

KATHMANDU UNIVERSITY
End Semester Examination [C]
July, 2017

Marks Scored:

Level : B. Tech.
Year : III

Course : BIOT 302
Semester : I

Exam Roll No. : Time: 30 mins.

F. M. : 20

Registration No. :

Date JUL 05 2017

SECTION "A"

[20Q × 1=20 marks]

1. Nucleosomes are:
 - a. Compact structure of the chromosome when isolated without breaking the protein DNA-interaction
 - b. Compact chromosomes that emerge out from scaffolds
 - c. Highly supercoiled DNA attached to proteins
 - d. A fragment of DNA, bound to one H1 and two copies of H2A, H2B, H3 and H4
2. Pol λ is involved in:
 - a. Translesion synthesis
 - b. Meiosis associated DNA repair
 - c. Somatic hypermutation
 - d. lagging Strand DNA synthesis
3. The following that best describes the distinction between the phosphodiester backbone of RNA and DNA is:
 - a. rNTPs are incorporated in RNA with Uracil in place of thymine in DNA
 - b. In 2' position of rNTP, there is an -OH group
 - c. In 3' and 2' position of DNA, there is an -OH group
 - d. The elongation occurs via 3'-OH in DNA while 2'-OH in RNA
4. The recruitment of Cdc6 and Cdt1 by ORC leads to the:
 - a. Proteolysis of Cdt1
 - b. Proteolysis of Cdc6
 - c. Recruitment of Mcm2-7
 - d. Recruitment of polymerase α
5. In humans, the activity of telomerase is regulated by:
 - a. Binding of Rif1 and Rif2 proteins to Rap1 protein, which binds to the ds DNA
 - b. Binding of Rap1 to TRF2 and Rif2, which then binds to the ds DNA
 - c. TRF2 binds to RAP1, TRF1 then binds to TRF2
 - d. POT1, TPP1, TIN2 binds to TRF1 and TRF2; which binds to the ds DNA
6. The poly-a signal in DNA causes:
 - a. Recruitment of TFIIA and TFIIF
 - b. Recruitment of CstF and CPSF in the nascent mRNA
 - c. Bending of the DNA and distorting the promoter
 - d. Recruitment of upstream promoter elements
7. Threonine is present in _____ position in the heptapeptide sequence, present in the CTD of RNA polymerase.
 - a. 2 and 7
 - b. 4 and 5
 - c. 4 only
 - d. 1, 3 and 7
8. P-TEFb is a kinase that phosphorylates:
 - a. hSPT5
 - b. TAT-SF1
 - c. TFIIS
 - d. CstF

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9. The DNA sequence in 3' splice site is:
a. AGGUA/GAGU b. AGUUA/GAGU c. UGG d. AGG
10. The eukaryotic sequence that is equivalent to shine-delgarno sequence in prokaryotes is:
a. TUS sequence b. Kozak sequence c. OriC sequence d. CpG sequence
11. Methylation of promoter can cause:
a. Expression of CpG islands
b. Differential expression of the gene in different cell-types.
c. Abolishes the expression of the particular gene.
d. Up-regulates the expression of the particular gene.
12. The purpose of perfect match and mismatch probes in a microarray is to:
a. Increase the efficiency of cDNA hybridized to the microarray
b. Increase the no. of bindings per probe
c. To normalize the effect of non-specific hybridization
d. To accomplish the technical replicates during the experiment design.
13. EIF5B is prokaryotic equivalent of:
a. IF1 b. IF2 c. IF3 d. IF4
14. G-quadruplex structure, also known as G4 can regulate the protein expression by:
a. Enhancing the translation rate by binding to ribosome
b. Repressing the translation
c. Changing the codon-anticodon specificity thus repressing translation
d. Binding with upstream promoter elements either repressing or enhancing translation
15. Poly A binding proteins base pair with _____ during ribosome recycling:
a. EIF4F b. EIF5B c. EIF8G d. EIF2S
16. PPAR stands for:
a. Peroxisome proliferator activated receptor
b. Peroxisome phosphorylating activated receptor
c. Pyrophosphate activated receptor
d. None of the above.
17. There are _____ no. of dorsal binding sites in *sog* gene
a. 6 b. 1 high affinity c. 2 low affinity d. 4 optimal affinity
18. Nanos protein inhibits the translation of:
a. SWI5 mRNA b. ASH1 Mrna c. Hunchback mRNA d. She3 mRNA
19. The enhancers in 5' UTR of *rhomboid* is kept in off state in mesodermal tissues by:
a. Snail protein b. Oskar mRNA c. bicoid mRNA d. hunchback mRNA
20. Kruppel gradient causes distinction of:
a. 2nd and 3rd segmentation b. 3rd and 4th segmentation
c. 1st and 2nd segmentation d. 5th and 7th segmentation

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F. M. : 55

SECTION "B"

1. On the basis of DNA replication, answer the following questions:
 - a. Point out the differences in DNA-replication of eukaryotes from prokaryotes. [2]
 - b. How is pre-RC formation and activation linked to cell division? [2]
 - c. Lagging strand synthesis is unable to copy the extreme ends of linear chromosomes. How do cell cope with this? Explain! [2]
 - d. Telomerase are the enzymes that solve the end-repair problem. However, if they are to be acted without any inhibitors, the DNA end will be extended indefinitely. How is this extension regulated? [1]
2. On the basis of transcription, answer the following questions:
 - a. What is a core promoter? How does the transcription proceeds in eukaryotes? [1+3]
 - b. What are the modifications that occur in nascent mRNA in eukaryotes? Explain how do those modifications occur. [4]
3. On the basis of splicing, answer the following questions:
 - a. What is RNA splicing? How is it mediated by spliceosome? [1 + 4]
 - b. Give examples of RNA-RNA interaction that occurs during splicing. [3]
 - c. What is alternative splicing? Give details on any two strategies. [3]
4. Based on transcriptome profiling, answer:
 - a. What is a microarray? Explain the concept of perfect match and mismatch probe. How is it useful in downstream analysis? [1+2+1]
 - b. How Sanger sequencing elucidates DNA sequence? [4]
5. Based on translation, answer the following questions:
 - a. What ensures the correctness of translation? How does translation terminate in eukaryotes? [2+3]
 - b. What is ribosome recycling? How does it ensure effective translation? [2]
6. Based on gene regulation, answer the following questions:
 - a. The un-translated region at 5' end has a major role in gene regulation. Explain the structure of this region in brief and point out how they regulate gene expression. [5]
 - b. With examples, explain what is post-translational modification? [3]
 - c. How do different proteins bind to DNA if they need to interact with the DNA? [2]
 - d. What is epigenetic gene regulation? Explain with example [2]
 - e. How does localization of mRNA occurs and how does it bring regulation during development? [2]

