

KATHMANDU UNIVERSITY  
End Semester Examination [C]  
November/December, 2023

Marks Scored:

Level : B.Tech.

Year : II

Exam Roll No.:

Time: 30 mins.

Registration No.:

Course : BIOT 206

Semester : II

F. M. : 20

Date 28 NOV 2023

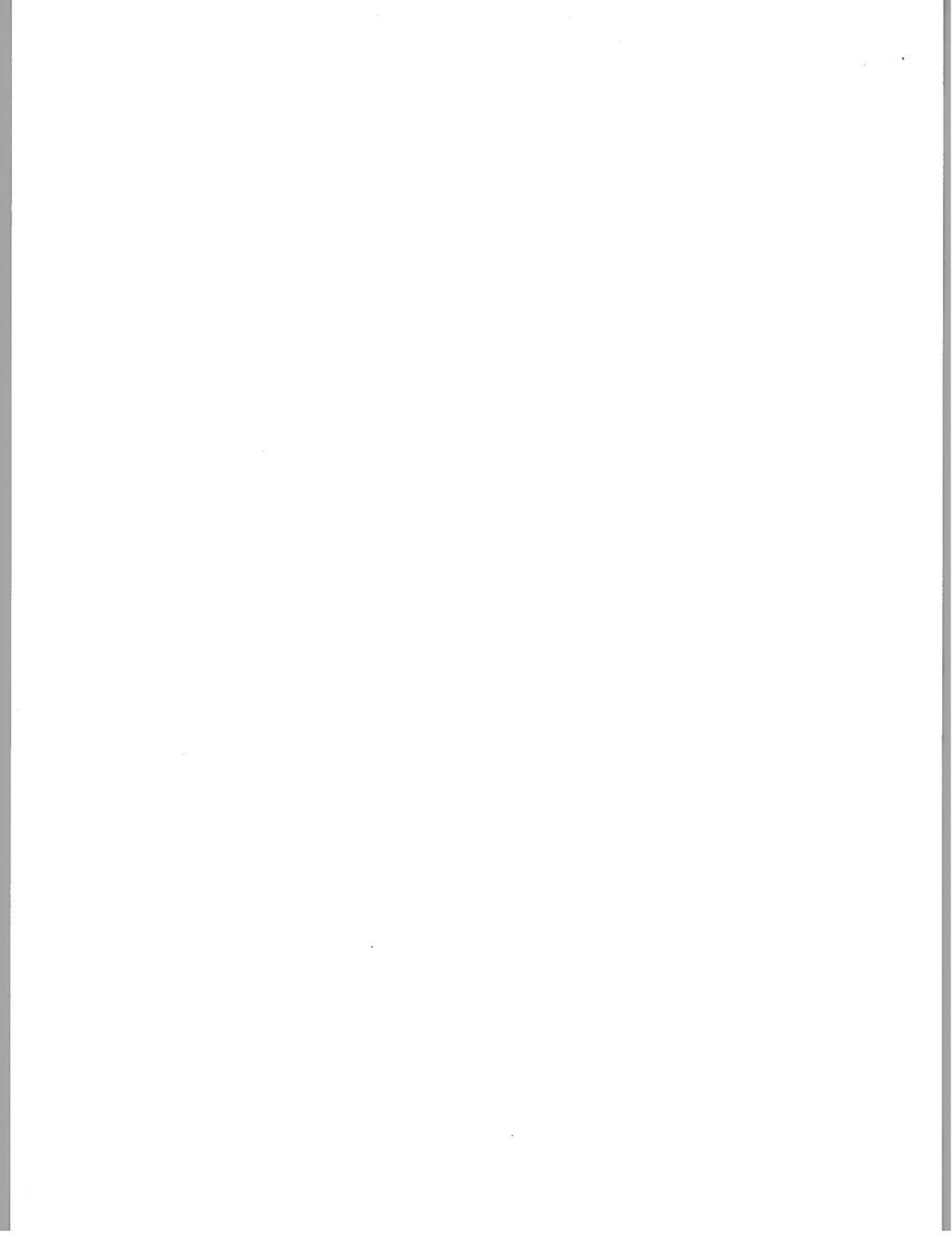
SECTION "A"  
[20Q. × 1 = 20 Marks]

Encircle the most appropriate option.

- Which of the following experimental designs about Hershey and Chase experiment is **NOT TRUE**?
  - Labeling the virus with S-35 and P-32 was carried out.
  - Host cells were infected by injecting virus into the E. coli cells.
  - Violent agitation was carried out to shake off the ghosts and allow P-32 to enter bacterial cells.
  - Mixing of virus and host cells is sufficient for infection.
- In the Messelson and Stahl experiment how many bands of DNA will be observed if the semi conservative method of replication were true in the fourth generation of bacteria transferred to regular Nitrogen media?
  - 1
  - 2
  - 3
  - 4
- Which of the following statements is **TRUE**?
  - Bond length and strength are unrelated
  - Longer the bond length weaker the bond strength
  - Longer the bond length stronger the bond strength
  - Shorter the bond length weaker the bond strength
- Which of the following DNA can be left handed?
  - A form DNA
  - B form DNA
  - C form DNA
  - Z form DNA
- What about DNA structure is **TRUE**?
  - It is a polymer of dNMPs
  - Each strand has only a 5' end
  - Complementary strands run parallel
  - Phosphoanhydrite bonds are found in DNA
- Which of the following is a three-helix bundle that fits into minor groove?
  - Lymphocyte enhancer factor 1
  - Zinc finger motif
  - Bacteriophage lamda repressor
  - Yeast transcription factor GCN4
- Which one of the method is **NOT** to predict the structure of RNA?
  - Nuclear magnetic resonance spectroscopy
  - X ray crystallography
  - SELEX
  - Mutate and map strategy

8. Western Blotting technique visualizes electrophoretically separated \_\_\_\_\_.
- a. DNA
  - b. RNA
  - c. protein
  - d. carbohydrate
9. Pulsed field electrophoresis is used to separate \_\_\_\_\_.
- a. Entire bacterial chromosome
  - b. 10 kb DNA
  - c. 1 kb DNA
  - d. less than 1 kb DNA
10. Two primers amplify a gene from *E. coli* DNA. After the first round of amplification what about the amplification product is **TRUE**?
- a. The amplification product contains the entire genome
  - b. Amplification leads to exact gene amplification
  - c. Amplification leads to amplification of gene and flanks from either side
  - d. There is no amplification product
11. Which of the following statements is **TRUE**?
- a. Blunt end can contain 3' overhang
  - b. Staggered end can contain 3' overhang
  - c. Blunt end can contain 5' overhang
  - d. There is no difference between blunt end and staggered ends
12. A fly morphologically very similar to mosquito was discovered. What is probably the most likely description of its genome?
- a. It contains almost no transposable elements
  - b. Its size is roughly 5 Mb
  - c. It contains significant amount of introns
  - d. Its size is roughly 2500Mb
13. What are solenoid and zigzag models?
- a. They describe how the structure of 30 nm fiber is formed
  - b. They describe how the structure of 10 nm fiber is formed
  - c. They help describe differences in superhelicity
  - d. They describe how proteins access the nucleosome
14. Which of the following are nucleosome variants?
- a. H1, which helps nucleosomes form
  - b. H2AX, which is activated when DNA damage occurs
  - c. CENP-Z found in centromeric DNA
  - d. CENP-C, a component of kinetochore
15. In *E. coli* DNA replication takes 40 minutes while cell division occurs every two minutes. Which of the following is true in *E. coli*?
- a. There are multiple origins of replication, which initiate during replication.
  - b. There is a second initiation from the origin of replication before the first replication has completed.
  - c. When you look at an *E. coli* cell in phase the DNA looks like a flower.
  - d. One round of replication completes before initiating another round of replication.

16. Which of the following statements is **FALSE**?
- During DNA replication, only alpha phosphate gets incorporated into the DNA
  - In the primer template junction, primer is shorter than template
  - Incoming nucleotide is always added at the 3 prime end
  - Incoming nucleotide can be added at the 5 prime end
17. Which of the following about helicases is **CORRECT**?
- They can fit single stranded DNA but not double stranded DNA.
  - They can move in only in the 5' to 3' direction
  - They do not require ATP to function
  - They are pentameric in nature
18. First yeast replicator were identified by \_\_\_\_\_
- Using the chromosomal assay with 1 D gel
  - Using the chromosomal assay with 2 D gel
  - Using transformation assay with antibiotic selection
  - Using transformation assay with auxotroph selection
19. What type of damage does UV radiation mostly cause?
- |                               |                                |
|-------------------------------|--------------------------------|
| a. Pyrimidine dimer formation | b. Alkylation of bases         |
| c. Depurination of guanine    | d. Intercalation between bases |
20. Which of the following proteins is involved in bacterial mismatch repair?
- |                         |                  |
|-------------------------|------------------|
| a. MutS, MutL and MuthI | b. UvrA and UvrB |
| c. MSH and PMS          | d. Glycosylases  |



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Indicate by checking (✓) of each question you have answered in the cover page of main answer book.

SECTION "B"

[5Q. × 3 = 15 marks]

Attempt *ANY FIVE* questions.

1. Describe A and B form of DNA.
2. What is protein domain? Describe with reference to TIM barrel and CD4 domains.
3. What is a tetraloop? Describe with structure.
4. Describe Western Blot technique.
5. What are amino terminal tails? What are their functions?
6. How are the functions of DNA polymerases specialized?
7. What is translesional polymerase?

SECTION "C"

[5Q. × 5 = 25 marks]

Attempt *ANY FIVE* questions.

8. Give three examples of high-energy bonds? Distinguish between hydrogen bond and hydrophobic interaction. [3+2]
9. With structures describe the mechanism of topoisomerase.
10. Describe pair end sequencing. What problem does it solve?
11. Describe why we need chromosomes. What are the costs of compaction?
12. Compare and contrast histone chaperones, nucleosome modifying complexes and nucleosome remodeling complexes.
13. How are exact replicator sites identified in the chromosome through Southern blot like method?
14. Describe nucleotide excision repair in bacteria.

**SECTION "D"**  
[2Q. × 7.5 = 15 marks]

Attempt *ANY TWO* questions.

15. Describe Avery's experiment. What is adaptor hypothesis? How were adaptors discovered? [3+2+2.5]
16. Describe in detail two techniques to study interaction between DNA and proteins. [7.5]
17. What is end replication problem? How does helicase act on DNA? [3+4.5]