

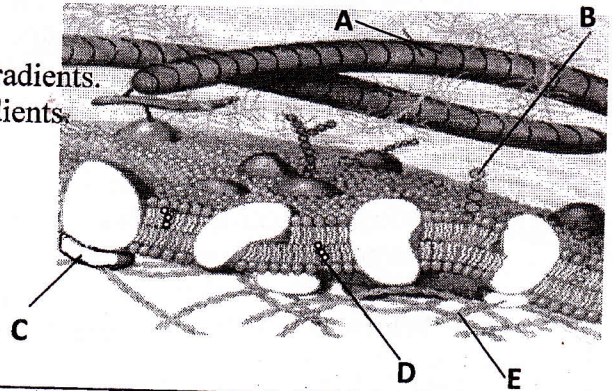
Multiple Choice Questions: Choose the most appropriate answer and shade the letter corresponding to the correct answer on the computerized answer sheet.

1. Which of the following types of molecules are the major structural components of the animal cell membrane?

- A. phospholipids and cellulose      B. nucleic acids and proteins  
D. proteins and cellulose      E. glycoproteins and chitin  
 C. phospholipids and proteins

Refer to the figure on the right to answer questions (2-4)

2. The primary function of component B is to  
A. facilitate diffusion of molecules down their concentration gradients.  
B. actively transport molecules against their concentration gradients.  
C. maintain the fluid mosaic membrane.  
D. maintain membrane fluidity at low temperatures.  
 E. mediate cell-to-cell recognition.



3. Which component is the peripheral protein?

- A    B     C    D    E

4. Which component is cholesterol?

- A    B    C     D    E

Refer to the following figure on the right to answer questions (5-6)

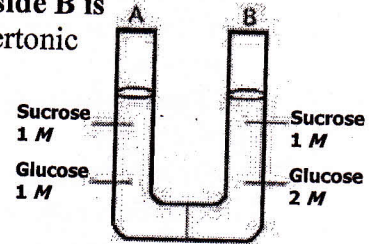
The solutions in the two arms of this U-tube are separated by a membrane that is permeable to water, glucose and sucrose.

5. Initially, in terms of tonicity, the solution in side A with respect to that in side B is

- A. hypotonic.      B. plasmolyzed.      C. isotonic.      D. saturated.      E. hypertonic

6. After the system reaches equilibrium, what changes are observed?

- A. The concentration of sucrose and glucose are equal on both sides.  
B. The concentration of glucose is higher in side A than in side B.  
C. The water level is higher in side A than in side B.  
 D. The water level is higher in side B than in side A.  
E. Both A and D



7. Ions diffuse across membranes through specific ion channels

- A. down their chemical gradients.      B. down their concentration gradients.  
C. down their electrical gradients.       D. down their electrochemical gradients.  
E. down the osmotic potential gradients

8. The sodium-potassium pump is called an electrogenic pump because it

- A. pumps equal quantities of Na<sup>+</sup> and K<sup>+</sup> across the membrane.  
B. pumps hydrogen ions out of the cell.  
 C. creates a voltage across membranes.  
D. ionizes sodium and potassium atoms.  
E. is used to transport sucrose and H<sup>+</sup> against their concentration gradients.

9. Water passes quickly through cell membrane because

- A. the bilayer is hydrophilic.      B. it moves through hydrophobic channels.  
C. it is a small, polar, charged molecule.      D. water movement is coupled to ATP hydrolysis.  
 E. it moves through aquaporins in the membrane.

10. Which of the following would likely move most rapidly through the lipid bilayer of a plasma membrane?

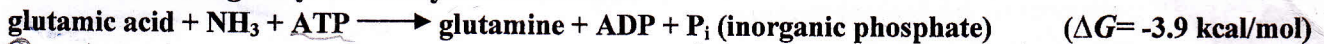
- A. CO<sub>2</sub>       B. Amino acid      C. Glucose      D. K<sup>+</sup>      E. Starch

11. Cellular breakdown of glucose into CO<sub>2</sub> and H<sub>2</sub>O is described as

- A. catalysis       B. catabolism      C. anabolism      D. dehydration      E. None of the above



12. The following enzyme-catalyzed reaction is

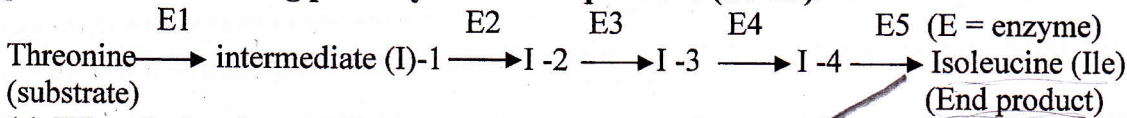


- A. endergonic B. at equilibrium C. exergonic D. reversible E. None of the above

13. The active site of an enzyme is a region in the enzyme that

- A. binds the substrate B. binds a competitive inhibitor C. binds noncompetitive inhibitor  
D. A and B E. A, B and C.

Refer to the following pathway to answer questions (14-15).



14. When Isoleucine concentration becomes high (more than enough), it inhibits the enzyme

- A. E5 B. E4 C. E3 D. E2 E. E1

15. The inhibition in question 14 is

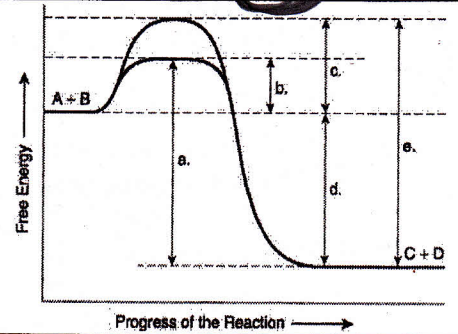
- A. competitive B. irreversible C. feedback inhibition

- D. reversible E. C and D.

Refer to the figure on the right to answer questions (16-17).

16. Which of the following terms best describe the forward reaction?

- A. Endergonic, ΔG is greater than 0  
B. Exergonic, ΔG is less than 0  
C. Endergonic, ΔG is less than 0  
D. Exergonic, ΔG is greater than 0  
E. Chemical equilibrium, ΔG = 0



17. Which of the following represents the ΔG of the reaction?

- A. a B. b C. c D. d E. e

18. Which is FALSE about biosynthesis of ATP from ADP and P<sub>i</sub>?

- A. Exergonic B. Endergonic C. Enzymatic reaction D. Requires at least 7.3 kcal/mol  
E. Required for anabolic reactions such as protein synthesis and nucleic acids synthesis.

19. Cellular regulatory enzymes

- A. are allosteric enzymes B. may be stimulated or inhibited C. reversibly inhibited  
D. are made of more than one polypeptide E. all of the above.

20. The conversion of glucose to pyruvate with the formation of ATP is termed

- A. glycolysis B. citric acid cycle C. electron transport chain  
D. electron transport system E. all of the above

21. The first step in the activation of glucose in glycolysis is

- A. removal of water molecule B. addition of Hydrogen ion C. removal of an oxygen atom  
D. addition of phosphate group E. addition of oxygen atom

22. Cellular glucose degradation to carbon dioxide occurs in

- A. glycolysis B. electron transport chain C. Citric Acid Cycle (Krebs cycle)  
D. the conversion of pyruvate to acetyl CoA E. C and D

23. Which of the following is/are the products of Citric Acid Cycle (Krebs Cycle)?

- A. ATP B. NADH C. FADH<sub>2</sub> D. CO<sub>2</sub> E. all of the above

24. Cellular respiration produces about 38 ATP from one glucose molecule. What happens to the rest of the energy in glucose?

- A. It is stored as Fat B. It is converted to heat C. It is released as CO<sub>2</sub> and H<sub>2</sub>O  
D. It is used to make H<sub>2</sub>O from H<sup>+</sup> and O<sub>2</sub> E. It is converted to starch

25. At the substrate-level phosphorylation, Citric Acid Cycle produces per one glucose molecule

- A. 36 ATP B. 12 ATP C. 3 ATP D. 2 ATP E. 1 ATP

26. Which is NOT a product of Citric Acid Cycle?

- A. CO<sub>2</sub> B. NADH C. lactic acid D. FADH<sub>2</sub> E. citric acid

Refer to the figure on the right to answer question (27-29)

27. Glycolysis takes place in

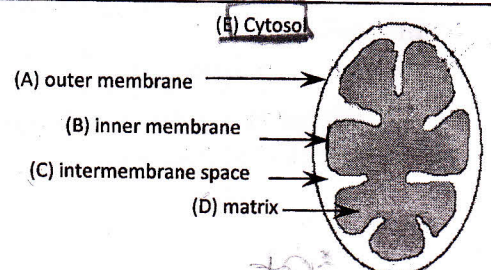
- A. B C D E

28. ATP synthase complex is attached to

- A. B C D E

29. The site of CO<sub>2</sub> formation during cellular respiration is

- A. B C D E





30.  $\beta$ -oxidation

- A. is the second step in the oxidation of glucose.
- B. is a process used to oxidize fatty acids.
- C. is a process used to deaminate amino acids.
- D. is a process used to digest some polysaccharides.
- E. B and C

31. In electron transport, which respiratory complex is NOT involved in the flow of electrons from FADH<sub>2</sub>?

- A. complex I
- B. complex II
- C. complex III
- D. complex IV
- E. all of the above

32. Which of the following molecules is NOT a carrier of electrons in the electron transport chain?

- A. flavoproteins
- B. copper-nickel compounds
- C. cytochromes
- D. iron-sulfur proteins
- E. coenzyme Q

33. Which of the following is NOT a product of alcohol fermentation of glucose?

- A. ATP
- B. CO<sub>2</sub>
- C. ethanol
- D. NAD<sup>+</sup>
- E. sucrose

34. The purpose of the alcohol fermentation process is the

- A. regeneration of NAD<sup>+</sup>.
- B. generation of additional energy in the form of ATP.
- C. production of inorganic compounds.
- D. only A and B.
- E. all of the above

35. Which of the following enzymes of glycolysis responds to citrate and ATP as inhibitors?

- A. Phosphofructokinase.
- B. Hexokinase.
- C. Pyruvate kinase.
- D. Enolase.
- E. Isomerase.

Refer to the figure on the right to answer question (36-38)

36. The letter A represents

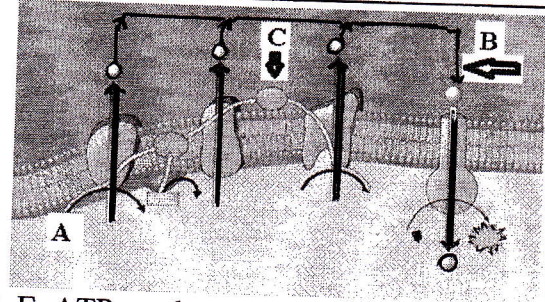
- A. FADH<sub>2</sub>
- B. NAD<sup>+</sup>
- C. FAD
- D. NADH
- E. ATP synthase

37. The letter B represents

- A. electrons flow
- B. protons flow
- C. Na<sup>+</sup> flow
- D. active transport
- E. B and C

38. The letter C represents

- A. Cyt b
- B. Cyt c
- C. ubiquinone
- D. Cyt a<sub>3</sub>
- E. ATP synthase



39. Plants are

- A. photoautotrophs.
- B. heterotrophs.
- C. decomposers.
- D. any of the above.
- E. none of the above

40. In photosynthesis, the light energy is converted to chemical energy in the form of

- A. NADP<sup>+</sup>
- B. NADPH
- C. ADP
- D. ATP
- E. both B and D

41. Which wavelength of light is/are most effective in driving photosynthesis?

- A. Violet-blue
- B. Green
- C. Red
- D. All of the above
- E. Both A and C

42. Carotenoids

- A. are accessory pigments
- B. function in photoprotection
- C. absorb violet-blue light
- D. are components of light harvesting complexes of a photosystem
- E. all of the above

43. Chlorophyll *a* is anchored in the thylakoid membrane through

- A. the porphyrin ring
- B. Mg<sup>++</sup>
- C. the hydrocarbon tail
- D. the CH<sub>3</sub> group
- E. all of the above

44. The cyclic electron flow of the light reaction includes all of the following EXCEPT

- A. photosystem I
- B. ferredoxin (Fd)
- C. plastocyanin (Pc)
- D. cytochrome complex
- E. NADP<sup>+</sup> reductase

45. Which of the following translocates H<sup>+</sup> from stroma to the thylakoid space?

- A. Cytochrome complex
- B. Plastocyanin (Pc)
- C. Plastoquinone (Pq)
- D. Ferredoxin (Fd)
- E. NADP<sup>+</sup> reductase

46. Transport of H<sup>+</sup> from the thylakoid space to stroma results in .....synthesis.

- A. CO<sub>2</sub>
- B. ATP
- C. ADP
- D. NADP<sup>+</sup>
- E. Sucrose

47. Where do the enzymatic reactions of the Calvin cycle take place? X

- A. Stroma of the chloroplast.      B. Thylakoid membranes.       C. Thylakoid space.  
D. Electron transport chain.      E. Outer membrane of the chloroplast.

48. What is the primary function of the Calvin cycle?

- A. Use ATP to release carbon dioxide  
B. Use NADPH to release carbon dioxide  
C. Split water and release oxygen  
D. Transport RuBP out of the chloroplast  
 E. Synthesize simple sugars from carbon dioxide

49. Which of the following is (are) required in the Calvin cycle?

- A.  $\text{CO}_2$       B. ATP      C. RuBP      D. A and B only       E. A, B, and C

50. What are the substrates for the enzyme RuBP carboxylase?

- A. Ribulose 1,5-bisphosphate and  $\text{CO}_2$   
 B. Ribulose 1,5-bisphosphate  
X C. 3-phosphoglycerate and  $\text{CO}_2$   
D. Glyceraldehyde 3-phosphate and  $\text{CO}_2$   
E. Glyceraldehyde 3-phosphate