Ahmedabad University

School of Arts and Sciences

BIO 211 Molecular Biology

iMS Life Sciences
Mid Term Examination 2022 (Monsoon Semester)

Total Marks = 30 **Time – 1 hour 30 minutes**

Enrolment Number:.....
Date: 20-09-2022
No. of printed pages: 3

Section-I (All questions are compulsory) **1 X 10 = 10**

1. Formation of radial loop domains plays an important in the compaction of eukaryotic genome. The width of this structure is:
   (a) 700 nm
   (b) 300 nm
   (c) 30 nm
   (d) 11 nm

2. Which of the following have a multipartite genome?
   (a) *Escherichia coli*
   (b) *Vibrio cholerae*
   (c) *Saccharomyces cerevisiae*
   (d) All of the above

3. The number of base pairs of DNA wound around the histone octamer is:
   (a) 176
   (b) 156
   (c) 146
   (d) 136

4. The 14-3-3 protein recognizes phosphorylation on serine residues of histone and transduces the proper signal. So the 14-3-3 protein is termed as:
   (a) Reader
   (b) Eraser
   (c) Writer
   (d) None of the above

5. Which of the following is not the part of the histone octamer?
   (a) H4
   (b) H3
   (c) H2B
   (d) H2A
   (e) H1

6. Which ration is constant for DNA
    A. A+G/T+C
    B. A+T/G+C
    C. A+C/U+G
    D. A+U/C+G

7. What is the reaction in DNA replication catalyzed by DNA ligase?
    A. Addition of new nucleotides to the leading strand
    B. Addition of new nucleotide to the lagging strand
    C. Formation of a phosphodiester bond between the 3'-OH of one Okazaki fragment and the 5'-phosphate of the next on the lagging strand
    D. Base pairing of the template and the newly formed DNA strand

8. Gyrase (or topoisomerase):
    A. Separates the DNA strands at the origin
    B. Keeps the single-stranded DNA regions from coming back together
    C. Re-coils the DNA into a helix after replication is complete
    D. Breaks and re-joins the DNA backbone to remove tension produced by the helicase
    E. Breaks hydrogen bonds between DNA and the RNA primers

9. Which force can stabilize a DNA double-helix?
    A. Hydrophobic bases are found in the interior of the helix where each base-
    B. pair is stabilized by the same number of hydrogen bonds.
    C. Hydrophilic sugar-phosphate groups are found on the exterior of the helix where they can interact with water.
    D. Non-covalent N-glycosidic bonds can form between nitrogenous bases in opposite strands in the helix.
    E. Covalent base-stacking interactions can occur between adjacent bases within the same strand in the helix.

10. Eukaryotes differ from prokaryote in mechanism of DNA replication due to
    A. Use of DNA primer rather than RNA primer
    B. Different enzymes for synthesis of lagging and leading strand
    C. Discontinuous rather than semi-discontinuous replication
    D. Unidirectional rather than semi-discontinuous replication

Section-II (All questions are compulsory)

1.
   A. A closed circular relaxed DNA molecule has a linking number of 100. If the number of base pairs per turn is 10.5, what is the total number of base pairs in this DNA molecule?
   B. Write the name of the SMC protein which plays important role in sister chromatid alignment.
   C. What is meant by hyperchromic shift?
   D. What is the reason behind C value paradox?
   E. Does metaphase chromosome undergo gene transcription? Write your answer with proper explanation? **[1+1+1+1+1=5]**

2. What is C_0t analysis? Describe the procedure by which this analysis is performed with explanation of each step. **[1+4=5]**

3. Complete the following table (**2.5 marks)**

	Percentage of each base			
Species	**Adenine**	**Cytosine**	**Thymine**	**Guanine**
A	23	27	23	
B	18	32		
C	20		20	
D				24

4. If a mixture of DNA and protein is shown to contain genetic information by some assay such as transformation in bacteria, how can a researcher determine whether that genetic information is present in the DNA or the protein component? **(2.5 marks)**

5. Comment on the followings: (**2.5 marks each)**
   A. Many of the origins of replication that have been characterized contain AT-rich core sequences. Are these AT-rich cores of any functional significance? If so, what?
   B. In E. coli, three different proteins are required to unwind the parental double helix and keep the unwound strands in an extended template form. What are these proteins, and what are their respective functions?