

KATHMANDU UNIVERSITY
End Semester Examination [C]
April/May, 2023

Marks Scored:

Level : B.Tech.

Year : III

Exam Roll No. :

Time: 30 mins.

Registration No.:

Course : BIOT 302

Semester : I

F. M. : 20

Date : 3 May 2023

SECTION "A"

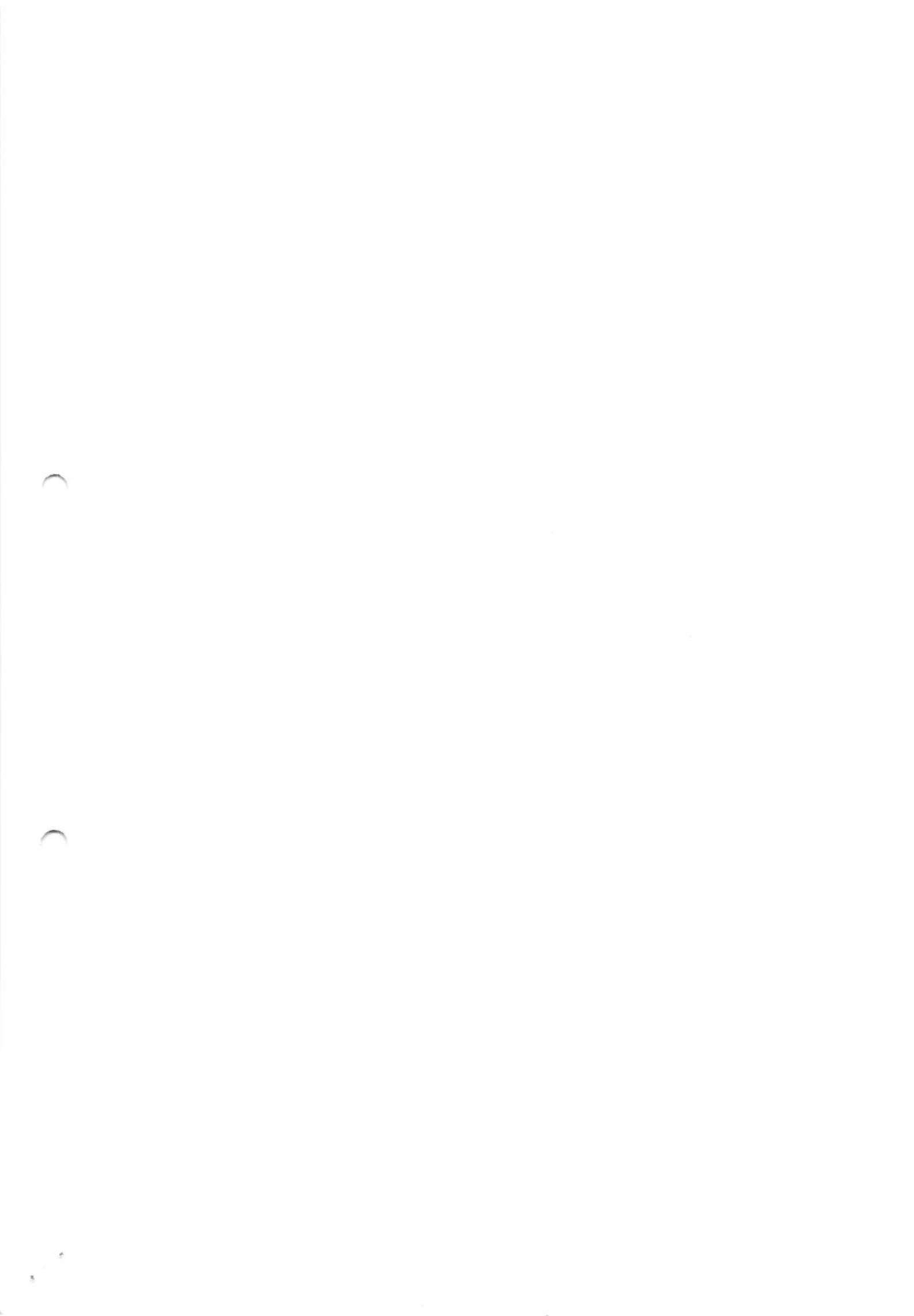
[20Q. × 1 = 20 marks]

Encircle the most appropriate option.

- What is the difference between site specific recombination and transposition?
 - One uses recombinase another uses transposase that are different.
 - The specificity of the DNA locations from which jumping takes place are different.
 - The DNA location to which DNA jumps is specified in one and not specified in another.
 - One describes jumping of DNA while another describes jumping of RNA.
- Autonomous means
 - Able to jump from one location to another.
 - Having its own copy of transposase.
 - Able to move through RNA intermediate.
 - Able to jump to any location in the genome.
- Promoter escape by RNA polymerase in eukaryotes
 - involves phosphorylation of polymerase tail
 - involves RNA capping
 - does not involve ATP hydrolysis
 - involves RNA loop formation
- There isn't a channel in RNA polymerase for which of the following activities
 - Intake of ribonucleotide tri phosphase
 - Release of DNA chain
 - Release of RNA chain
 - Release of ribonucleotide di phosphate
- Splicing
 - takes place in all prokaryotes and eukaryotes.
 - is active in lower eukaryotes such as *S. cerevisiae*.
 - is almost non existent in fly organisms such as *Drosophila*.
 - is very active in mice.
- What is **TRUE** about Group I introns?
 - Branch site contains guanine.
 - Catalytic machinery is the minor spliceosome.
 - Catalytic machinery is the major spliceosome.
 - It is very common in eukaryotes.
- Dscam gene splicing
 - is very well studied in humans
 - produces heavy and light chains in *Drosophila*
 - can produce thousand of isoforms
 - contains docking site and discriminator sequence

8. For the attachment of amino acid to tRNA
 - a. The amino acid must first react with GMP
 - b. The amino acids directly react to 5' OH of tRNA
 - c. The amino acids directly react to 3' OH of tRNA
 - d. The amino acid must first be attached to AMP
9. Ribosome is a ribozyme. This means
 - a. Peptidyl transferase unit of ribosome has RNA
 - b. Peptidyl transferase unit of ribosome is partly RNA
 - c. Decoding center of ribosome has RNA
 - d. Decoding center of ribosome is partly RNA
10. How does iron level regulate ferritin protein production?
 - a. Iron changes transcription of ferritin protein
 - b. High level of iron binds to IRE
 - c. High level of iron binds to IRP which can no longer bind to IRE
 - d. High level of iron binds to eIF4F/B protein
11. What is the function of 5' capping of mRNA?
 - a. It helps recruit ribosome during translation initiation
 - b. It helps release ribosome after translation is complete
 - c. It helps release GTF from mRNA during promoter escape
 - d. It measures total mRNA levels in a cell
12. Genetic code
 - a. is overlapping
 - b. can sometimes have non universal triplet code
 - c. can sometimes have doublet code
 - d. is non degenerate
13. LacZ, LacY and LacA are in an operon. What does this mean?
 - a. It means that the genes operate together
 - b. It means that the genes lie together and are transcribed from a promoter
 - c. It means that the three genes are translated by a common ribosome
 - d. It means the genes are homologous to each other
14. How is RecA and lysis/lysogeny related?
 - a. Lamda repressor resembles LexA and is cleaved by action of RecA
 - b. RecA downregulates lamda repressor transcription
 - c. RecA upregulates lamda repressor transcription
 - d. RecA binds to the operator sites to switch lysis to lysogeny
15. What is common about NtrC and MerR regulation?
 - a. One directly regulates transcription, another regulates translation
 - b. They work by changing recruitment
 - c. They work by allosteric modification
 - d. They both bind to operator sites
16. Which of the following is **NOT TRUE** about transcription regulation of eukaryotes compared to prokaryotes?
 - a. Regulation involves more regulatory sequences
 - b. Regulation involves more proteins
 - c. Regulation involves binding to sites further upstream than promoter
 - d. Regulation involves binding to intronic sites

17. What are insulators?
- They insulate charge between activators
 - They insulate activity of an enhancer on a promoter
 - They insulate activity of two activators
 - They insulate charge from an enhancer to a promoter
18. Aptamer and expression platform are parts of
- Long non coding RNA that regulate sex determination
 - CRISPR RNA that degrade viral DNA sequences
 - Riboswitches that regulate expression of tryptophan
 - miRNA that regulate gene expression
19. What is CRISPR and what are Cas genes?
- CRISPR is sequence found in virus and Cas are genes encoding nucleases in virus
 - CRISPR is sequence found in bacteria and Cas are genes found in bacteria
 - CRISPR encodes for nucleases whereas Cas encode for proteases
 - There is no difference between CRISPR and Cas
20. Which of the following is **NOT** an example of the biological significance of negative autoregulation?
- Regulation of insulin receptor gene to maintain glucose homeostasis
 - Quick adaptation of *E. coli* to changes in nutrients in the environment
 - Sporulation in the bacterium *Bacillus subtilis*
 - Regulation of thyroid hormone level in the bloodstream



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03. May.

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Semester : I
F.M. : 55

SECTION "B"

[5Q. × 3 = 15 marks]

Attempt *ANY FIVE* questions.

1. What is special about serine recombinase? Describe.
2. What are mediators in transcription?
3. What is ribosome and polysome profiling?
4. What did Jacob and Monod describe about lac operon?
5. How can the pattern of DNA methylation be maintained through cell division?
6. What is domain swap experiment in eukaryotic transcription regulation?
7. How can RNAi be used as a defense mechanism?

SECTION "C"

[5Q. × 5 = 25 marks]

Attempt *ANY FIVE* questions.

8. Other than RNA capping, what are the other RNA processing activities? Describe.
9. How does spliceosome find splice sites reliably?
10. Describe antibiotics that block translation.
11. Describe how the genetic code was cracked.
12. How do operators work together in lamda phage to switch between lysis and lysogeny?
13. How do long non-coding RNAs lead to X chromosome inactivation?
14. What is noise in systems biology? Explain using examples. Describe the expression of somite genes in vertebrate development. [2.5 + 2.5]

SECTION "D"

[2Q. × 7.5 = 15 marks]

Attempt *ANY TWO* questions.

15. What are three types of transposons? Describe their genomic organization. Describe how poly A retrotransposons move in the genome. [3 + 4.5]
16. How is sex determined in flies through splicing? How is pluripotency determined by splicing? [4 + 3.5]
17. Describe the structure of tRNA and ribosome. [5 + 2.5]

