KATHMANDU UNIVERSITY
End Semester Examination [C]
May/June, 2019

Marks Scored:

Level : B. Tech.
Year : III

Course : BIOT 302
Semester: I

Exam Roll No. :

Time: 30 mins.

F. M. : 20

Registration No.:

Date 30 MAY 2019

SECTION "A"
[20Q. × 1 = 20 marks]

Choose the most appropriate answer among the given options and ***encircle*** *the letter of your choice.*

1. What is the function of Rad51c-XRCC3 complex in eukaryotes?
   a. It pairs homologous DNA and causes strand invasion.
   b. It introduces double stranded breaks.
   c. It assembles strand exchange proteins.
   d. It acts as Holliday junction resolvase in eukaryotes.

2. What is heteroduplex DNA?
   a. DNA paired with RNA during transcription.
   b. DNA of invading strand paired with invaded strand.
   c. Homologous sister chromatids paired together.
   d. DNA paired with RNA after translation.

3. The term conservative in used in CSSR because
   a. The recombinase is highly conserved from one eukaryote to another.
   b. The recombinase-DNA intermediate conserves energy of cleaved phosphodiester bond.
   c. The recombinase is highly conserved from bacteria to eukaryotes.
   d. The recombinase-DNA intermediate conserves energy of ATP cleavage.

4. Target site duplication is present in
   a. All three transposons.
   b. Only in DNA transposons.
   c. Only in virus-like transposons.
   d. Only in DNA and virus-like transposons.

5. What does SINE stand for?
   a. Short Integrated Nuclear Entity
   b. Short Integrated Nuclear Element
   c. Short Interspersed Nuclear Element
   d. Short Interspersed Nuclear Entity

6. The structure of RNA polymerase resembles a crab claw. The active site lies
   a. At the base of the pincher region
   b. In the middle of the pincher region
   c. At the tip of the pincher region
   d. Outside the pincher region

7. Which of the following is NOT a channel of RNA polymerase
   a. NTP-uptake channel
   b. RNA exit channel
   c. pyrophosphate release channel
   d. template strand channel

8. TBP uses
   a. Beta sheet to recognize minor groove of TATA element
   b. Alpha helix to recognize major groove of TATA element
   c. Beta sheet to recognize major groove of TATA element
   d. Alpha helix to recognize minor groove of TATA element

9. The most conserved sequence of
   a. Branch site is A 5'splice site is UG and 3'splice site is GU
   b. Branch site is G 5' splice site is AG and 3'splice site is GU
   c. Branch site is A 5' splice site is AG and 3'splice site is GU
   d. Branch site is A 5' splice site is GU and 3' splice site is AG

10. Which of the following is NOT a start codon in prokaryotes
    a. AUG b. UUG c. GUG d. UUC

11. 16S ribosomal RNA is found in
    a. both prokaryotes and eukaryotes
    b. neither in eukaryotes nor in prokaryotes
    c. only prokaryotes
    d. only eukaryotes

12. Which of the following is true in eukaryotic translation
    a. Initiation factors bind to both 5 and 3 prime ends of the mRNA
    b. Initiation factors bind only to the 5 prime end of the mRNA
    c. Initiation factors bind only to the 3 prime end of the mRNA
    d. Initiation factors do not bind to the 5 or 3 prime end of the mRNA

13. What made it possible to crack the genetic code?
    a. Ability to sequence amino acids of a protein
    b. Ability to sequence nucleotides of DNA
    c. Ability to synthesize artificial messenger RNA
    d. Ability to sequence mRNA

14. In E coli
    a. No amino acid lies within 18 angstrom of the active site of ribosome.
    b. Nine amino acids of L27 lie close to the active site of the ribosome.
    c. C terminus of L27 reaches the active site of the ribosome.
    d. Alpha helix of L27 reaches the active site of the ribosome.

15. In lamda phage the repressor binds to which of the operators with strongest affinity
    a. OR1 b. OR2 c. OR3 d. OR4

16. Most repressors and activators act at the level of
    a. Transcription initiation
    b. Transcription elongation
    c. Transcription termination
    d. Translation initiation

17. Which of the following about DNA activators in eukaryotes is true
    a. There is no separation between activating and DNA binding sites.
    b. Activating and DNA binding sites often lie in the same domain.
    c. Activating and DNA binding sites often lie in separate domains.
    d. Often only activating site is present.

18. What most accurately describes insulator in molecular biology?
    a. It insulated electrical currents in DNA
    b. It inhibits enhancer activity on promoter.
    c. It inhibits promoter activity on enhancer.
    d. It inhibits promoter activity on transcription.

19. sRNAs
    a. are formed by processing longer RNA
    b. range in size from 21 to 30 nucleotides
    c. are found in number over 1000 in E. coli
    d. base pair with complementary mRNA and direct their degradation

20. Xist
    a. Is a long coding RNA
    b. Is encoded by Xic in X chromosome
    c. Localizes along the active X chromosome
    d. Causes accumulation of H2AX on the silent chromosome

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

SECTION "B"
[5Q. × 3 = 15 marks]

Answer *ANY FIVE* questions.

1. During mating type switching how double stranded break is created and 3 prime end generated?
2. Describe how serine recombinase works.
3. Describe the mechanisms of initial transcription.
4. What are the functions of different arms of the tRNA?
5. What is wobble hypothesis? Describe.
6. What do zinc finger DNA binding domain and helix loop helix domain look like?
7. Describe the structure and function of Dicer.

SECTION "C"
[5Q. × 5 = 25 marks]

Answer *ANY FIVE* questions.

8. Describe the structure and function of RecA protein.
9. Describe the mechanism of VDJ recombination including the roles of Rag1, Rag2 and RSS.
10. What is RNA editing? Describe.
11. Describe how eukaryotic translation initiation is different from prokaryotic transcription initiation.
12. What are the different mechanisms used by ribosome to select against incorrectly incorporated aminoacyl tRNA? Describe.
13. Draw the outline of the genetic map of lamda phage. Describe which genes are switched on and which genes are switched off during lysogenic and lytic cycles. Additionally describe the operators present in lamda phage.
14. Write a note on locus control regions.

SECTION "D"
[2Q. × 7.5 = 15 marks]

Answer *ANY TWO* questions.

15. How does CRISPR and RNA act as defense agents in prokaryotes and archaea?
16. In eukaryotic transcription describe the promoter element, TAF, TFIIB and TFIIF.
17. How do NtrC and MerR transcriptional activators work? Describe alternative sigma factors.