) End specificity of polymerase
 - c) SSB protein
 - d) Helicase
15. The formation of the phosphodiester bond is an example of _____ reaction.
- a) SN1
 - b) SN2
 - c) E1
 - d) E2

Short answer Questions

1. What is palindromic sequence of DNA?
2. What is meant by the description "antiparallel" regarding the strands that make up DNA?
3. Describe the structure of DNA and its correlation to its role as the molecular basis of inheritance?
4. What does it mean that DNA bases are complementary?
5. Where is glycosidic bond located in DNA?
6. State a role for each of four different named enzymes in DNA replication.
7. Explain how the process of DNA replication depends on the structure of DNA
8. Distinguish between RNA and DNA.
9. Describe the roles of mRNA, tRNA and ribosomes in translation.
10. Outline the structure of tRNA.

Long answer type questions

1. On paper, replicate the following segment of DNA:
5' ATCGGCTACGTTTAC 3'
3' TAGCCGATGCAAGTG 5'

a) Show the direction of replication of the new strands and explain what the lagging and leading strands are.

b) Explain how this is semiconservative replication. Are the new strands identical to the original segment of DNA?
2. Compare the structure and functions of DNA and RNA.
3. Distinguish between DNA and RNA with regard to chemical composition, nucleotides included in each, location in the cell, and function.
4. Explain, in detail, how DNA replication occurs. Include DNA polymerase, RNA polymerase, primase and ligase.

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SET-II

1. Which is correct for termination of transcription in eukaryotes?
 - a) Terminates during polyadenylation
 - b) Terminates prior to polyadenylation
 - c) Termination prior to or during or after polyadenylation
 - d) Terminates after polyadenylation
2. The _____ RNA polymerase has a single subunit.
 - a) T7
 - b) E. coli
 - c) Bacillus subtilis
 - d) λ phage
3. The promoters for RNA polymerase III are located at:
 - a) Internal to the transcribed sequence
 - b) -35 to -10 downstream
 - c) +1 to +10 upstream
 - d) More than 100 bp upstream
4. Which of the following is necessary for the transport of mRNA from the nucleus to the cytoplasm?
 - a) NLS sequence
 - b) Secondary structure
 - c) 5'-Capping
 - d) Splicing
5. The 5' cap of RNA is made of:
 - a) 3-methylguanylate
 - b) 5-methylguanylate
 - c) 7-methylguanylate
 - d) Methyl-5-hydroxyl-guanylate
6. Which molecule is continuously transported from nucleus to the cytoplasm?
 - a) Histone
 - b) DNA
 - c) RNA

d) Ribosome

7. The poly-A-tail of an mRNA consists of multiple adenine units in the form of:

- a) Adenosine triphosphates
- b) Adenosine monophosphates
- c) Adenosine diphosphates

8. The RNA polymerase enzyme of *E. coli* consists of _____ different subunits.

- a) 8
- b) 5
- c) 4
- d) 6

9. Which of the following statements regarding the location of the promoter is correct?

- a) Promoters are located downstream of the start site on the DNA towards the 5' region of the sense strand
- b) Promoters are located upstream of the start site on the DNA towards the 5' region of the sense strand
- c) Promoters are located downstream of the start site on the DNA towards the 5' region of the sense strand
- d) Promoters are located upstream of the start site on the DNA towards the 3' region of the sense strand

10. For the translation process, besides eIF2 and Met-t-RNA, the eukaryotic 80S ribosome also requires:

- a) UTP
- b) ATP
- c) GTP
- d) CTP

11. The 20 different amino acids in the protein are normally coded by:

- a) 63 codons
- b) 61 codons
- c) 60 codons
- d) 62 codons

12. Which of the following antibiotic inhibit 80S ribosomes?

- a) Chloramphenicol
- b) Streptomycin
- c) Cyclohexamide
- d) Tetracycline

13. A messenger RNA is 336 bases long including the initiation and termination codon. The number of amino acids in the polypeptide translated from this is:

- a) 111
- b) 333
- c) 110

d) 600

14. Which of the following non-coding RNAs is involved in RNA editing?

- a) siRNA
- b) gRNA
- c) snRNA
- d) miRNA

15. A protein which is to be degraded in the proteasome is tagged with:

- a) Ubiquitin
- b) Polyproline
- c) Polyglycine
- d) Formyl-methionine

16. The anticodon sequence is located in:

- a) r-RNA
- b) t-RNA
- c) r-RNA
- d) DNA

Short Answer questions

1. 1. The base composition of a virus was found to be 11% A, 32% G, 18% U and 39% C. Is this a DNA or RNA virus? How can you tell? Is it single-stranded or double-stranded? How can you tell?
2. An anticodon of a tRNA has the sequence 5'GCA3'. a. What amino acid does this tRNA carry? what would be the effect of a mutation that changes the C to a A?
3. What is Shine-Dalgarno sequence? In which groups of microorganisms, it is found?
4. What do the codons UGA, UAA and UAG mean in normal translation?
5. What is wobble hypothesis? What is the importance of wobble and degeneracy?
6. Define an operon.
7. What are genes? Define.
8. What controls induction and repression?
9. What is the lac operon?
10. What is catabolite repression?

Long answer type question

1. What are positive regulators (activators) and negative regulators (repressors)? Describe.
2. What are split genes? Describe.
3. Outline the molecular events that lead to the synthesis of a primary transcript by RNA polymerase II, and describe how evidence for the process was obtained
4. Describe the properties of the three eukaryotic RNA polymerases and their templates.
5. Discuss the role played by the C-terminal domain of RNA polymerase II in the production of a transcript
6. How do covalent modifications of histones and DNA affect gene expression?

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SET-III

MCQs

1. 1. Damage and errors in DNA cause _____
 - a) Mutation
 - b) DNA repair
 - c) Translation
 - d) Transcription
2. Mark the INCORRECT statement about mutation?
 - a) Mutation is predestined
 - b) Major source of evaluation
 - c) Usually deleterious and recessive
 - d) It is a reversible process
3. Name the term given to the type of mutation which depends on the conditions of the environment?
 - a) Forward mutation
 - b) Reverse mutation
 - c) Conditional lethal mutation
 - d) Gain of function mutation
4. Name the type of mutation in which the cause of mutation is not known?
 - a) Spontaneous mutation
 - b) Suppressor mutation
 - c) Nonsense mutation
 - d) Mis-sense mutation
5. Addition or deletion of bases causes which kind of mutation?
 - a) Transversion
 - b) Frameshift mutation
 - c) Transition
 - d) Transcription
6. Which of the following chemical mutagen affects only replicating DNA?
 - a) Acridine dye
 - b) Alkylating agent
 - c) Deaminating agent
 - d) Base analog
7. How many kinds of mutation are found in DNA which includes mutation of only one base?
 - a) 1
 - b) 2
 - c) 3
 - d) 4

8. By which process miss-incorporated base can change into a permanent mutation?
- a) Replication
 - b) Transcription
 - c) Translation
 - d) Transposition
9. High level of mutation in the germ cells is acceptable but in somatic cells can be catastrophic.
- a) True
 - b) False

10. Which of the following does not protect body surfaces:

- A Skin.
- B Mucus.
- C Gastric acid.
- D Salivary amylase
- E Gut microflora.

11. A polymorphonuclear neutrophil (PMN):

- A Is a bone marrow stem cell.
- B Is closely similar to a mast cell.
- C Contains microbicidal cytoplasmic granules.
- D Is not a professional phagocytic cell.
- E Has granules which stain with eosin.

12. Acute inflammation characteristically involves:

- A Constriction of arterioles.
- B Capillary endothelial cell enlargement.
- C Influx of macrophages.
- D Influx of mast cells.

13. Lysozyme:

- A Is a cytoplasmic organelle.
- B Activates complement.
- C Is a proteolytic enzyme.
- D Splits peptidoglycan.
- E Is released by mast cells.

14. Eosinophils do not:

- A Stain with basic dyes.
- B Contain a major basic protein.
- C Contain peroxidase.
- D Give a respiratory burst on activation.
- E Have C3b receptors.

15. Polymorphonuclear neutrophils attack bacteria:

- A Exclusively by oxygen-dependent mechanisms.
- B Exclusively by oxygen-independent mechanisms.
- C By phagocytosis.
- D By secreting complement.
- E By secreting interferon.

Short answer questions

1. What are mutants and how do they affect a normal biological system?
2. Describe some common chromosomal mutations: inversions, deletions, duplications, fusions, fissions, and translocations. with diagram
3. Name the two basic kinds of point mutations.
4. What is a frameshift mutation?
5. Describe the mechanisms leading to generation of antibody diversity in the bone marrow and lymphoid tissue.
6. Describe antigen presentation to T cells
7. What molecules are involved in T cell stimulation?
8. Compare and contrast the differences and similarities between mast cells and basophils. You may draw a table to help you structure your answer
9. Describe the process leading to mast cell activation / degranulation by IgE (type I hypersensitivity reaction).
10. How does the release of mast cell mediators follow activation/degranulation result in anaphylaxis?

Long answer questions

1. What causes mutations?
2. What is the difference between a missense mutation and a nonsense mutation?
3. Describe the development, cellular characteristics and effector functions of eosinophils. What are the pathologic consequences of prolonged tissue eosinophilia?
4. CD4⁺ Helper T-cells can be differentiated into several subsets; Th1, Th2, Th17 and TReg . In a table list the following:
 - i) Cytokines and transcription factors responsible for this differentiation
 - ii) Effector functions of these T-cells
 - iii) List one disease that can develop as a result of a defect in each of these subsets