Written Q

1. ***Enumerate and define steps of food oxidation ?***
2. ***Enumerate biological importance of ATP ? مهم***
3. ***Define and example of amphibolic pathway ?***
4. ***Def and site of electron transport chain ?***
5. ***Mention mechanism of oxidative phosphyration ? مهم***
6. ***Def P/O ratio and example ? مهم***
7. ***Def and example of uncoupler ? مهم***

MCQ

1. If ΔG of the reaction A → B is -40kJ/mol under standard conditions, then the reaction: *a) will never reach equilibrium* *b) will not occur spontaneously* *c) will proceed at a rapid rate* *d) will proceed from left to right spontaneously* *e) proceeds only if free energy can be gained*	***D***
2. Study of relationship of energy and transformation of energy in living organisms is known as: *a. Catabolism energetics* *b. Anabolism energetics* *c. Bioenergetics* *d. Amphibolic energetics* *e. Anaplerotic energetics.*	***C***

3. What is true about Gibbs free energy change at equilibrium: *a) Value of delta G is zero* *b) Value of delta G is minimum* *c) Value od delta G is maximum* *d) Both B and C*	***A***
4. Study the relation between the energy and transformation of energy in living organisms is known as: *A. Bio energetics* *B. Biophysics* *C. Metabolic energetic* *D. Broken energetic* *E. Catabolize energetic*	***A***
5. What is the kind of cellular respiration which occurs in the presence of oxygen? *a) acidic respiration* *b) aerobic respiration* *c) anaerobic respiration* *d) basic respiration* *e) nitrogenous respiration*	***B***
6. The major source of energy to perform cellular functions such as: exocytosis, endocytosis, movement, and transmission of nerve impulses is: *a) Adenosine Triphosphate (ATP).* *b) Flavin adenine dinucleotide (FAD).* *c) Adenosine monophosphate (AMP).* *d) Cytidine di phosphate.* *e) Cytidine triphosphate.*	***A***

7. Which of the following is true about endorgenic reactions? *a) Anabolic reactions* *b) Catabolic reactions* *c) Free energy change is a negative* *d) Free energy change is zero* *e) Release energy*	***A***
8. What is the site of occurrence of electron transport chain? *a) Cytoplasm* *b) Golgi apparatus* *c) Mitochondria* *d) muscle tissue* *e) Nervous tissue*	***C***
9. Which reaction releases the chemical energy stored in the high energy bonds of ATP? *a. ATP phosphorylation* *b. ATP dehydrogenation* *c. ATP hydrogenation* *d. ATP hydrolysis* *e. ATP oxidation*	***D***
10. How many ATP molecules are produced by oxidative phosphorylation starting with succinate as a substrate? *a. 1.5 ATP* *b. 2.5 ATP* *c. 3 ATP* *d. 4 ATP* *e. 5 ATP*	***A***

11. Oxidative phosphorylation occurs with the production of: *a) oxygen* *b) ADP + pi* *c) ATP* *d) NADH* *e) FADH2*	**C**
12. ATP synthesis by ATP synthase is driven by the movement of: *a) NADH* *b) FADH2* *c) electrons* *d) protons* *e) cytochromes*	***D***
13. What role does O2 play in aerobic respiration? *a) Aerobic respiration does not need O2.* *b) It is the final electron acceptor at the end of the electron transport chain.* *c) It combines with H2O to drive the formation of ATP.* *d) It combines with acetyl-CoA at the start of the Krebs cycle.* *e) It is the end product of the electron transport chain.*	***B***
14. Hydrolysis of phosphate groups in ATP is a/an: *a) endergonic process* *b) exergonic process* *c) synthetic reaction* *d) anabolic reaction* *e) energy requiring process*	***B***

15. What is an amphibolic pathway? *a) Breaking down processes* *b) Synthetic processes* *c) Another name for anabolic processes* *d) Another name for catabolic processes* *e) Both anabolic and catabolic processes*	***E***
16. Which of the following bioenergetic phrases is correctly defined? *a) An anabolic reaction is an exergonic reaction* *b) A catabolic reaction is an exergonic reaction* *c) The potential energy is the energy in use* *d) The kinetic energy is stored in food stuffs* *e) The biosynthetic pathways produce ATP*	***B***
17. Which of the following is product of 2nd stage of food catabolism? *a) Carbon mono-oxide* *b) Carbon dioxide* *c) Oxygen* *d) NADPHH* *e) All of the above*	***B***
18. NADHH, FADH2 are oxidized in 3rd stage via: *a) Krebs cycle* *b) Glycolysis* *c) Pentose shunt* *d) E.T.C*	***D***
19. Which of the following is considered as energy currency of the cell? *a) AMP* *b) ADP* *c) ATP* *d) UTP*	***C***

20. Which of the following is considered as cross-roads of metabolism? *a) Anabolic reactions* *b) Catabolic reactions* *c) Amphibolic reactions* *d) Hydrolytic reactions*	**C**
21. Food digestion is considered as…….stage of catabolism. *a) 2ry* *b) Tertiary* *c) Primary* *d) Quaternary*	**C**
22. Under anerobic condition , the energy produced from fuel oxidation is little due to: *a) No sufficient ADP to be converted to ATP* *b) No sufficient NAD and FAD as hydrogen carriers* *c) Stage III not occurs in absence of oxygen* *d) No sufficient catabolic enzymes*	**C**
23. An endergonic reactions : *a) Proceeds spontaneously* *b) Does not require activation energy* *c) Overall release energy* *d) Overall require energy* *e) Require an enzyme*	**D**
24. ATP is : *a) Adenine triphosphate* *b) Adenosine triphosphate* *c) Adenine diphosphate* *d) Adenine monophosphate*	**B**

25. Chemiosmotic hypothesis suggests that: *a) Proton motive force forces ATP synthase to inhibit electron transport* *b) The presence of intact IMM is not necessary* *c) pH gradient inside IMM is lower than outside* *d) Protons are pumped out to intermembrane space of the mitochondria*	***D***
26. Thyroid hormones are: *a) Specific site I inhibitors* *b) Specific site II inhibitors* *c) Uncouplers* *d) Non specific site inhibitors*	***C***
27. The first enzyme complex of the electron transport chain is called: *a) Succinate dehydrogenase* *b) NADH dehydrogenase* *c) Ubiquinol dehydrogenase* *d) Cytochrome oxidase*	***B***
28. Which one of the following components of respiratory chain is mobile in the inner mitochondrial membrane? *a) Coenzyme Q & cytochrome c* *b) Cytochrome c & cytochrome a* *c) Cytochrome b & coenzyme Q* *d) Coenzyme Q & cytochrome oxidase*	***A***
29. Uncouplers include: *a) BAL* *b) Thyroid hormone* *c) Oligomycin* *d) Barbiturates* *e) Rotenone*	***B***

30. Where does the electron transport chain take place in eukaryotic cells? *A) Cytoplasm* *B) Nucleus* *C) Mitochondrial inner membrane* *D) Chloroplast*	**C**
31. What is the primary purpose of the electron transport chain? *A) To produce glucose* *B) To generate ATP through oxidative phosphorylation* *C) To convert light energy into chemical energy* *D) To synthesize proteins*	**B**
32. Which molecule is the final electron acceptor in the electron transport chain? *A) Carbon dioxide* *B) Oxygen* *C) Water* *D) NADH*	**B**
33. What are the main products of the electron transport chain? *A) ATP and NADH* *B) ATP and $FADH_2$* *C) ATP and water* *D) NADPH and glucose*	**C**
34. What role do protons (H^+ ions) play in the electron transport chain? *A) They inhibit enzyme activity* *B) They are transported to the cytoplasm* *C) They create a proton gradient used for ATP synthesis* *D) They are converted to glucose*	**C**

35. Which of the following is NOT a component of the electron transport chain? *A) Cytochrome c* *B) Ubiquinone (Coenzyme Q)* *C) ATP synthase* *D) Ribosomes*	***D***
36. Which of the following processes is directly powered by the electron transport chain? *A) Substrate-level phosphorylation* *B) Photorespiration* *C) Chemiosmosis* *D) Glycolysis*	***C***
37. Which complex in the electron transport chain transfers electrons from NADH? *A) Complex I* *B) Complex II* *C) Complex III* *D) Complex IV*	***A***
38. What is the role of cytochrome c in the electron transport chain? *A) To act as an electron donor* *B) To transport electrons between Complexes III and IV* *C) To synthesize ATP* *D) To convert ADP to ATP*	***B***
39. Which of the following statements about $FADH_2$ is true in the context of the electron transport chain? *A) It donates electrons to Complex I.* *B) It donates electrons to Complex II.* *C) It produces more ATP than NADH.* *D) It is not involved in the electron transport chain.*	***B***

40. In which part of the mitochondria does the electron transport chain occur? *A) Mitochondrial matrix* *B) Mitochondrial outer membrane* *C) Mitochondrial intermembrane space* *D) Mitochondrial inner membrane*	***D***
41. What is the main source of electrons for the electron transport chain? *A) Glucose* *B) Fatty acids* *C) NADH and $FADH_2$* *D) Amino acids*	***C***
42. What is the primary function of complex 5 in the electron transport chain? *A) To oxidize NADH* *B) To synthesize ATP from ADP and inorganic phosphate* *C) To transport electrons* *D) To produce water*	***B***
43. Which electron carrier is primarily involved in transferring electrons from Complex II to Complex III? *A) Ubiquinone (Coenzyme Q)* *B) Cytochrome c* *C) NADH* *D) $FADH_2$*	***A***
44. What happens to the electrons after they pass through Complex IV? *A) They are stored as glucose.* *B) They are transferred to oxygen, forming water.* *C) They are recycled back to Complex I.* *D) They are released into the cytoplasm.*	***B***

45. Which of the following best describes the process of oxidative phosphorylation? *A) Direct synthesis of ATP from glucose* *B) Production of ATP through the transfer of electrons* *C) Conversion of light energy into chemical energy* *D) Breakdown of fatty acids for energy*	***B***
46. During which stage of cellular respiration is the electron transport chain utilized? *A) Glycolysis* *B) Krebs cycle (Citric Acid Cycle)* *C) Fermentation* *D) Oxidative phosphorylation*	***D***
47. What is the role of NADH in the electron transport chain? *A) It serves as a final electron acceptor.* *B) It donates electrons to Complex I.* *C) It synthesizes ATP directly.* *D) It transports protons across the membrane.*	***B***
48. Which molecule is formed as a byproduct of the electron transport chain? *A) Carbon dioxide* *B) Oxygen* *C) Water* *D) Glucose*	***C***
49. What is the primary driving force for ATP synthesis during oxidative phosphorylation? *A) Substrate-level phosphorylation* *B) Proton motive force* *C) NADH oxidation* *D) Electron affinity*	***B***

50. Which of the following complexes does not pump protons across the inner mitochondrial membrane? *A) Complex I* *B) Complex II* *C) Complex III* *D) Complex IV*	***B***
51. What is the purpose of the electron transport chain in cellular respiration? *A) To produce glucose* *B) To oxidize NADH and $FADH_2$, generating ATP* *C) To convert light energy into chemical energy* *D) To synthesize proteins*	***B***
52. Which of the following best describes the function of ubiquinone (Coenzyme Q) in the ETC? *A) It acts as a final electron acceptor.* *B) It transfers electrons from Complex I and II to Complex III.* *C) It synthesizes ATP.* *D) It oxidizes NADH.*	***B***
53. Which of the following describes the process of chemiosmosis? *A) Movement of electrons through the electron transport chain* *B) Movement of protons across mitochondrial membrane to generate ATP* *C) Conversion of ATP to ADP* *D) Transport of glucose into the mitochondria*	***B***
54. How many ATP molecules are produced from one molecule of $FADH_2$ through the electron transport chain? *A) 1* *B) 2* *C) 1.5* *D) 3*	***C***

55. Which complex of the electron transport chain is known to be inhibited by the antibiotic oligomycin? *A) Complex I* *B) Complex II* *C) Complex III* *D) ATP synthase*	***D***
56. Which of the following is a result of uncoupling agents like dinitrophenol (DNP)? *A) Increased ATP production* *B) Decreased heat generation* *C) Increased metabolic rate with heat production* *D) Increased proton gradient*	***C***
57. What is the typical P/O ratio for NADH in the electron transport chain? *A) 1 ATP per O_2* *B) 1.5 ATP per O_2* *C) 2.5 ATP per O_2* *D) 3 ATP per O_2*	***C***
58. What is the primary action of uncouplers in cellular respiration? *A) They enhance ATP synthesis.* *B) They inhibit the electron transport chain.* *C) They dissipate the proton gradient across the mitochondrial membrane.* *D) They increase oxygen consumption without producing ATP.*	***C***
59. Which of the following statements is true about the action of uncouplers? *A) They block electron transport at Complex II.* *B) They increase ATP production while dissipating the proton gradient.* *C) They allow protons to re-enter the mitochondrial matrix without generating ATP.* *D) They inhibit oxygen consumption.*	***C***

MCQ on inhibitors of electron transport chain

1. Rotenone is: *a) Uncoupler* *b) Specific site I inhibitor* *c) Specific site II inhibitor* *d) Specific site III inhibitor*	***B***
2. What is the effect of cyanide on the electron transport chain? *A) It stimulates ATP production.* *B) It inhibits Complex IV.* *C) It increases electron flow.* *D) It enhances oxygen consumption.*	***B***
3. Which complex of the electron transport chain is known to be inhibited by the antibiotic oligomycin? *A) Complex I* *B) Complex II* *C) Complex III* *D) ATP synthase*	***D***
4. Which of the following compounds is a known inhibitor of Complex I in the electron transport chain? *A) Cyanide* *B) Rotenone* *C) Oligomycin* *D) Dinitrophenol (DNP)*	***B***

5. What is the primary action of cyanide on the electron transport chain? *A) It inhibits ATP synthase.* *B) It inhibits Complex IV.* *C) It stimulates electron flow.* *D) It increases proton pumping.*	***B***
6. Oligomycin is an inhibitor of ATP synthase. What is the consequence of its action? *A) Increased ATP production* *B) Decreased proton gradient* *C) Inhibition of ATP synthesis* *D) Enhanced electron transport*	***C***
7. Which of the following is an inhibitor of Complex III? *A) Sodium azide* *B) Antimycin A* *C) FCCP* *D) DNP*	***B***
8. Amobarbital is an inhibitor of which of the following complexes? *a) Complex I.* *b) Complex II.* *c) Complex III.* *d) Complex IV.* *e) Complex V.*	***A***