

Sub: Science of Living Systems

Sub No: BS20001

Full Marks: 20

Session: Spring, 2018-19

Date: 13-02-2019

Time: 30 minutes

NAME:

ROLLNO:

DEPT:

Choose (tick) the (ONE) correct answer OR write in a few words

1. Why is RNA primer required during DNA replication?

(A) RNA is less stable than DNA, hence easy to remove

(B) RNA has extra –OH group at 2' position

☒ (C) DNA polymerase needs an existing 3' –OH group

(D) RNA polymerase can work without a template

2. RNA is chemically less stable than DNA, because of

(A) the uracil base instead of the thymine

☒ (B) the presence of the 2'-OH group

(C) the extra carbon atom

(D) All of the above

3. Griffith's experiment paved the way to establish that

☒ (A) DNA is the genetic material

(B) The ratio of Adenine to thymine was always the same

(C) proteins and DNA both are genetic material

(D) Phage DNA was similar to bacterial DNA

4. Which of the following enzyme adds complementary bases during replication?

(A) Helicase

(B) Synthetase

(C) Replicase

☒ (D) Polymerase

5. Write True/False against each statement:

(A) During DNA replication, half of the DNA is synthesized as Okazaki fragments. ☒ T(B) The linkage between sugar and nitrogenous base in DNA is called Glycosidic bond. ☒ T

6. In Sanger DNA sequencing technique, ddNTP (analog of dNTP) is used that can terminate DNA synthesis when they get incorporated. How does that happen?

(A) ddNTPs are bulky molecules

☒ (B) In ddNTPs 3'-OH group is changed to –H group

(C) ddNTPs are positively charged

(D) ddNTPs have ribose sugar instead of deoxyribose

7. Following is the protein coding part of the DNA sequence of a hypothetical gene:

5' **ATG** GCC CAA TAC TGG TGC ACG ACG TGC GGT GTC TGC ATA TTT **TAA** 3'

What will happen to the protein product of the gene if you mutate (change) the start codon from ATG into TTG?

(A) Protein length will be unaffected

(B) Protein will be shorter in length

(C) Amino acid composition will be changed

☒ (D) No protein will be synthesized

8. A 900 nucleotide long Eukaryotic nascent mRNA has a 30 nucleotide long intron. But the mature mRNA available for translation is found to be 1100 nucleotide long. What may have caused the increased length of the mature mRNA?

(A) Splicing

(B) 5' capping

☒ (C) Poly-A tailing

(D) Reverse transcription

9. In an alien species, there are only 2 types of nucleotides (instead of 4 types in humans) but codons are 4 nucleotide long. If each type of codon specifies one unique amino acid, how many possible amino acids can be coded. Also consider that they have only one stop codon.

(A) 7

☒ (B) 15

(C) 31

(D) 63

10. A mutation in the *lac*-repressor gene removes the allolactose binding site of the *lac*-repressor protein. What will be the effect on the activity of the *lac* operon system?

(A) Lactose metabolizing enzymes will be produced irrespective of the presence or absence of lactose

(B) Glucose metabolism will be blocked

- ☒ (C) Lactose will not be metabolized because the enzymes will not be synthesized  
☒ (D) RNA Polymerase will not be able to bind the promoter

Note: Q10. Full marks will be given for any of the answers (C or D)

11. Which type of RNA carries the amino acids during translation?

- (A) mRNA      ☒ (B) tRNA      (C) rRNA      (D) None of these

12. What is the nature of the interaction between tRNAs and mRNAs?

- (A) Covalent bond      (B) Hydrophobic interaction      ☒ (C) Hydrogen bond      (D) Electrostatic interaction

13. The function of the sigma factor of RNA polymerase is to ensure that

- ☒ (A) transcription begins at the proper point      (B) transcription ends at the proper point  
(C) translation begins at the proper point      (D) translation ends at the proper point

14. Write True/False against the following statements:

- (A) Poly-A tailing of mRNA is a template-independent synthesis. ☒ T  
(B) Transcription and translation occurs in the same cellular compartment in both Eukaryotes and Prokaryotes. ☒ F

15. Which of the following best describes 'quaternary structure' of a protein?

- ☒ (A) The arrangement of two or more polypeptide subunits into a single functional complex  
(B) The folding of the polypeptide backbone in three-dimensional space  
(C) The interaction of amino acid side chains  
(D) The sequence of amino acids in a polypeptide chain

16. Which type of bonding is responsible for secondary structure of proteins?

- (A) Disulphide bonds between cysteine residues  
☒ (B) Hydrogen bonding between the C=O and N-H groups  
(C) Peptide bonds between amino acids  
(D) Bonds between charged side chains of amino acids

17. Which of the following pairs of amino acids might contribute to protein conformation by forming electrostatic interactions? (Hints: Nonpolar: Glycine, Phenylalanine and Tyrosine; Positively charged: Lysine and Arginine; Negatively charged: Glutamate and Aspartate)

- (A) Glycine and aspartate      ☒ (B) Glutamate and lysine  
(C) Phenylalanine and tyrosine      (D) Lysine and arginine

18. You have purified a multi-subunit extracellular protein that has several interchain disulfide bonds. Which of the following chemicals would you add to your purified protein mixture if you wanted to eliminate the disulfide bonds?

- (A) NaCl, a salt      (B) SDS, an ionic detergent  
☒ (D) DTT, a reducing agent

19. Which of the following provides the necessary information to specify the three-dimensional structure of a protein?

- (A) The protein's peptide bonds      (B) The protein's interactions with other polypeptides  
☒ (C) The protein's amino acid sequence      (D) The protein's interaction with molecular chaperones

20. In a helical wheel plot what is the angular distance between two amino acids?

- (A) 90°      ☒ (B) 100°      (C) 150°      (D) 360°