REV-01
MSZ/10/20

2024/05

SET A

M.Sc. ZOOLOGY
SECOND SEMESTER (REPEAT)
MOLECULAR BIOLOGY AND BIOCHEMISTRY
MSZ-202

[USE OMR SHEET FOR OBJECTIVE PART]

Duration: 3 hrs. **Full Marks: 70**

Objective

Time: 30 mins. **Marks: 20**

Choose the correct answer from the following: ***1×20=20***

1. Which one of the following enzymes does not need activation during catalytic reaction?
   a. Lipase
   b. Pepsinogen
   c. Trypsinogen
   d. Proelastase

2. In zero order kinetics, the enzyme catalyzed reaction shows:
   a. Increase in velocity
   b. Decrease in velocity
   c. No change in velocity
   d. Variable velocity

3. Inhibitors bind non covalently in:
   a. Reversible inhibition
   b. Irreversible inhibition
   c. Allosteric inhibition
   d. None of these

4. Change in entropy is expressed as:
   a. ΔH
   b. ΔG
   c. ΔE
   d. ΔS

5. Select the process involved in the reaction ATP⇌ ADP +Pi
   a. Phosphorylation
   b. Hydrolysis
   c. Oxidation
   d. Reduction

6. Match **List I (Enzyme)** with **List II (Function)** and select the correct answer using the codes given the lists.

List-I	List-II
a. DNA Ligase	1. Catalyses the covalent union of segments of an interrupted sugarphosphate strand in double-stranded DNA
b. DNA polymerase	2. End nuclease that digests either single stranded or double stranded DNA
c. DNase I	3. Produces single or double stranded breaks in DNA during replication to release tension brought about by the separation of double strands
d. DNA topoisomerase	4. Catalyses the formation of DNA worn deoxyribonucleotides using one strand of DNA as template

   a. A-1, B-4, C-3, D-2
   b. A-4, B-1, C-2, D-3
   c. A-1, B-4, C-2, D-3
   d. A-4, B-1, C-3, D-2

7. A bacteria culture growing in a medium containing $^{15}NH_4Cl$ is switched to a medium containing $^{14}NH_4Cl$ for three generations (Resulting into eight fold increase in its population), what is the molar ratio of hybrid DNA (^{15}N-^{14}N) to light DNA (^{14}N-^{14}N) at this point?
   a. 2/6 b. 3/5
   c. 4/4 d. 1/7

8. In methyl-directed mismatch repair in E. coli the daughter strand containing the mismatched base is nicked by:
   a. Mut H- endonuclease b. Uvr ABC - endonuclease
   c. AP- endonuclease d. 3′ to 5′ exonuclease

9. **Assertion:** The two chains of DNA have anti-polarity.
   Reason: In one chain of DNA, deoxyribose sugar at 5′ end consists of a free phosphate moiety while at the other end the ribose has a free 3′ OH group.
   a. If both Assertion and Reason are true and Reason is the correct explanation of Assertion b. If both Assertion and Reason are true but Reason is not the correct explanation of Assertion
   c. If Assertion is true but Reason is false d. If both Assertion and Reason are false

10. Nucleotide excision repair of DNA in E. coli:
   a. Replaces both strands of the DNA in the damaged region b. Uses high energy phosphate bond
   c. Utilizes RNA polymerase to make a primer d. Require uvrABC exonuclease

11. Which of the following is *not* a component of the transcription initiation complex in eukaryotes?
   a. TATA-binding protein (TBP) b. Transcription factor IIB (TFIIB)
   c. Transcription factor IIH (TFIIH) d. Sigma factor

12. The unusual nucleotide added to the 5' end of hnRNA during processing is:
   a. Methyl guanosine triphosphate b. Poly(A) tail
   c. Ribosome binding site d. 5' cap

13. Which initiation factor in prokaryotes blocks the A site of the 30S ribosomal subunit, allowing only the P site to be available for the initiator tRNA?
   a. IF-4 b. IF-2
   c. IF-1 d. IF-3

14. **Assertion(A)**: The genetic code is degenerate
   Reason(R): Most amino acids are coded by more than one codon.
   a. Both A and R are correct and reason is the correct explanation of assertion b. Both A and R are true but R is not the correct explanation of A
   c. If A is true and R is false d. If both A and R are false

15. **Assertion**: There is single DNA-dependent RNA polymerase that catalyses transcription of all types of RNA (mRna, tRna and rRna) in eukaryotes.
   Reason: In bacteria, there are at least three RNA polymerases are required.
   a. Both assertion and reason are true and the reason is the correct explanation of the assertion b. Both assertion and reason are true but reason is not the correct explanation of the assertion
   c. Assertion Is true but reason is false d. Both assertion and reason are false

16. A researcher is testing a new drug designed to inhibit glycolysis by targeting a key enzyme in the pathway. They observe that after treatment with the drug, there is a significant increase in the concentration of glucose-6-phosphate (G6P) in the cell. Which enzyme is most likely being inhibited by this drug?

a. Hexokinase
b. Phosphoglucose isomerase
c. Phosphofructokinase-1
d. Aldolase

17. How does the TCA cycle contribute to the overall process of aerobic respiration?

a. It produces ATP directly through substrate-level phosphorylation
b. It provides electrons to the electron transport chain through reduction of NAD++ and FAD
c. It synthesizes glucose through the process of gluconeogenesis
d. It generates oxygen for the electron transport chain

18. What is the immediate result of each cycle of beta oxidation for a fatty acid?

a. The fatty acid is completely converted into acetyl-CoA
b. One molecule of acetyl-CoA is produced, and the fatty acid chain is shortened by two carbon atoms
c. The fatty acid chain is lengthened by two carbon atoms and converted into a triglyceride
d. One molecule of glucose is produced from the fatty acid chain

19. Which of the following statements accurately describes the function of the urea cycle?

a. It converts ammonia to urea, which is less toxic and more water-soluble for excretion
b. It synthesizes urea from glucose and fatty acids for energy storage
c. It breaks down urea into ammonia and carbon dioxide to provide energy
d. It converts urea into amino acids for protein synthesis

20. What is a primary function of the pentose phosphate pathway (PPP) in cellular metabolism?

a. It primarily generates ATP through substrate-level phosphorylation
b. It converts glucose into two molecules of pyruvate
c. It is the main pathway for the synthesis of cholesterol and other sterols
d. It provides NADPH and pentoses for biosynthetic reactions

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Descriptive

Time : 2 hr. 30 mins. **Marks : 50**

[Answer question no.1 & any four (4) from the rest]

1. What is oxidative phosphorylation? Write the site of oxidative phosphorylation and explain the mechanism of electron transport in oxidative phosphorylation process. 2+2+6=10

2. Write short notes on *any two*: 5+5=10
   a) IUB system of enzyme classification
   b) Michaelis-Menten equation
   c) Specifity of enzymes

3. Why is it important in mismatch repair that the cell distinguish the parental strands from newly synthesized strands? Contrast the mechanism of nucleotide excision repair with illustrations. 4+6=10

4. Why DNA replication is called Semi-discontinuous replication? Explain with proper illustration the mechanism of replication in both leading and lagging strand of a bacterial DNA. 2+8=10

5. What is the role of t RNA during translation? Explain the process of initiation of translation in prokaryotes. What is Wobble hypothesis? 2+5+3=10

6. Describe the entire process of post transcriptional modification in prokaryotes with necessary diagrams. Write two differences between rho dependent and rho independent termination in prokaryotes. 8+2=10

7. Write short notes on: (*any two*) 5+5=10
   a) Urea cycle
   b) Regulation of glycolysis
   c) TCA cycle

8. Describe the process of beta oxidation of fatty acids and calculate the total ATP yield from the oxidation of a 15-carbon fatty acid. 10

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