

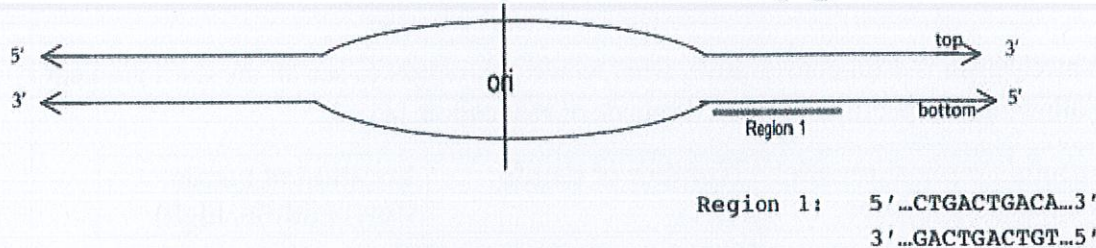
JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT
 TEST -2 EXAMINATION- 2024
 M.Sc-I Semester (BT)

COURSE CODE (CREDITS): 20MS1BT112 (3)
 COURSE NAME: Cell and Molecular Biology
 COURSE INSTRUCTORS: Dr. Abhishek

MAX. MARKS: 25
 MAX. TIME: 1 Hour 30 Minutes

Note: (a) All questions are compulsory.

(b) The candidate is allowed to make Suitable numeric assumptions wherever required for solving problems

Q.No	Question	Mar ks
Q1	<p>Consider the following origin of replication that is found on a chromosome. The sequence of region 1 is shown below.</p>  <p style="text-align: right;">Region 1: 5' ...CTGACTGACA...3' 3' ...GACTGACTGT...5'</p> <p>a. Within Region 1, which strand will be the template for leading strand synthesis, the top or the bottom? Give suitable reason [2] b. If we assume that a lagging strand fragment is made from region 1, what will be its sequence? [1] c. You examine DNA replication in an E. coli mutant, which has a partially defective DNA polymerase. In vitro experiments using the mutant DNA polymerase gives an error rate of 10^{-3}, as compared to the expected error rate of 10^{-6}. Which activities of the mutant polymerase likely to be missing, as compared to the normal polymerase? Name any three activity of DNA polymerase I and there importance in replication. [1+1.5+1.5] d. Why is it important for the cell to be able to distinguish parental (old) DNA strands from their daughter (new) DNA strands? [1] e. The Klenow fragment is a protein fragment derived from which polymerase? name the activities you will find in Klenow fragment [2] f. Do you think Primase and Gyrase are important enzyme for replications, if so? Detail-out the functioning of both the enzymes [2]</p>	12

Q2

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The Meselson–Stahl experiment is an experiment by Matthew Meselson and Franklin Stahl in 1958 which supported Watson and Crick's hypothesis that DNA replication was semiconservative. In semiconservative replication, when the double-stranded DNA helix is replicated, each of the two new double-stranded DNA helices consisted of one strand from the original helix and one newly synthesized.

- a. In the Meselson and Stahl experiment, what part of the DNA gets labeled with ^{15}N ? [1]
- b. Would any other macromolecule get labeled in that experiment? If yes, what is it? [1]
- c. In the Meselson and Stahl experiment, where on the CsCl gradient would the following DNA be found (low, middle, high): [3]
 - i. Double stranded DNA where both strands are labeled
 - ii. Double stranded DNA where one strand is labeled
 - iii. Double stranded DNA where neither strand is labeled

d. If the mechanism is semi-conservative, what would you expect to see on the CsCl gradient after allowing the specified number of rounds of replication: [4]

# rounds replication after switching to light N	Number of Bands	Location of bands (low, middle, high)
None		
One		
Two		
Three		

e. If the mechanism is conservative, what would you expect to see on the CsCl gradient after allowing the specified number of rounds of replication: [4]

# rounds replication after switching to light N	Number of Bands	Location of bands (low, middle, high)
None		
One		
Two		
Three		