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**DEPARTMENT OF MICROBIOLOGY**

**BSC SEM IV MCQS PAPER I**

**METABOLISM**

**1.Which of the following is a tricarboxylic acid?**

(a) Acetic acid

(b) Succinic acid

(c) Oxaloacetic acid

(d) Citric acid

**Sol.(d) Citric acid.**

**2.. Which of the following metabolites negatively regulates pyruvate kinase?**

(a) Citrate

(b) Alanine

(c) Acetyl CoA

(d) Fructose-1,6-Bisphosphate

**Sol. (b) Alanine**

**3. In muscles, the pyruvate is converted into lactate. Find the correct statement**

(a) During lactate formation, NADH is reconverted into NAD

(b) During the product of lactate two ATP are produced

(c) Lactate is the substrate from the downstream pathway

(d) Lactate acts as the substrate for the formation of amino acid

**Sol. (a) During lactate formation, NADH is reconverted into NAD.**

**4. Which of the following glycolytic enzyme is inhibited by an accumulation of long-chain fatty acid in the liver?**

(a) Glucokinase

(b) Hexokinase

(a) Pyruvate kinase

(d) Phosphofructokinase

**Sol. (a) Glucokinase.**

**5. Which of the following statements is known as the rate-limiting step in glycolysis?**

(a) Enolase

(b) Phosphofructokinase

(c) Phosphohexose isomerase

(d) Glyceraldehyde-3-phosphate dehydrogenase

**Sol. (b) Phosphofructokinase.**

**6. Which of the following hormones decreases blood glucose and increases the uptake of glucose in various tissues like skeletal muscle, adipose tissues?**

(a) Insulin

(b) Cortisol

(a) Glucagon

(d) Epinephrine

**Sol. (a) Insulin.**

**7. What is the net gain of ATP during the conversion of glucose to pyruvate?**

(a) 2 ATP

(b) 4 ATP

(c) 6 ATP

(d) 1 ATP +1 GTP

**Sol. (a) 2 ATP.**

**8. Which of the following hormones is responsible for increasing gluconeogenesis in the liver during prolonged starvation?**

(a) TSH

(b) Insulin

(c) Thyroxine

(d) Glucagon

**Sol. (d) Glucagon.**

9. Which of the following enzyme catalyzes the first step of glycolysis?
a) Hexokinase
b) Pyruvate kinase
c) Glucokinase
d) Phosphofructokinase-1
View Answer

Answer: a
Explanation: The first of glycolysis is irreversible under intracellular conditions and is catalyzed by hexokinase.

10. What is the general term used for the anaerobic degradation of glucose to obtain energy?
a) Anabolism
b) Oxidation
c) Fermentation
d) Metabolism
View Answer

Answer: c
Explanation: Fermentation is the general term used for the degradation of glucose to obtain energy in the form of ATP.

11. Whenever the cell’s ATP supply is depleted, which of the following enzyme’s activity is increased?
a) Hexokinase
b) Pyruvate kinase
c) Glucokinase
d) Phosphofructokinase-1
View Answer

Answer: d
Explanation: Phosphofructokinase-1 is a regulatory enzyme; it is the major point of regulation in glycolysis. Its activity is increased whenever the cell’s ATP supply is depleted.

12. Cleavage of Fructose 1, 6-biophosphate yields \_\_\_\_\_\_\_\_\_\_\_
a) Two aldoses
b) Two ketoses
c) An aldose and a ketose
d) Only a ketose
View Answer

Answer: c
Explanation: Fructose 1, 6-biophosphate is cleaved to yield glyceraldehyde 3-phosphate, an aldehyde and dihydroxyacetone phosphate, a ketose.

13. Dihydroxyacetone phosphate is rapidly and reversibly converted to \_\_\_\_\_\_\_\_\_\_\_
a) Glyceraldehyde 3-phosphate
b) 1, 3-bis-phosphoglycerate
c) Fructose 1, 6-bisphosphate
d) Fructose 6-phosphate
View Answer

Answer: a
Explanation: Dihydroxyacetone phosphate is rapidly and reversibly converted to glyceraldehyde 3-phosphate by triose phosphate isomerase.

14. What is the first step in the payoff phase of glycolysis?
a) Reduction of 1, 3-bisphosphoglycerate to glyceraldehyde 3-phosphate
b) Oxidation of glyceraldehyde 3-phosphate to 1, 3-bisphosphoglycerate
c) Reversible conversion of dihydroxyacetone phosphate to glyceraldehyde 3-phosphate
d) Irreversible conversion of dihydroxyacetone phosphate to glyceraldehyde 3-phosphate
View Answer

Answer: b
Explanation: Glyceraldehyde 3-phosphate dehydrogenase catalyzes the first step in the payoff phase, oxidation of glyceraldehyde 3-phosphate to 1, 3-bisphosphoglycerate.

15. Which substrate is used in the last step of glycolysis?
a) Glyceraldehyde 3-phosphate
b) Pyruvate
c) Phosphoenolpyruvate
d) 1, 3-bisphosphoglycerate
View Answer

Answer: c
Explanation: The last step in glycolysis is the transfer of phosphoryl group from phosphoenolpyruvate to ADP catalyzed by pyruvate kinase.

16. High concentration of glucose 6-phosphate is inhibitory to \_\_\_\_\_\_\_\_\_\_\_
a) Hexokinase
b) Pyruvate kinase
c) Glucokinase
d) Phosphofructokinase-1
View Answer

17. The product formed in the first substrate level phosphorylation in glycolysis is \_\_\_\_\_\_\_\_\_\_\_
a) Pyruvate
b) 3-phosphoglycerate
c) 1, 3-bisphosphoglycerate
d) 2-phosphoglycerate
View Answer

Answer: b
Explanation: Phosphoglycerate kinase transfers phosphoryl group from 1, 3-bisphosphoglycerate to ADP forming ATP and 3-phosphoglycerate.

18 Glycolysis converts \_\_\_\_\_\_\_\_\_\_\_
a) Glucose into pyruvate
b) Glucose into phosphoenolpyruvate
c) Fructose into pyruvate
d) Fructose into phosphoenolpyruvate
View Answer

Answer: a
Explanation: Glycolysis is a metabolic pathway that converts glucose into pyruvate.

**19. Product of Krebs cycle essential for oxidative phosphorylation is \_\_\_\_\_\_\_**

(a) NADPH and ATP

(b) Acetyl CoA

(c) CO2 and oxaloacetate

(d) NADH and FADH2

**Answer: (d)**

**20. A single molecule of glucose generates \_\_\_\_\_\_\_\_\_ molecules of acetyl CoA, which enters the Krebs cycle.**

(a) 4

(b) 3

(c) 2

(d) 1

**Answer: (c)**

**21. \_\_\_\_\_\_\_\_\_\_\_ accepts hydrogen from malate**

(a) FAD

(b) NAD

(c) NADP

(d) FMN

**Answer: (b)**

**22. Which of the intermediate of the Kreb’s cycle is utilised in the formation of amino acids?**

(a) Citric acid

(b) Malic acid

(c) Isocitric acid

(d) 𝛼-ketoglutaric acid

**Answer: (d)**

**23. Krebs cycle occurs in aerobic respiration due to**

(a) Electron transport chain requires aerobic conditions to operate

(b) Oxygen is a reactant

(c) Oxygen has a catalytic function

(d) All of the above

**Answer: (a)**

**24. Acetyl CoA is formed from pyruvate by\_\_\_\_\_\_\_\_\_\_ reaction**

(a) Dehydration

(b) Reduction

(c) Oxidative decarboxylation

(d) Dephosphorylation

**Answer: (c)**

**25. Which of the following is not formed during the Krebs cycle?**

(a) Lactate

(b) Isocitrate

(c) Succinate

(d) Both (a) and (b)

**Answer: (a)**

**26. The entry of pyruvate into the TCA cycle is inhibited by the presence of a high cellular concentration of**

(a) Pyruvate

(b) NADH

(c) Coenzyme A

(d) AMP

**Answer: (b)**

**27. ATP synthesis is powered by**

(a) Coenzyme motive force

(b) cAMP

(c) proton gradient

(d) GTP hydrolysis

**Answer: (c)**

**28. FAD is reduced in which of the reaction of the Kreb’s cycle?**

(a) Isocitrate to oxaloacetate

(b) Succinyl CoA to Succinate

(c) Fumarate to malate

(d) Succinate to fumarate

**Answer: (d)**

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| 29.Which binding is inhibited by pactamycin? |
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| **A.** | Aminoacyl-tRNA to the A-site of 30S subunit |
| **B.** | Initiator-tRNA to 30S/40S initiation complexes |
| **C.** | Peptidyl t-RNA to the 50S subunit |
| **D.** | Formation of peptide bond in P site |

**Answer:** Option **B** |

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| 30.  | Which of the following act as the blueprint or template for the process of protein synthesis that takes place on ribosomes? |
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| **A.** | rRNA |
| **B.** | DNA |
| **C.** | tRNA |
| **D.** | mRNA |

**Answer:** Option **D** |

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| 31.  | Negative regulation of protein synthesis is accomplished by |
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| **A.** | allosteric inhibition |
| **B.** | the binding of RNA polymerase to the promoter |
| **C.** | the binding of a repressor to the DNA |
| **D.** | the binding of a repressor to the RNA polymerase |

**Answer:** Option **C** |

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| 32.  | Site in the ribosome from which the tRNA donates amino acids to the growing polypeptide chain is |
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| **A.** | P site |
| **B.** | O site |
| **C.** | T site |
| **D.** | A site |

**Answer:** Option **A** |
| 33.Which stop codon has been found to encode selenocysteine? |
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|  **A.** | UAA |
| **B.** | UAG |
| **C.** | UGA |
| **D.** | AGA |

**Answer:** Option **C** |

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| 34.  | Which of the following is a nontranslated sequence located between the transcription and the translation start site? |
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| **A.** | Ending frame |
| **B.** | Leader sequence |
| **C.** | Trailer sequence |
| **D.** | Reading frame |

**Answer:** Option **B** |

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| 35.  | The final step of gene expression is protein synthesis, which is also known as |
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| **A.** | replication |
| **B.** | translation |
| **C.** | transcription |
| **D.** | none of these |

**Answer:** Option **B** |

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| 36.  | What is the maximum number of different amino acids in a polypeptide chain coded by the synthetic polyribonucleotides (UCAG)5? |
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| **A.** | One |
| **B.** | Two |
| **C.** | Three |
| **D.** | Four |

**Answer:** Option **C**. |
| 37.The accepted hypothesis for DNA replication is |
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| **A.** | conservative theory |
| **B.** | dispersive theory |
| **C.** | semi-conservative theory |
| **D.** | evolutionary theory |

**Answer:** Option **C** |

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| 38..  | When DNA polymerase is in contact with guanine in the parental strand, what does it add to the growing daughter strand? |
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| **A.** | Phosphate |
| **B.** | Cytosine |
| **C.** | Uracil |
| **D.** | Guanine |

**Answer:** Option **B** |

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| 39.  | Telomeres are usually rich in which nucleotide? |
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| **A.** | Adenine |
| **B.** | Guanine |
| **C.** | Thymine |
| **D.** | Cytosine |

**Answer:** Option **B** |

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| 40.  | Which is the largest among the followings? |
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| **A.** | Nucleotide |
| **B.** | Nitrogenous base |
| **C.** | Phosphate |
| **D.** | Carbon |

**Answer:** Option **A** |

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| 41.  | The chromosomal DNA complexes with |
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| **A.** | three types of histone as H1, H2A and H4 |
| **B.** | five types of histone as H1, H2A, H2B, H3 and H4 |
| **C.** | four types of histone as H1, H2A, H3 and H4 |
| **D.** | two types of histone as H1 and H4 |

**Answer:** Option **B** |

42.In most organisms, DNA is a genetic material that stores the information template for the synthesis of RNA and subsequently protein.

Name the processes a, b, c represented in the figure**:**

Central Dogma of Molecular Biology

43) In some viruses, RNA serves as the storage of genetic materials and DNA is synthesized from RNA by the enzyme known as:
a) DNA synthetase
b) DNA polymerase
c) Reverse transcriptase
d) DNA convertase

44) Which of the following process does not occur in prokaryotes?

a) Replication

b) Splicing

c) Translation

d) Transcription

45) Phosphodiester bond links two nucleotides together and maintains polarity which refers to**:**

a) the 5' hydroxyl group of pentose of one nucleotide to 3' hydroxyl group of adjacent nucleotide through a phosphate group.
b) 5' end with a phosphate group and 3'end with hydroxyl are free.
c) addition of new nucleotide occurs via attachment of 5' phosphate group of new nucleotide to 3' phosphate group of an existing chain.
d) All of the above

46) DNA helices exist in various forms.

**Which of the following form is predominantly expressed in cells**?
a) B- Helix
b) A-Helix
c) E-Helix
d) Z-Helix

47) Which one of the following statements is true regarding the DNA double-helical structure?
a) The DNA double helix is coiled around a common axis known as the axis of symmetry
b) The hydrophilic deoxyribose-phosphate backbone of each chain is on the outside.
c) The hydrophobic nitrogen bases are stacked inside.
d) All of the Above

48) The spatial arrangement DNA helical structure creates a major and minor groove which are important for**:**
a) kinking and bending of the helical structure
b) providing recognition and binding sites for various DNA binding proteins
c) All of Above
d) None of the Above

49.**Which of the following base-pairing rule is true**?
a) Adenine pairs with Guanine and Thymine pairs with Cytosine
b) Adenine pairs with Thymine and Guanine pairs with Cytosine
c) Adenine pairs with Cytosine and Guanine pairs with Thymine
d) DNA base pairing is nonspecific

50) The DNA replication occurs in a semi-conservative manner which means:
a) Two daughter cells with one consisting of double-helical parent DNA, others have newly synthesized DNA.

b) Two daughter cells each consisting of one parental strand and one newly synthesized DNA.
c) Two daughters cells each consisting of one-half parental and another half newly synthesized DNA resulting from the crossover.
d) None of the above

51) Which of the following are the characteristic feature of DNA replication?
a) DNA replication is template-directed
b) DNA replication requires short RNA primers
c) DNA replication is a highly accurate process
d) All of the Above

52) In prokaryotes, DNA replication begins at a single site that is rich in AT nucleotide sequence, where two strands unwind and separate.

This ATP dependent process is catalyzed by a protein known as**..................................?**
a) DnaA protein
b) Single-strand binding protein
c) DNA polymerase
d) Topoisomerase

53) The short strand of .......................... primer is required for the replication of DNA**:**
a) DNA
b) RNA
c) Histone
d) hnRNA

54) As the two strands of the double helix are separated, the positive supercoiling interferes with the further unwinding of DNA.

**Which of the following enzyme makes a break in a strand of DNA to release the supercoiling and facilitate the replication to occur**?
a) DnaA protein
b) Single-strand binding protein
c) DNA polymerase
d) Topoisomerase

55) Which of the following enzyme has a unique ability to introduce positive and negative supercoiling of the DNA and it is the target for antibacterial agents such as ciprofloxacin**/**quinolones?
a) DnaA protein
b) DNA helicase
c) DNA gyrase
d) DNA polymerase

56) DNA replication is bidirectional and anti-parallel.

**Which of the statement is FALSE regarding DNA replication**?
a) The DNA synthesis i.e. addition of nucleotide occurs from 5'-3' position
b) The DNA synthesis is semi-continuous with continuous leading strand and discontinuous lagging strand.
c) The synthesis of leading and lagging strands occurs simultaneously
d) None of the Above

57) The DNA polymerase is a template-directed enzyme that synthesizes a new complementary strand from a parent strand but it requires the existing short nucleotide sequence for its elongation.

**Which of the following enzyme is required for the synthesis of this primer**?
a) Primase/RNA polymerase
b) RNA synthase
c) DNA synthase
d) Helicase

58) DNA polymerase III holoenzyme possesses**:**
a) polymerase activity only
b) 3’→ 5’ endonuclease activity
c) 3’→ 5’ exonuclease activity and polymerase activities
d) 5’→ 3’ exonuclease activity

59) Which of the following statement is true regarding an enzyme DNA polymerase that catalyzes the elongation of complementary DNA strand?

a) DNA polymerase III is a highly processive enzyme.
b) DNA polymerase III possesses 5'-3' polymerase activity required for elongation.
c) DNA polymerase III possesses 3'-5' exonuclease activity important for maintaining fidelity
d) All of the above

60) In prokaryotes, the RNA primer from the lagging strand is removed and replaced by the DNA sequence.

This process is catalyzed by an enzyme ..................................................which possess 5'-3' exonuclease activity and 5'-3' polymerase activity.
a) DNA polymerase I
b) DNA polymerase II
c) DNA polymerase III
d) DNA polymerase IV

61) In eukaryotes, DNA polymerase alpha is a multi-subunit enzyme with different functions. **They include..........................................................?**
a) Elongation of the leading strand
b) 3'-5' exonuclease activity
c) Initiation and synthesis of RNA primer
d) High processivity

62) In eukaryotes, which of the following DNA polymerase is highly processive and required for the elongation phase of DNA replication?
a) Pol alpha
b) Pol delta
c) Pol gamma
d) Pol beta

63) In eukaryotes, which of the following DNA polymerase is required for mitochondrial DNA replication?
a) Pol alpha
b) Pol beta
c) Pol gamma
d) Pol delta

64) Telomeres are the repetitive sequence of T's and G's that are present in the eukaryotes to protect the random cleavage from nucleases. These telomeres are synthesized by the enzyme telomerase.

**65 Which of the following are the properties of enzyme telomerase**?
a) Telomerase is a reverse transcriptase enzyme
b) Telomerase consist of an RNA sequence that serves as a template
c) After completion of each cycle, telomerase translocates to 3'end of DNA to synthesize repetitive sequence.
d) All of the above