UNIVERSITY ENTRANCE EXAMINATION (2003 – 2010) ON "ENERGY TRANSFORMATION"

1. In aerobic respiration of cells, in which cellular part does the Krebs cycle (Citric acid cycle) take place? (2003)

   A. Chloroplasts
   C. Nuclei
   B. Mitochondria
   D. Lysosomes

2. What is the final electron acceptor in the electron transport chain of cellular respiration? (2003)

   A. O_2
   C. $NADP^+$
   B. H_2
   D. NAD^+

3. When the muscle cells are in short supply of oxygen, which of the following compounds would be accumulated in them? (2004)

   A. Ethanol
   C. Lactic acid
   B. Acetic acid
   D. Carbon dioxide

4. Which of the following processes of photosynthesis does NOT require the presence of light to take place? (2004)

   A. The splitting of water
   C. Reduction of NADP
   B. ATP formation
   D. Carbon fixation

5. What is the correct equation for cellular respiration? (2004)

   A. $6CO_2 + 6H_2O + Energy = 6O_2 + C_6H_{12}O_6$
   B. $6O_2 + C_6H_{12}O_6 = 6CO_2 + 6H_2O + Energy$
   C. $6O_2 + C_6H_{12}O_6 + Energy = 6CO_2 + 6H_2O$
   D. $6CO_2 + 6H_2O = 6O_2 + C_6H_{12}O_6 + Energy$

6. Which of the following is NOT one of the stages in cellular respiration? (2004)

   A. Calvin cycle
   C. Electron transport
   B. Glycolysis
   D. Krebs cycle

7. Which of the following is true for cellular respiration? (2004)

   A. Restricted to plant cells
   C. Occurs in all eukaryotic cells
   B. Restricted to animal cells
   D. Occurs in prokaryotic cells only

8. How many moles of ATP will be generated as a result of the oxidation of one mole of $FADH_2$ in an actively respiring mitochondrion? (2004)

   A. 0
   C. 2
   B. 3
   D. 6

9. In cyclic photophosphorylation, what is the source of the recycled electron? (2004)
   A. Reduced NADP
   B. Chlorophyll molecule
   C. Adenosine triphosphate
   D. Photolysis of water molecules
10. If there were no free oxygen to breath, which one of the following steps of the respiration process can operate in our body? (2004)
   A. Glycolysis
   B. Krebs cycle
   C. Electron transport chain
   D. Reaction that links glycolysis and Krebs cycle
11. What is the source of the oxygen that is produced during the process of photosynthesis by higher plants? (2004)
   A. CO_2
   B. H_2O
   C. ATP
   D. Chlorophyll
12. Which energy rich organic compound contains adenine in its molecule? (2005)
   A. Lipid
   B. Glucose
   C. Carbohydrate
   D. ATP
13. During chemiosmosis, what substance diffuses from one side to the other side of the membrane? (2005)
   A. Water molecules
   B. Electrons
   C. Protons
   D. ATP molecules
14. Which of the following is NOT true about photosystem – II? (2005)
   A. Its reaction center molecule is P680.
   B. It passes its excited electrons to photosystem – I.
   C. The energy lost from its excited electrons reduces NADP.
   D. It replenishes its lost electrons from photolysis of water.
15. What is the importance of chemiosmosis in photosynthesis and cellular respiration? (2005)
   A. Splitting of water molecule
   B. Operating the proton pump
   C. Combining hydrogen and carbon
   D. Synthesizing ATP
16. Where does the light dependent reaction of photosynthesis occur in the chloroplast? (2005)
   A. In the thylakoid membrane
   B. In all parts of the chloroplast
   C. In the fluid of the stroma
   D. In the stromal opening
17. In which process is ATP generated during short distance high speed running? (2005)

A. Aerobic respiration
B. Mitochondrial energy transformation
C. Anaerobic respiration
D. The Krebs cycle

18. How many net ATP molecules are generated through anaerobic respiration, when a single glucose molecule is changed to pyruvate in the human body? (2006)
    A. Two
    B. Three
    C. Four
    D. Six
19. During the Krebs cycle, which of the following molecules temporarily stores most of the energy released from food molecule? (2006)
    A. ADP
    B. ATP
    C. NADH
    D. FADH
20. At which stage is most of the ATP generated in aerobic respiration? (2006)
    A. Glycolysis
    B. Link reaction
    C. Krebs cycle
    D. Electron transport
21. Which of the following substances is **NOT** necessary for photosynthesis to take place? (2006)
    A. Chlorophyll
    B. Carbon dioxide
    C. Oxygen
    D. Water
22. The molecule of which pigment is located at the reaction center of a photosystem? (2006)
    A. Chlorophyll a
    B. Chlorophyll b
    C. Carotenoid
    D. Accessory pigments
23. Where exactly in the cell does the Krebs cycle take place? (2006)

A. Mitochondrial matrix
B. Inner mitochondrial membrane
C. Cytoplasmic fluid
D. Outer mitochondrial membrane

24. If present in the fermentation system, which one of the following would negatively affect alcohol production by yeasts? (2006)
    A. Water
    B. Oxygen
    C. Glucose
    D. Fermentation enzyme
25. Which of the following is an accurate representation of the relationships between the terms metabolism, anabolism and catabolism? (2006)
    A. Anabolism = catabolism
    B. Metabolism = catabolism
    C. Anabolism = catabolism + metabolism
    D. Metabolism = catabolism + anabolism
26. Which of the following groups of plants carry out light dependent and light independent reactions of photosynthesis in separate cells? (2006)
    A. C-3 plants
    B. C-4 plants
    C. CAM plants
    D. Plants without chlorophyll
27. From which of the processes of cellular respiration is the majority of the ATP generated? (2006)
    A. Anaerobic fermentation
    B. Glycolysis & link reaction
    C. Electron transport & chemiosmosis
    D. Krebs cycle & glycolysis
28. On which of the following does the rate of algal photosynthesis in a lake depend? (2006)
    A. The oxygen content of the water
    B. The nitrogen content of the water
    C. The elevation where the lake is found
    D. The amount of light that penetrates the lake water

29. During aerobic respiration, what is the route through which protons return from the mitochondrial inter-membrane space back to its matrix? (2006)
    A. Proton pump
    B. ATP synthase
    C. Ion channel
    D. Membrane lipid
30. In which industrial products is pyruvate fermentation by yeast practically applied? (2007)
    A. Brewing beer
    B. Swiss cheese making
    C. Production of vinegar
    D. Yoghurt making
31. When athletes take part in short distance running, how do the cells generate most of the energy that is quickly needed? (2007)
    A. Aerobic respiration in muscle cells.
    B. Mitochondrial respiration in any cell.
    C. Anaerobic respiration in muscle cells.
    D. Yeast fermentation in the stomach.
32. Cells immediately use the energy that electrons lose as they pass along the chain of electron carriers to: (2007)
    A. produce ATP
    B. pump protons
    C. spin the rotor of ATP synthase
    D. reduce NAD
33. Which of the following happens in both cyclic and non-cyclic photophosphorilation? (2007)
    A. ATP is formed
    B. Oxygen is generated
    C. NADP is reduced
    D. water molecule splits
34. What does the fermentation of glucose by yeast normally yield? (2007)
    A. Lactic acid, CO_2, and 2 ATP
    B. CO_2, H_2O, and 36 ATP
    C. Alcohol, CO_2, and 2 ATP

D. Alcohol, CO_2, and 36 ATP

35. Which of the following is **NOT** true about C4 plants such as tef (*Eragrostis tef*)? (2007)

A. CO_2 is harvested during the night time.

B. The bundle sheath cells contain chloroplasts.

C. Light-dependent reaction occurs in mesophyll cells.

D. Chloroplasts of bundle sheath cells lack thylakoids.

36. From which of the following does the O_2 released during the process of photosynthesis originate? (2008)

(A) Pyruvic acid

(B) CO_2

(C) Sugar

(D) Water

37. What happens in the first reaction of the Krebs cycle during energy transformation? (2008)

(A) A 2-C compound is produced

(B) A 6-C compound is produced

(C) A 4-C compound is produced

(D) A 5-C compound is produced

38. Under what conditions do C4 plants have more photosynthetic efficiency than C3 plants? (2008)

(A) Low water supply

(B) Low temperature

(C) Low light intensity

(D) Low CO_2 concentration

39. During which of the following processes in cellular respiration are most of the ATPs formed? (2008)

(A) Glycolysis

(B) Chemiosmosis

(C) Link reaction

(D) Krebs cycle

40. Which of the following is the adaptation by C4 plants that helps them to avoid photorespiration? (2008)

(A) Harvesting of carbon dioxide at night

(B) Using separate cells for light and dark reactions

(C) Storing carbon dioxide in the vacuole

(D) Keeping the stomata closed during the day

41. Which phosphate bond of the ATP is broken when the energy it contains is needed for cellular activity? (2008)

(A) The first bond

(B) The C – C bonds

(C) The second bond

(D) The third bond

42. What is the advantage that a photo system containing molecules of different types of light sensitive pigments have? (2008)

(A) To absorb light of different wave lengths

(B) To increase the size of the photosystem

(C) To increase the complexity of the photosystem

(D) To increase the surface area for light absorption

43. Which of the following plants uses CAM photosynthesis? (2009)

(A) Sugarcane

(B) Sorghum

(C) Maize

(D) Cactus

44. Which of the following stages of photosynthesis can take place in the dark? (2009)

A. Photolysis of water

B. Photosystem I

C. Photosystem II

D. Calvin cycle

45. Glycolysis occurs in the _____? (2009)

A. Cytoplasm

B. Mitochondria

C. Nucleus

D. Chloroplast

46. Anaerobic metabolism refers to the generation of ATP: (2009)

A. without the involvement of ADP

B. without the use of glycogen

C. without the use of oxygen

D. by the conversion of pyruvate to lactate

47. The conversion of one molecule of glucose to two molecules of pyruvate results in the net formation of: (2009)

A. two molecules of ATP

B. six molecules of water

C. three molecules of ATP

D. thirty-eight molecules of ATP

48. During alcohol fermentation, pyruvic acid in the presence of pyruvate decarboxylase is first converted to _____. (2009)

A. glucose

B. lactose

C. lactic acid

D. acetaldehyde

49. During the Krebs cycle, to which of the following molecules is most of the energy released from food transferred? (2009)

A. ATP

B. NAD

C. ADP

D. AMP

50. During which stage of aerobic respiration does oxidative phosphorylation occur? (2009)

A. Glycolysis

B. Krebs cycle

C. Link reaction

D. Chemiosmosis

51. During anaerobic respiration, what is the gross number of ATP molecules that are produced per glucose molecule? (2009)

A. Two

B. Three

C. Four

D. Six

52. For which of the following processes is ATP **NOT** required? (2009)

A. Diffusion of oxygen into cells

B. Synthesis of molecules

C. Active transport of molecules from one site to another

D. Muscle contraction

53. At which stage is most of the carbon dioxide released during aerobic respiration? (2010)

A. Glycolysis

B. Electron transport

C. Krebs cycle

D. Chemiosmosis

54. One of the following groups of plants carry out light dependent and light independent reactions of photosynthesis in separate cells of the leaf. (2010)

A. Plants adapted to temperate regions

B. Carbon-3 plants

C. Cacti

D. Carbon-4 plants

55. Which of the following takes place under normal conditions, as electrons flow down the electron transport chain of the mitochondria? (2010)

A. NADH and $FADH_2$ are oxidized.

B. The electrons lose free energy.

C. The pH of the matrix increases.

D. An electrochemical gradient is formed.

56. In the process of photosynthesis light is necessary to: (2010)

A. split carbon dioxide

B. release energy

C. produce ATP and a reducing substance

D. combine CO_2 and H_2O

57. Why is that longer races by athletes must be run slower than shorter races? (2010)

A. To give time for lactic acid fermentation in muscle cells

B. To allow aerobic respiration to produce the required ATP

C. To avoid hunger as food is quickly converted to energy

D. To adapt to the weather conditions at the racing place

58. Among the following crops, which one uses a non-C4 photosynthetic pathway? (2010)

A. Maize

B. Sorghum

C. Sugarcane

D. Pineapple

59. Where is the convergence point for the metabolism of the building blocks of carbohydrates, lipids and proteins? (2010)

A. Krebs cycle
B. Cytoplasm
C. Calvin cycle
D. Electron transport

60. During photosynthesis, which of the following is the first step in the transduction of light energy to chemical energy? (2010)

A. Photolysis of water
B. ATP formation
C. Carbon fixation
D. Glucose formation

61. Which of the following molecules can provide the cell the least amount of energy per molecule? (2010)

A. Glucose
B. Reduced NAD
C. ATP
D. Reduced FAD

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ANSWER KEY

1. B	**16.** B	**31.** C
2. C	**17.** C	**32.** A
3. D	**18.** C	**33.** A
4. C	**19.** B	**34.** B
5. D	**20.** B	**35.** B
6. B	**21.** B	**36.** A
7. D	**22.** A	**37.** C
8. B	**23.** B	**38.** D
9. D	**24.** D	**39.** B
10. B	**25.** C	**40.** A
11. B	**26.** B	**41.** C
12. A	**27.** C	**42.** C
13. A	**28.** A	**43.** B
14. D	**29.** C	**44.** A
15. B	**30.** B	**45.** B