تجميع هيكل – مراجعة نهاية الفصل

تم تحميل هذا الملف من موقع المناهج الإماراتية
موقع المناهج ⇦ المناهج الإماراتية ⇦ الصف الحادي عشر المتقدم ⇦ أحياء ⇦ الفصل الأول ⇦ ملفات متنوعة ⇦ الملف
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المزيد من مادة أحياء: ملفات ا كتب للمعلم ا كتب للطالب ا اختبارات الكترونية ا اختبارات ا حلول ا عروض بوربوينت ا أوراق عمل منهج انجليزي ا ملخصات وتقارير ا مذكرات وبنوك ا الامتحان النهائي ا للمدرس
إعداد: معهد رواد التعليمية

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المزيد من الملفات بحسب الصف الحادي عشر المتقدم والمادة أحياء في الفصل الأول	
1	تجميع هيكل – مراجعة نهاية الفصل
2	مراجعة هيكل - تحولات الطاقة وقوانين الديناميكا الحرارية
3	التنفس الخلوي ملخص وتدريبات الدرس الثالث
4	البناء الضوئي ملخص وتدريبات الدرس الثاني
5	كشكول مراجعة الطاقة الخلوية – الدرس الأول من الوحدة السابعة

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معهد رواد التعليمية

Grade 11 Advanced

Biology

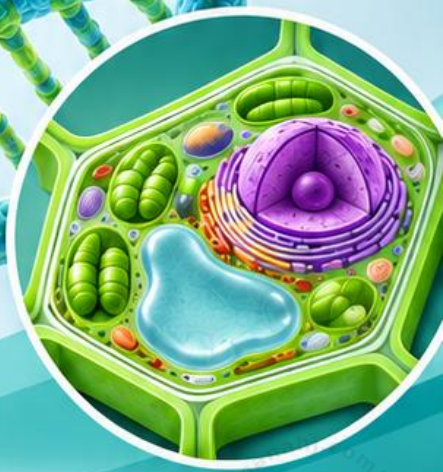
EOT (1) - Term 1

2026 - 2027

تجميع هيكل الاحياء

الصف الحادي عشر متقدم





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Part A – How organisms obtain energy

Exam item Q1 · Page 30 · Text

1. What describes the first law of thermodynamics?

A. Energy cannot be converted without the loss of usable energy.
B. Energy cannot be converted from one form to another without a net gain of usable energy.
C. Energy can be converted from one form to another, but it cannot be created or destroyed.

2. What describes the second law of thermodynamics?

A. Energy cannot be converted without the loss of usable energy (entropy increases).
B. Energy cannot be converted from one form to another without a net gain of usable energy.
C. Energy can be converted from one form to another, but it cannot be created or destroyed.

3. A log burns in a campfire. How is energy produced?

A. Matter in the log is destroyed to make energy.
B. Increasing entropy creates usable energy.
C. The fire's heat keeps generating new energy.
D. Chemical energy in the log is converted to heat and light.

Exam item Q4 · Page 32 · Figure 2

4. Which of the following is an autotroph?

A. wolf
B. daisy
C. earthworm
D. mushroom

5. What type of organism converts light energy from the Sun into chemical energy?

A. a detritivore
B. a photoautotroph
C. a chemoautotroph
D. a heterotroph

6. Which organism depends on an external source of organic compounds?

A. autotroph
B. heterotroph
C. chemoautotroph
D. photoautotroph

7. A black widow spider snaring an insect to eat is an example of an organism called a(n) …

A. autotroph
B. heterotroph
C. producer
D. chemoautotroph

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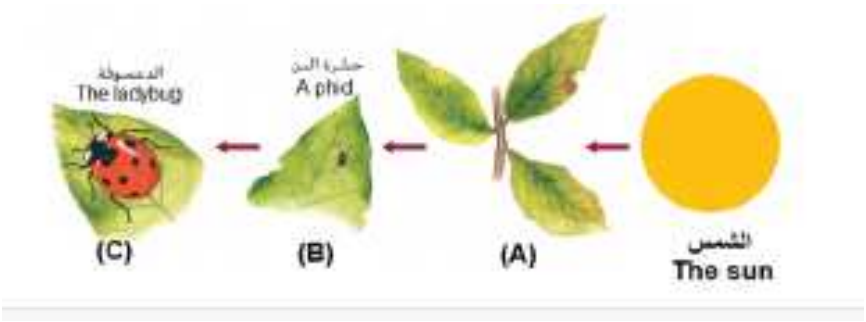
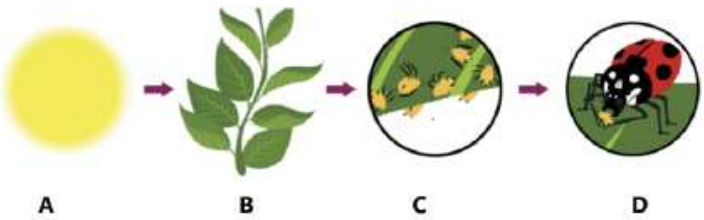
8. Almost all energy in living organisms comes from the Sun. In the figure, which letters refer to heterotrophic organisms?



A. A and B
B. B and C
C. A and C
D. A, B and C

9. According to the second law of thermodynamics, which letter represents the trophic level with the highest entropy and the least usable energy?



A. A
B. B
C. C
D. D

10. What is the major source of energy for living organisms?

A. the Sun
B. water
C. soil minerals
D. oxygen

11. As energy moves from the plant to the aphid to the ladybug, what happens to the usable energy?

A. It increases at each step.
B. It decreases; some is lost as heat.
C. It stays exactly the same.
D. It is destroyed completely.

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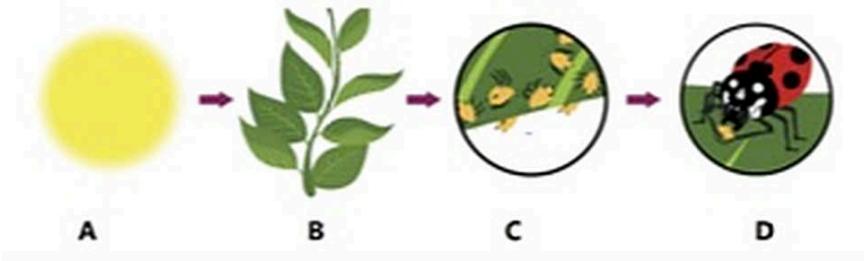
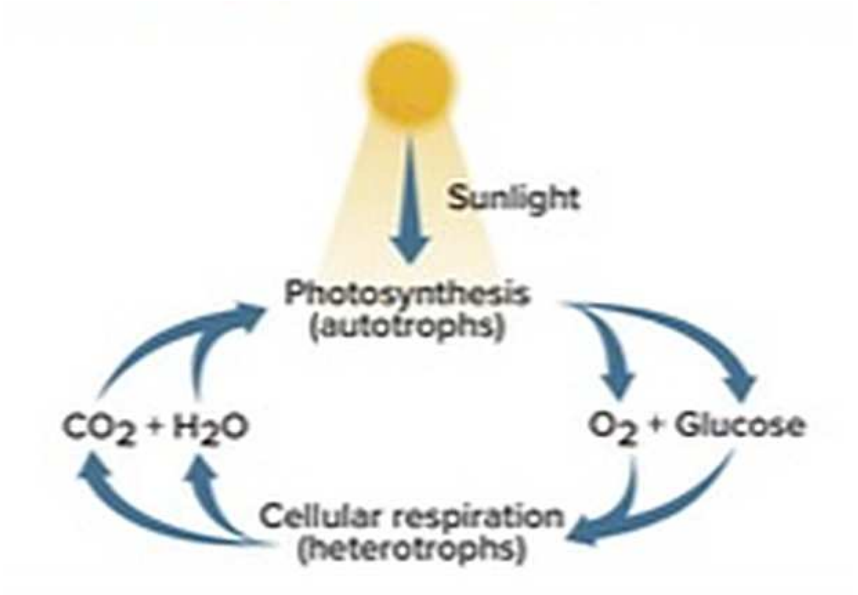
12. ★ The food chain below is a clear example of the laws of thermodynamics. Which letter refers to an organism that absorbs energy from its environment and relies on the anabolic pathway to produce large molecules from small molecules?



A. A and C
B. Only B
C. Only C
D. D and C

13. ★ In an ecosystem, photosynthesis and cellular respiration form a cycle, and the Sun is the main source of energy. Compared with sunlight in the figure, which compound is the energy source for chemoautotrophs?



A. carbon dioxide
B. hydrogen sulfide
C. nitrous oxide
D. sulfur oxide

Exam item Q5–6 · Page 32 · Figure 3

14. Which describes the process of cellular respiration?

A. anabolic pathway that breaks molecules into energy
B. catabolic pathway that breaks molecules into energy
C. catabolic pathway that builds molecules of stored energy
D. anabolic pathway that builds molecules of stored energy

15. Why is cellular respiration a catabolic pathway?

A. Energy is used to form glucose and oxygen.
B. Energy is converted from water to carbon dioxide.
C. Energy that is lost is converted to thermal energy.
D. Energy is released by the breakdown of molecules.

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16. In which metabolic process are molecules broken down to produce carbon dioxide and water?

A. photosynthesis
B. cellular respiration
C. homeostasis
D. fermentation

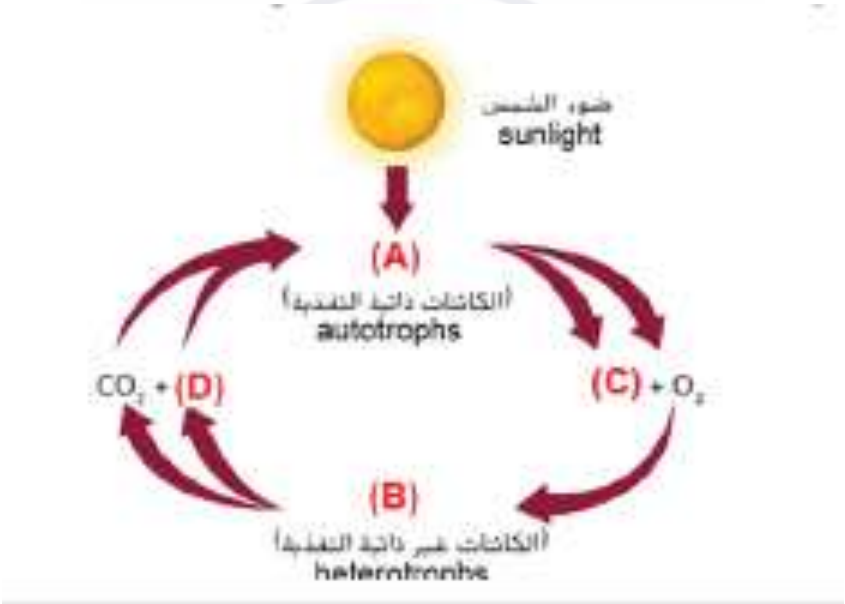
17. Which of the following defines metabolic pathways?

A. reactions in which organic molecules are broken down to release energy
B. reactions in which the product of one reaction is the substrate for the next
C. reactions in which light energy converts into chemical energy
D. reactions in which mechanical energy converts into chemical energy

18. How can light intensity and carbon dioxide levels affect rates of photosynthesis?

A. More light and CO_2 decrease the rate
B. More light and CO_2 increase the rate
C. Only more light increases the rate
D. Only more CO_2 increases the rate

19. In an ecosystem, photosynthesis and cellular respiration form a cycle. Based on the diagram, which labeling is INCORRECT?



A. (A) photosynthesis
B. (B) cellular respiration
C. (C) glucose
D. (D) chlorophyll

20. Which of the following is an example of an anabolic pathway?

A. lipid breakdown
B. glycolysis
C. building muscle tissue
D. digestion

21. Which of the following is an example of a catabolic pathway?

A. photosynthesis
B. creating new cells
C. making steroids
D. cellular respiration

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22. Which description fits BOTH anabolic and catabolic pathways?

- **A.** breakdown of large molecules into smaller ones
- **B.** build-up of large molecules from smaller ones
- **C.** metabolic pathways (chemical reactions in a cell)
- **D.** photosynthesis only

Exam item Q7 · Page 32 · Chemistry

23. When a muscle contracts, which energy conversion takes place?

- **A.** chemical energy → mechanical energy
- **B.** light energy → chemical energy
- **C.** mechanical energy → chemical energy
- **D.** thermal energy → light energy

24. Which is the most important biological molecule that provides chemical energy in cells?

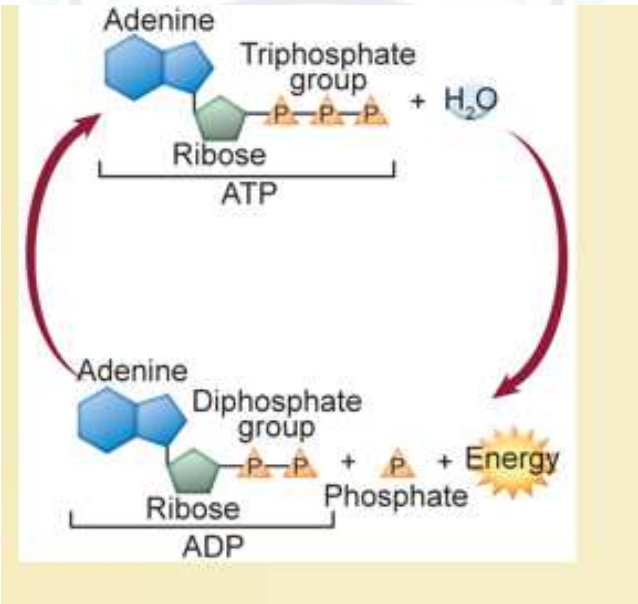
- **A.** DNA
- **B.** ATP
- **C.** water
- **D.** CO_2

25. Where is chemical energy stored in organisms before it is converted into other forms?

- **A.** in sunlight
- **B.** in water vapour
- **C.** in the bonds of biological molecules
- **D.** in the cell wall only

Exam item Q8 · Page 33 · Figure 4

26. Look at the figure. Which molecule is released when ATP becomes ADP?



- **A.** a phosphate group
- **B.** a water molecule
- **C.** ribose sugar
- **D.** adenine

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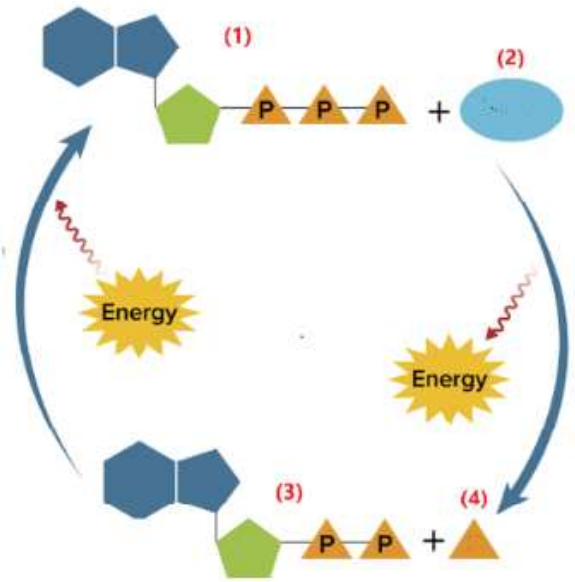
27. Why is adenosine triphosphate (ATP) such an important biological molecule?

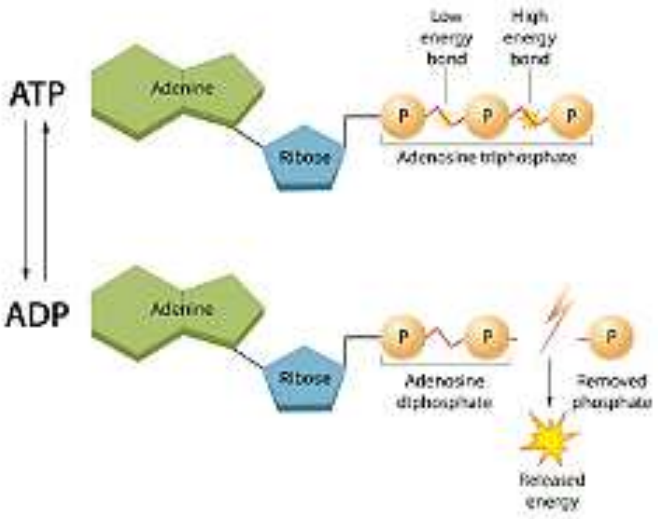
A. It captures light energy from the Sun.
B. It is produced in anabolic pathways only.
C. It stores and releases chemical energy.
D. It converts mechanical energy to thermal energy.

28. In living organisms, chemical energy is stored in molecules and converted when needed, as shown in the figure. Which of the following represents number (3)?



A. ADP
B. ATP
C. $NADP^+$
D. NADPH

29. Using the figure, the conversion of ADP into ATP is a(n) … reaction.



A. anabolic
B. catabolic
C. fermentation
D. digestion

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30. Where is the energy stored in an ATP molecule?

A. in the bond between ribose and adenine
B. in the bond between ribose and a phosphate
C. in the ribose sugar
D. in the bonds between phosphate groups

31. When is energy released from ATP?

A. when a phosphate group is removed
B. when the adenine–ribose bond breaks
C. when adenine binds to ribose
D. when a phosphate group is added

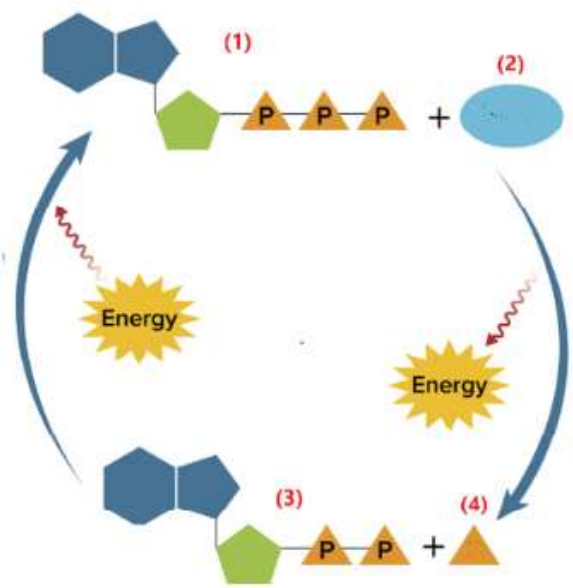
32. Which set correctly lists the parts of an ATP molecule?

A. adenine, ribose, three phosphate groups
B. adenine, deoxyribose, three phosphate groups
C. thymine, ribose, two phosphate groups
D. adenine, ribose, two phosphate groups

33. Which cell activity is powered directly by energy released from ATP?

A. light absorption by chlorophyll
B. muscle contraction
C. diffusion of oxygen
D. osmosis of water

34. ★ The figure shows the breakdown of ATP. Which of the following is an incorrect labelling?



A. (1) ATP, (2) H_2O
B. (3) ADP, (4) P
C. (3) ADP, (2) H_2O
D. (2) AMP, (1) ATP

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Exam item Q2·3·5 · Page 33 · Check

35. Which is an example of the first law of thermodynamics?

- **A.** A plant converts light energy into chemical energy stored in glucose.
- **B.** A plant creates new energy from carbon dioxide and water.
- **C.** Energy is destroyed when an animal dies.
- **D.** Usable energy increases at each trophic level.

36. Which statement correctly compares anabolic and catabolic pathways?

- **A.** Anabolic pathways release energy; catabolic pathways use energy.
- **B.** Anabolic pathways use energy to build large molecules; catabolic pathways break them down and release energy.
- **C.** Both pathways only happen in plants.
- **D.** Cellular respiration is an anabolic pathway.

37. Why is there less usable energy at each higher trophic level?

- **A.** Energy is destroyed by consumers.
- **B.** Some energy is lost as heat (second law).
- **C.** Consumers create their own energy.
- **D.** Entropy decreases at each step.

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Part B – Photosynthesis

Exam item Q9 · Page 34 · Overview

38. What three things do plants need for the process of photosynthesis?

- **A.** sunlight, oxygen and sugar
- **B.** water, soil and oxygen
- **C.** sunlight, carbon dioxide and water
- **D.** carbon dioxide, oxygen and soil

39. True or false: the chemical equation for photosynthesis is $6CO_2 + 6H_2O \rightarrow C_6H_{12}O_6 + 6O_2$.

- **A.** True
- **B.** False

40. In photosynthesis, which of the following are the reactants?

- **A.** O_2 and $C_6H_{12}O_6$
- **B.** CO_2 and H_2O (with light energy)
- **C.** O_2 and H_2O
- **D.** CO_2 and $C_6H_{12}O_6$

41. In photosynthesis, which of the following are the products?

- **A.** $C_6H_{12}O_6$ and O_2
- **B.** CO_2 and H_2O
- **C.** CO_2 and energy
- **D.** H_2O and O_2

42. How do the two phases of photosynthesis differ?

- **A.** Phase 1 is light-independent in the thylakoids; phase 2 is light-dependent in the stroma.
- **B.** Phase 1 is light-dependent in the thylakoids; phase 2 is light-independent in the stroma.
- **C.** Phase 1 is light-dependent in the outer membrane; phase 2 is in the inner membrane.
- **D.** Phase 1 is light-dependent in the stroma; phase 2 is light-independent in the thylakoids.

43. Which substance is a by-product of photosynthesis?

- **A.** oxygen
- **B.** carbon dioxide
- **C.** nitrogen
- **D.** glucose

44. In photoautotrophs, … energy is converted into … energy.

- **A.** chemical → light
- **B.** light → chemical
- **C.** thermal → mechanical
- **D.** light → nuclear

45. A hiker asks a guide to explain photosynthesis. Which is the correct answer?

- **A.** the process autotrophs use to make energy
- **B.** the process autotrophs use to make sugar
- **C.** the process heterotrophs use to make sugar
- **D.** the process heterotrophs use to make energy

46. … is formed during the light-independent phase of photosynthesis.

- **A.** Glucose
- **B.** ATP
- **C.** NADPH
- **D.** Oxygen

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47. Which of these steps happens FIRST in photosynthesis?

A. Carbon dioxide is used to make glucose molecules.
B. Light energy splits water into oxygen and hydrogen ions.
C. NADPH and ATP are used in the Calvin cycle.
D. Hydrogen ions move through ATP synthase, making ATP.

Exam item Q10 · Page 35 · Figure 5

48. What is the compound that plants use to absorb the energy from light?

A. carbon dioxide
B. H_2O
C. DNA
D. chlorophyll

49. The highlighted area is inside the chloroplast. Which statement correctly describes thylakoids and the thylakoid space?



A. A thylakoid is a saclike membrane arranged in stacks; the space inside it is the thylakoid space.
B. A thylakoid is an organelle that captures light; the space inside it is the thylakoid space.
C. A thylakoid is the outer membrane of the chloroplast; the space around it is the thylakoid space.

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50. Look at the figure. Which part of the chloroplast is a sac-like membrane arranged in stacks?



A. grana
B. stroma
C. thylakoids
D. Golgi apparatus

51. Where is the location of the light-dependent reactions?

A. matrix
B. thylakoid (membrane)
C. stroma
D. mitochondria

52. What is the term for a stack of thylakoids?

A. stroma
B. granum
C. thylakoid
D. matrix

53. What are the structures inside plant cells that contain chlorophyll called?

A. nucleus
B. ribosomes
C. chloroplasts
D. mitochondria

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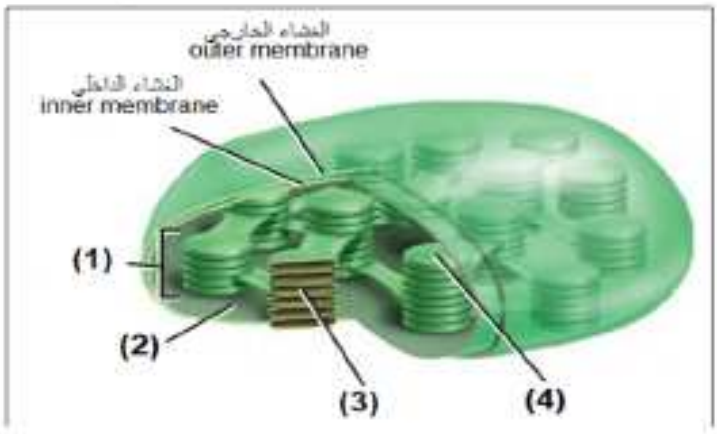
54. The diagram shows the structure of the chloroplast. Which number shows the location of the phase two (light-independent) reactions?

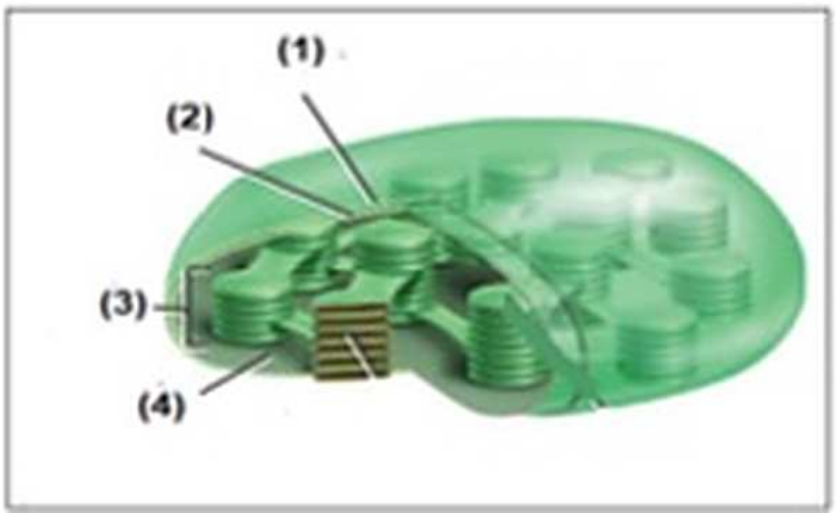


A. 1
B. 2
C. 3
D. 4

55. What is the stroma?

A. a stack of thylakoids
B. the fluid-filled space outside the grana
C. a light-absorbing pigment
D. the inner membrane of the mitochondrion

56. ★ The diagram shows the structure of the chloroplast. Which number shows where the light-independent reactions that use ATP and NADPH take place?



A. 1
B. 2
C. 3
D. 4

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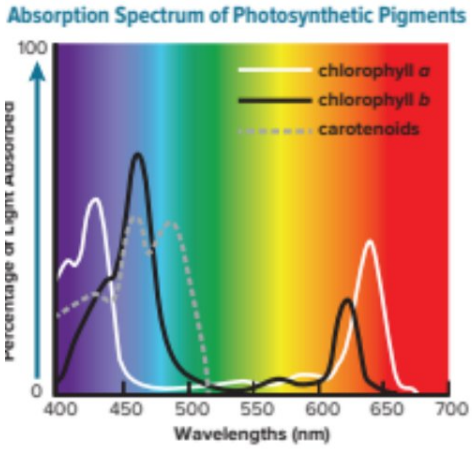
Exam item Q11 · Page 36 · Figure 6

57. Using the graph, which range of wavelengths is reflected by chlorophylls a and b?



igure 6 Colorful pigments found in the leaves of trees iffer in their ability to absorb specific wavelengths of light.

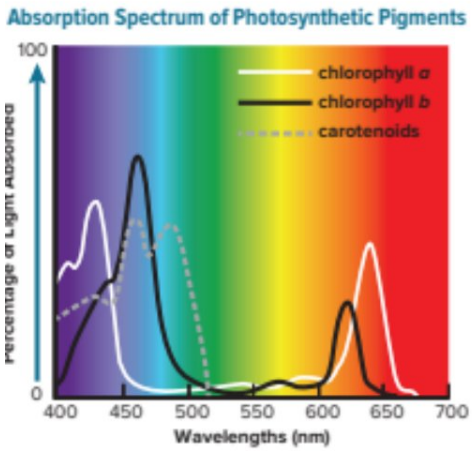
ypothesize *the effect on light absorption if a plant did not ave chlorophyll* b.

A. 400–500 nm
B. 500–600 nm
C. 600–700 nm
D. above 700 nm

58. At which wavelength do carotenoids absorb the greatest percentage of light?

A. 400 nm
B. 500 nm
C. 600 nm
D. 700 nm

59. Light-absorbing molecules such as chlorophyll are called …



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ypothesize *the effect on light absorption if a plant did not ave chlorophyll* b.

A. grana
B. thylakoids
C. pigments
D. stroma

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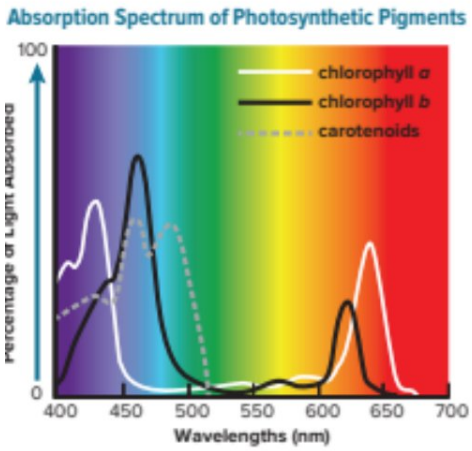
60. In which range do chlorophyll a, chlorophyll b and carotenoids ALL absorb light well?

A. 400–500 nm
B. 500–600 nm
C. 600–650 nm
D. 650–700 nm

61. Why do the leaves of many trees turn yellow and orange in autumn?



igure 6 Colorful pigments found in the leaves of trees iffer in their ability to absorb specific wavelengths of light.
ypothesize *the effect on light absorption if a plant did not ave chlorophyll* b.

A. Leaves start to make carotenoids from glucose.
B. Chlorophyll breaks down, revealing other pigments.
C. Leaves absorb more green light.
D. Chloroplasts produce more oxygen.

62. Why do most plant leaves appear green?

A. Chlorophyll absorbs green light strongly.
B. Chlorophyll reflects green light.
C. Carotenoids reflect green light.
D. Leaves contain no other pigments.

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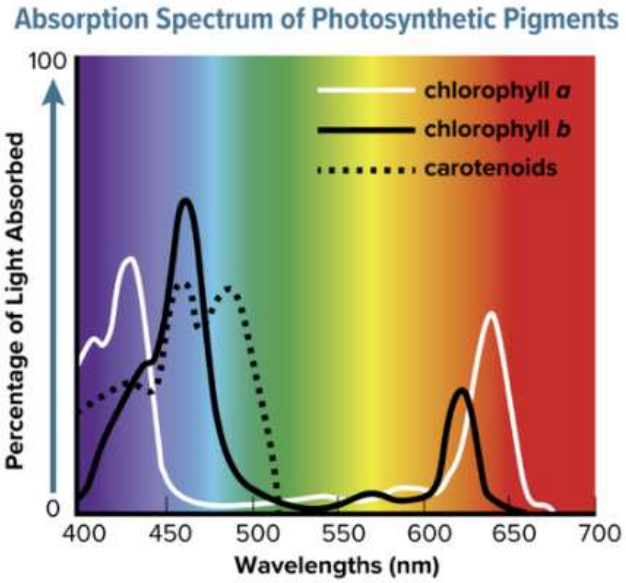
63. ★ Use the figure: why do plant parts that contain chlorophyll appear green to the human eye?



A. Chlorophylls absorb light in the yellow region of the spectrum.
B. Chlorophylls reflect light in the violet–blue region.
C. Chlorophylls absorb light in the green region.
D. Chlorophylls reflect light in the green region.

Exam item Q11–13 · Page 36 · Figure 7

64. Why do the leaves in Figure 7 turn yellow, orange and red?



A. The leaves make more chlorophyll before winter.
B. Chlorophyll breaks down, revealing the colours of the other pigments.
C. Carotenoids absorb yellow and orange light.
D. The leaves stop reflecting all light.

65. Why do many plant parts appear green?

A. Chlorophylls absorb green light.
B. Chlorophylls reflect green light.
C. Carotenoids reflect green light.
D. Chlorophylls absorb all colours equally.

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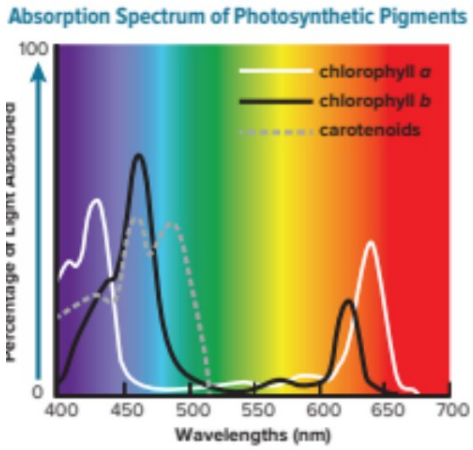
66. Use Figure 6. What happens if a plant has no chlorophyll b?



igure 6 Colorful pigments found in the leaves of trees iffer in their ability to absorb specific wavelengths of light.

ypothesize *the effect on light absorption if a plant did not ave chlorophyll b.*

A. It would absorb less light in the wavelengths that chlorophyll b absorbs, so photosynthesis decreases.
B. It would absorb more green light.
C. Light absorption would not change at all.
D. It could no longer reflect any light.

Exam item Q14 · Page 37 · Text

67. Which mechanism of photosynthesis uses the movement of hydrogen ions (H^+) across a concentration gradient to make ATP?

A. absorption
B. chemiosmosis
C. electron transport
D. C_2 pathway

68. At the beginning of photosynthesis, which molecule is split to produce oxygen (O_2) as a waste product?

A. CO_2
B. H_2O
C. $C_6H_{12}O_6$
D. 3-PGA

69. What supplies the electrons that are lost from photosystem II?

A. oxygen
B. water
C. glucose
D. rubisco

70. Which photosystem does the light-dependent reaction begin with?

A. Photosystem I
B. Photosystem II

71. After NADP reductase transfers electrons from ferredoxin to $NADP^+$, how many electrons does $NADP^+$ need to be reduced to NADPH?

A. 1
B. 2
C. 3

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72. What are the products of the light-dependent reaction that go on to the Calvin cycle?

A. glucose
B. ferredoxin
C. NADPH and ATP

73. What is the name of the chemical where energy is stored during the first phase of photosynthesis?

A. ATP
B. carbon dioxide
C. chlorophyll
D. oxygen

74. True or false: photosynthesis is responsible for the world's oxygen supply, which animals need to survive.

A. False
B. True

75. The major electron carrier involved in electron transport during photosynthesis is …

A. FAD
B. $NADP^+$
C. NAD^+
D. ADP

76. If a plant could no longer make $NADP^+$, what would be the main effect on photosynthesis?

A. More oxygen would be released.
B. No NADPH would form, so the Calvin cycle could not make sugars.
C. Chlorophyll would stop absorbing light.
D. Carbon dioxide would be produced instead of oxygen.

77. ★ The equation shows the reactants and products of photosynthesis: $6CO_2 + 6H_2O$ — light→ $C_6H_{12}O_6 + 6O_2$ The breakdown of which molecule is essential for starting the chemiosmosis process?

A. O_2
B. CO_2
C. H_2O
D. $C_6H_{12}O_6$

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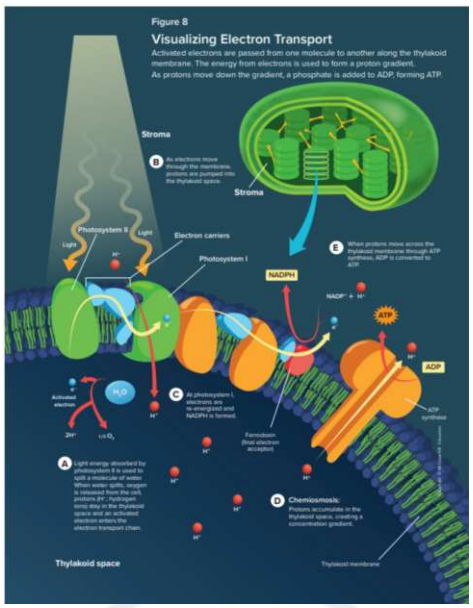
Exam item Q15 · Page 38 · Figure 8

78. In Figure 8, which protein is labelled as the final electron acceptor that passes electrons toward $NADP^+$?



- **A.** ferredoxin
- **B.** rubisco
- **C.** ATP synthase
- **D.** chlorophyll

79. In $6CO_2 + 6H_2O \rightarrow C_6H_{12}O_6 + 6O_2$, which molecule's breakdown is essential for starting chemiosmosis?

- **A.** O_2
- **B.** CO_2
- **C.** H_2O
- **D.** $C_6H_{12}O_6$

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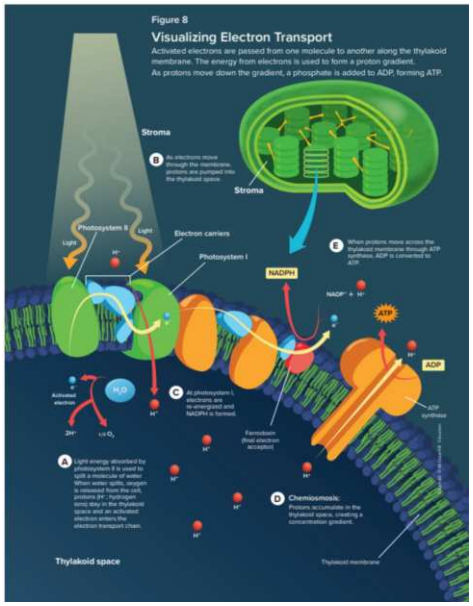
80. In Figure 8 (step D), where do hydrogen ions (H^+) build up to form a concentration gradient?

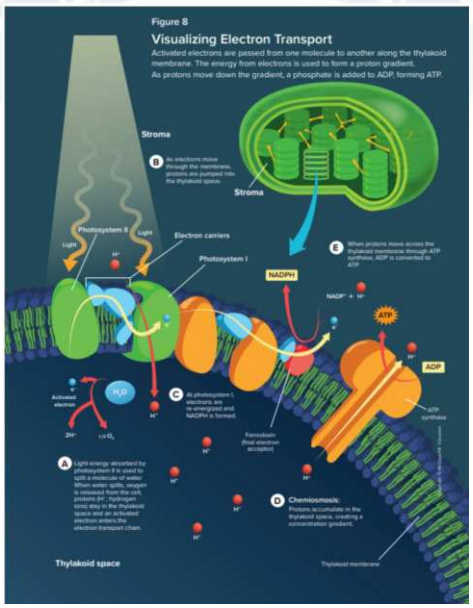


A. stroma
B. thylakoid space
C. cytoplasm
D. mitochondrial matrix

81. In Figure 8 (step E), what happens as H^+ ions flow through ATP synthase into the stroma?

A. ADP is converted to ATP.
B. Water is split into O_2.
C. CO_2 is fixed into sugar.
D. NADPH is broken down.

82. What is the terminal (final) electron acceptor in the light reactions of photosynthesis?



A. oxygen
B. $NADP^+$
C. water
D. FAD

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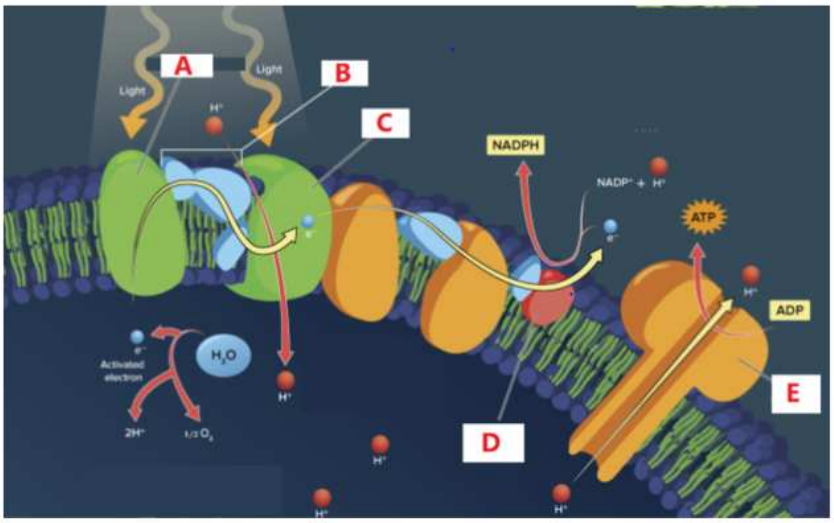
83. ★ The figure shows electron transport in the light reactions of photosynthesis. Which letter refers to ferredoxin?



A. A
B. B
C. C
D. D

Exam item Q16 · Page 39 · Figure 9

84. The figure shows the Calvin cycle. Why do plant cells carry out this second phase of photosynthesis?



A. to produce more NADH
B. to produce more ATP
C. to produce more NADPH
D. to store chemical energy in more stable organic molecules

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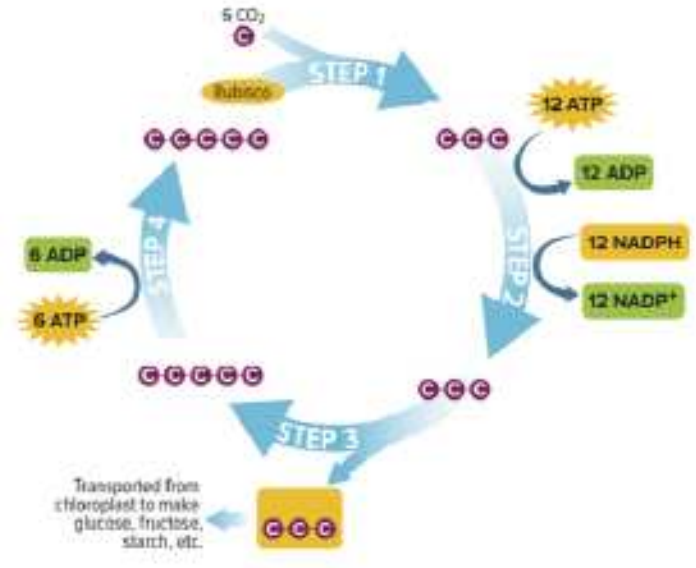
85. Which is the correct order of molecules produced in the Calvin cycle, starting from CO_2 fixation?



A. 3-PGA → RuBP → G3P
B. G3P → RuBP → 3-PGA
C. RuBP → 3-PGA → G3P
D. 3-PGA → G3P → RuBP

86. Which molecule is produced in the final step of the Calvin cycle?

A. acetyl-CoA
B. carbon dioxide (CO_2)
C. ribulose 1,5-bisphosphate (RuBP)
D. glyceraldehyde 3-phosphate (G3P)

87. At the end of the Calvin cycle, where is the energy stored?

A. NADPH
B. ATP
C. chloroplast
D. glucose

88. When carbon first enters the Calvin cycle, which molecule does it combine with?

A. PGA
B. G3P
C. RuBP
D. ATP

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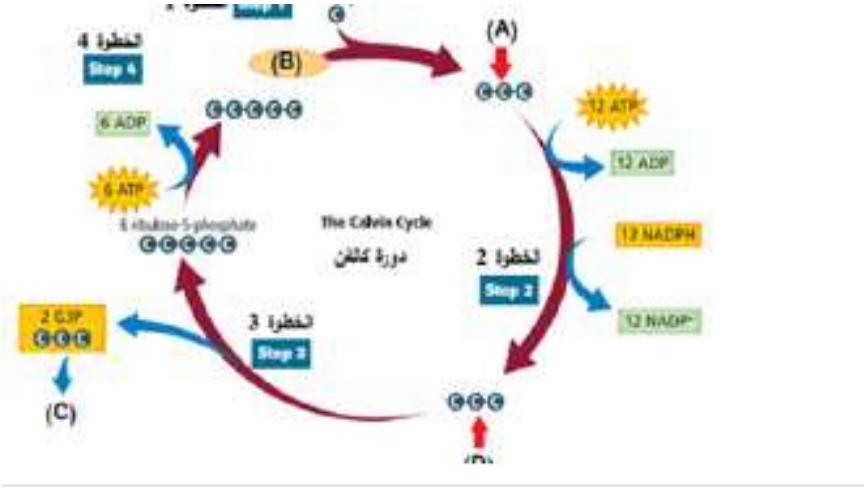
89. **The figure shows the Calvin cycle. Which letter refers to the compound that will be transported from the chloroplast to make glucose, fructose and starch?**



A. (A)
B. (B)
C. (C)

90. **How many carbon atoms does one G3P molecule have?**

A. 1
B. 2
C. 3
D. 6

91. **Inorganic CO_2 cannot be converted into organic molecules during photosynthesis without the enzyme …**

A. rubisco
B. pyruvate
C. lactic acid
D. ATP synthase

92. **True or false: the Calvin cycle is phase I of photosynthesis, in which light-dependent reactions convert light energy to chemical energy.**

A. True
B. False

93. **Glucose made in photosynthesis is linked into which polysaccharide for energy storage in plants?**

A. starch
B. cellulose
C. glycogen
D. chitin

94. ★ **Which equation describes the second step of the Calvin cycle?**

A. G3P + ATP + NADPH → 3-phosphoglycerate
B. 3-phosphoglycerate → ATP + NADPH + G3P
C. RuBP + ATP + NADPH → G3P
D. 3-phosphoglycerate + ATP + NADPH → G3P

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Exam item Q17 · Page 40 · C_4 · CAM

95. How is the Calvin cycle different in C_4 plants compared with other plants?

A. C_4 plants fix CO_2 into 4-carbon molecules instead of 3-carbon molecules.
B. The Calvin cycle in C_4 plants requires more water.
C. C_4 plants do not need carbon dioxide for the Calvin cycle.
D. In C_4 plants the Calvin cycle is the light-dependent phase.

96. CAM and C_4 plants are adapted to live in … environments.

A. cold and wet
B. hot and dry
C. shady forest
D. freshwater

97. How are the C_4 pathway and the CAM pathway an adaptive strategy for some plants?

A. They accelerate photosynthesis.
B. They release more oxygen.
C. They help the plant conserve water.
D. They reduce the need for ATP.

98. Which statement describes CAM plants?

A. They are found mostly everywhere and fix CO_2 into 3-carbon molecules.
B. They include sugarcane and corn and fix CO_2 into 4-carbon molecules.
C. They include cacti and pineapple and fix CO_2 into organic molecules at night.
D. They keep stomata open all day for regular CO_2 uptake.

99. Which pair of plants are both examples of C_4 plants?

A. sugarcane and corn
B. cactus and pineapple
C. jade plant and cactus
D. pineapple and corn

100. What is the main benefit shared by C_4 and CAM plants?

A. regular CO_2 uptake and regular water loss
B. enough CO_2 uptake while water loss is minimized
C. no need for the Calvin cycle
D. photosynthesis without light

101. ★ Which of the following plants does not follow the CAM pathway to maximise photosynthetic activity?

A. pineapple
B. cactus
C. orchids
D. sugarcane

102. ★ Which habitats do pineapple and other plants that store energy the same way share?

A. deserts and salt marshes
B. forests and shallow waters
C. deserts and rain forests
D. temperate areas and shallow waters

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103. ★ Light intensity and carbon dioxide levels affect the rate of photosynthesis. Which sentence describes the relationship best?

A. More light and CO_2 increase the rate.
B. More light and CO_2 decrease the rate.
C. Less light and CO_2 increase the rate.
D. Only more light increases the rate.

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Part C – Cellular respiration

Exam item Q18–19 · Page 41 · Figure 10

104. What is the overall equation for cellular respiration in the presence of oxygen?

- **A.** $6CO_2 + 6H_2O + \text{energy} \rightarrow C_6H_{12}O_6 + 6O_2$
- **B.** $6C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O + \text{energy}$
- **C.** $C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O + \text{energy}$
- **D.** $C_6H_{12}O_6 + 6H_2O \rightarrow 6CO_2 + 6O_2 + \text{energy}$

105. Which represents the general sequence of cellular respiration?

- **A.** TCA cycle → chemiosmosis → glycolysis
- **B.** glycolysis → Krebs cycle → electron transport
- **C.** electron absorption → catalysis → phosphorylation
- **D.** aerobic pathway → anaerobic pathway → fermentation

106. Which stage of cellular respiration is the anaerobic process?

- **A.** glycolysis
- **B.** Krebs cycle
- **C.** electron transport

107. What does it mean for a process to be anaerobic?

- **A.** It requires CO_2.
- **B.** It requires oxygen.
- **C.** It does not require CO_2.
- **D.** It does not require oxygen.

108. In cellular respiration, which of the following are the reactants?

- **A.** $C_6H_{12}O_6$ and O_2
- **B.** CO_2 and H_2O
- **C.** CO_2 and energy
- **D.** O_2 and H_2O

109. In cellular respiration, which of the following are the products?

- **A.** O_2 and $C_6H_{12}O_6$
- **B.** CO_2, H_2O and energy (ATP)
- **C.** O_2 and energy
- **D.** $C_6H_{12}O_6$ and H_2O

110. In eukaryotic cells, aerobic respiration occurs in organelles called …

- **A.** chloroplasts
- **B.** mitochondria
- **C.** ribosomes
- **D.** lysosomes

111. True or false: aerobic respiration is the process in which pyruvate is broken down and electron carriers are used to make ATP through electron transport.

- **A.** False
- **B.** True

112. What is the main job of cellular respiration?

- **A.** to build glucose from CO_2
- **B.** to break down food and store its energy in ATP
- **C.** to release oxygen into the air
- **D.** to absorb light energy

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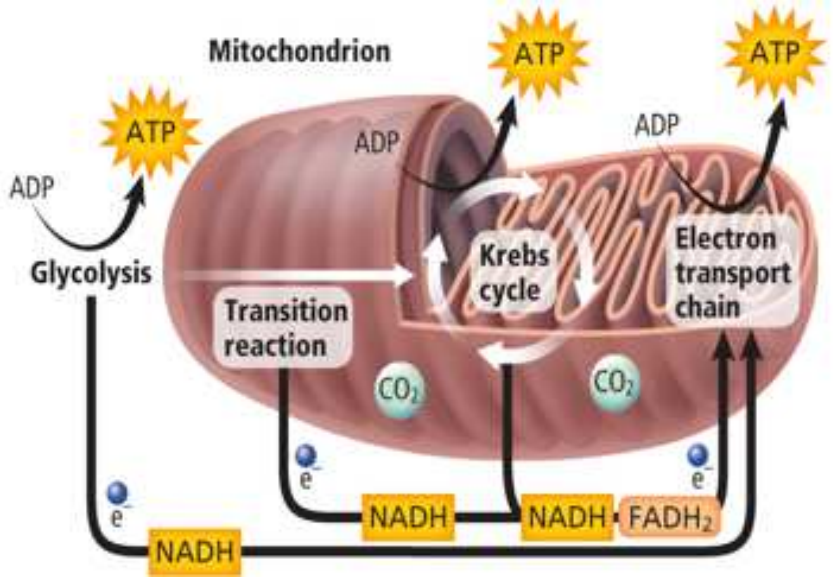
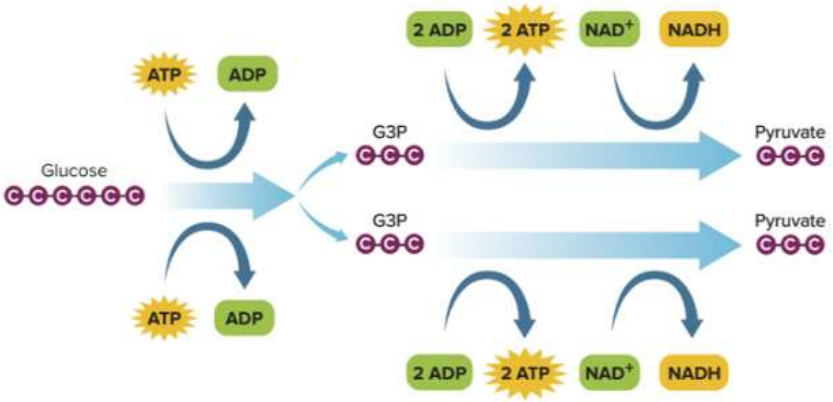
113. ★ The figure shows cellular respiration. Which of the following refers to an anaerobic process?



A. glycolysis
B. Krebs cycle
C. electron transport chain
D. chemiosmosis

Exam item Q20–21 · Page 42 · Figure 11

114. Which is true regarding the net results of the glycolysis process shown in the figure?



A. two ATP and two pyruvate molecules
B. three ATP and four pyruvate molecules
C. four ATP and three pyruvate molecules
D. two ATP and three pyruvate molecules

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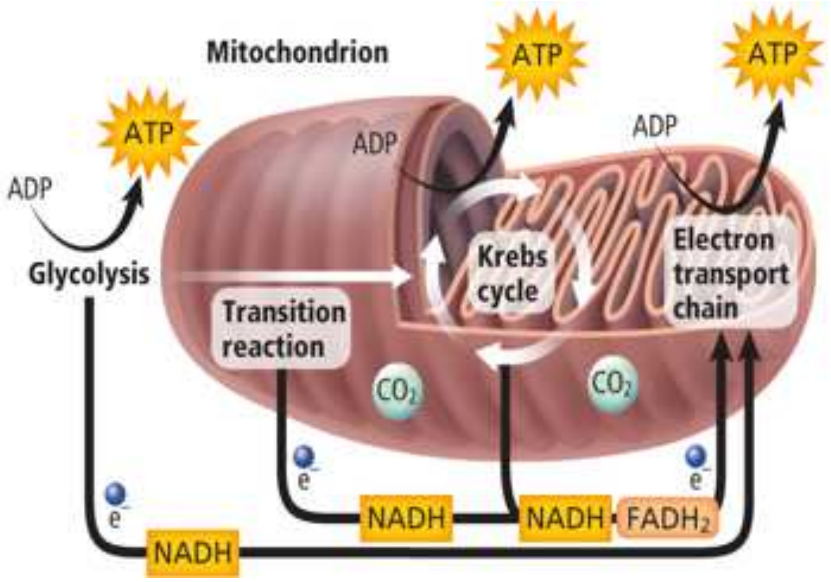
115. Which process does NOT occur in the organelle illustrated?



A. glycolysis
B. Krebs cycle
C. conversion of pyruvate into acetyl CoA
D. electron transport

116. Why is glycolysis an anaerobic process?

A. It produces carbon dioxide.
B. It does not produce carbon dioxide.
C. It uses oxygen in its steps.
D. It does not use oxygen in its steps.

117. Why is there a net yield of two, not four, ATP molecules in glycolysis?

A. 2 ATP are used to begin glycolysis.
B. 2 ATP are produced by ATP synthase.
C. 2 ATP are produced during glycolysis.
D. 2 ATP are used to complete glycolysis.

118. Which describes the process of glycolysis?

A. aerobic process that breaks down glucose
B. anaerobic process that breaks down glucose
C. aerobic process that manufactures glucose
D. anaerobic process that manufactures glucose

119. Glucose is broken down in the cytoplasm through the process of …

A. glycolysis
B. Krebs cycle
C. Calvin cycle
D. chemiosmosis

120. When pyruvate is converted to a 2-carbon intermediate called acetyl CoA, it produces …

A. NADH + ATP
B. NADH + CO_2
C. $FADH_2$ + CO_2
D. $FADH_2$ + ATP

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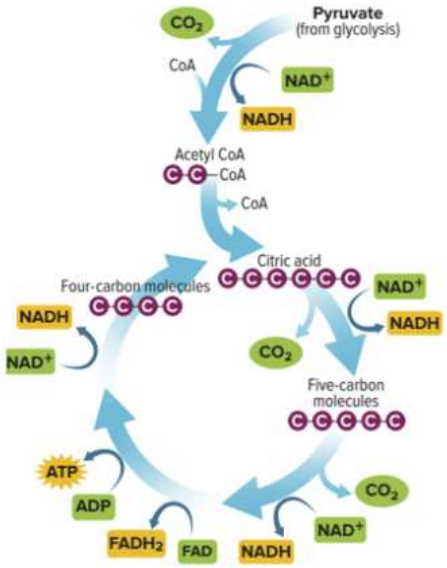
121. True or false: the final step of aerobic respiration, when most ATP is made, is called glycolysis.

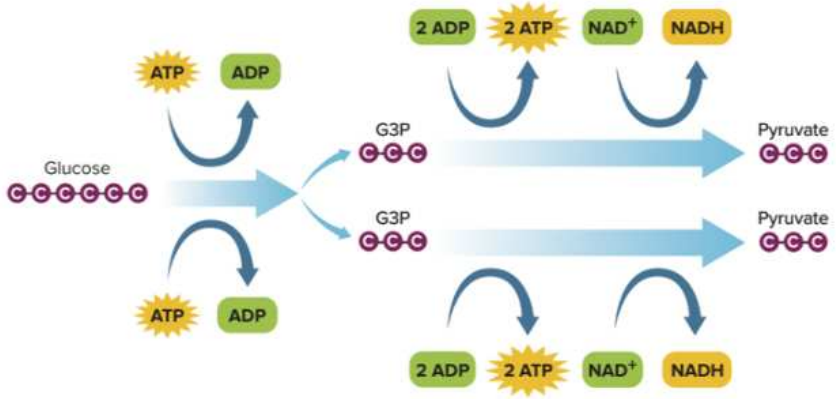
A. True
B. False

122. The figure shows the breakdown of pyruvate into carbon dioxide during the Krebs cycle. How many NADH molecules are produced from ONE pyruvate by the end of the cycle?



A. 1
B. 2
C. 4
D. 5

123. ★ The figure shows the products of glycolysis. What is the result of breaking down three glucose molecules?



A. six NADH and six pyruvate molecules
B. three NADH and four pyruvate molecules
C. three NADH and three pyruvate molecules
D. six NADH and three pyruvate molecules

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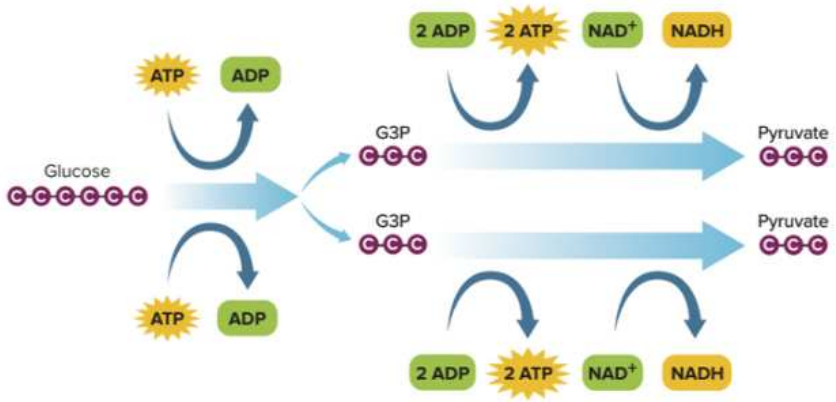
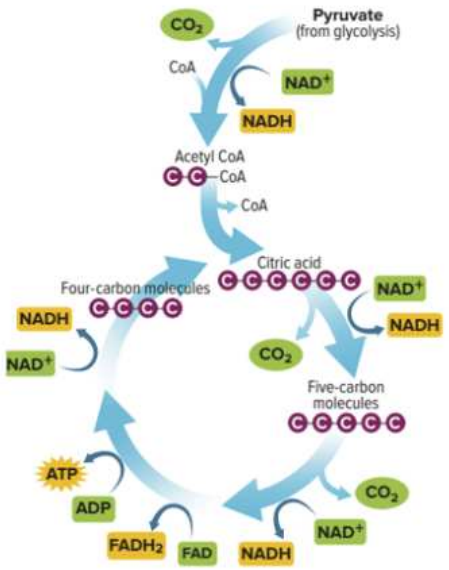
124. ★ **Which of the following products of glycolysis contains the most stored energy?**



A. NADH
B. ATP
C. ADP
D. pyruvate

Exam item Q22–23 · Page 43 · Figure 12

125. **The figure shows the breakdown of pyruvate through the Krebs cycle. How many ATP are produced from the NADH released by the breakdown of ONE pyruvate? (1 NADH → 3 ATP)**



A. 3
B. 6
C. 8
D. 12

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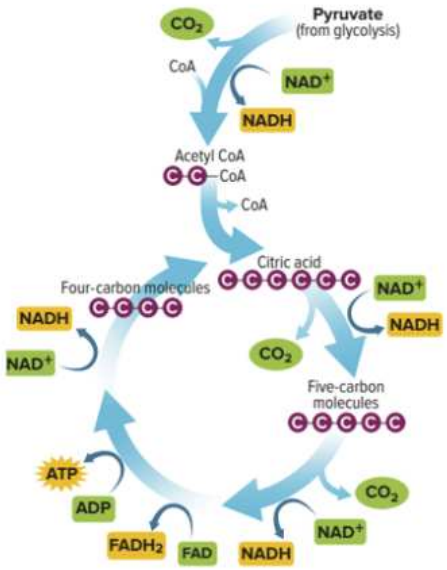
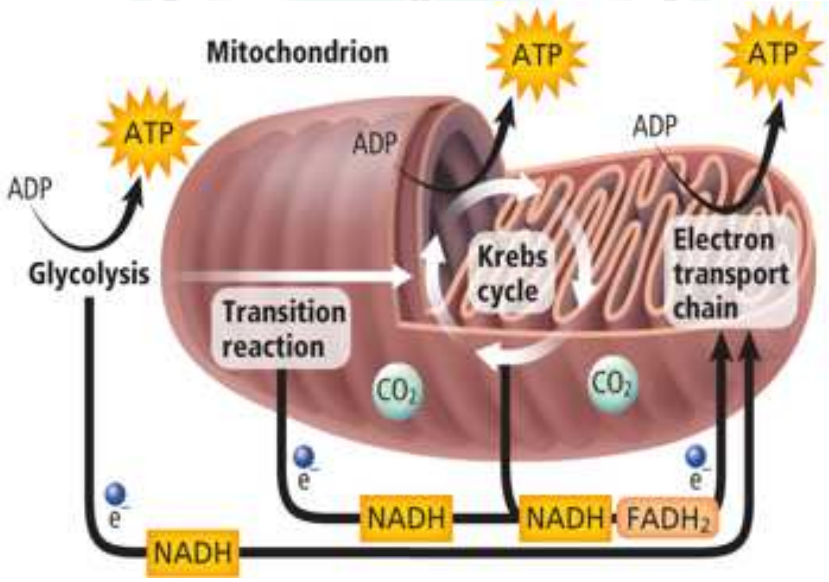
126. The figure shows the Krebs cycle and the preparatory reaction. In the electron transport chain, how many ATP are produced from all the NADH released when ONE glucose is broken down?



A. 30
B. 18
C. 12
D. 21

127. Which molecule generated by the Krebs cycle is a waste product?



A. CoA
B. CO_2
C. $FADH_2$
D. NADH

128. Which are the products of the preparatory reaction and the Krebs cycle after TWO turns (one glucose)?

A. 8 NADH, 6 CO_2, 2 $FADH_2$, 2 ATP
B. 4 NADH, 3 CO_2, 1 $FADH_2$, 1 ATP
C. 8 NADH, 3 CO_2, 2 $FADH_2$, 4 ATP
D. 2 NADH, 6 CO_2, 1 $FADH_2$, 2 ATP

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129. What is the importance of NADH and $FADH_2$?

A. They are useless by-products.
B. They are recycled for use in glycolysis.
C. They are used in the electron transport chain.
D. They are used as products in photosynthesis.

130. What is the series of reactions in which pyruvate is broken down into carbon dioxide called?

A. Krebs cycle
B. Calvin cycle
C. fermentation
D. glycolysis

131. Under ideal conditions, how many ATP molecules are made from cellular respiration in eukaryotic cells?

A. 32
B. 34
C. 36
D. 38

132. What driving force is responsible for most of the ATP made during respiration?

A. protons (H^+) moving down a concentration gradient
B. glucose moving into the mitochondrion
C. CO_2 diffusing out of the cell
D. light energy absorbed by pigments

133. What is produced when electrons leave the electron transport chain and bind to the final electron acceptor?

A. H_2O
B. CO_2
C. O_2
D. CO

134. The Krebs cycle is also known as the …

A. Calvin cycle
B. citric acid (TCA) cycle
C. C_4 pathway
D. ATP–ADP cycle

135. Where does the Krebs cycle take place in a eukaryotic cell?

A. cytoplasm
B. mitochondrial matrix
C. chloroplast stroma
D. outer mitochondrial membrane

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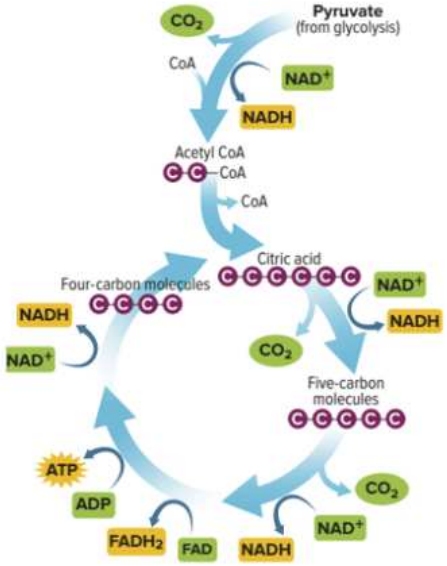
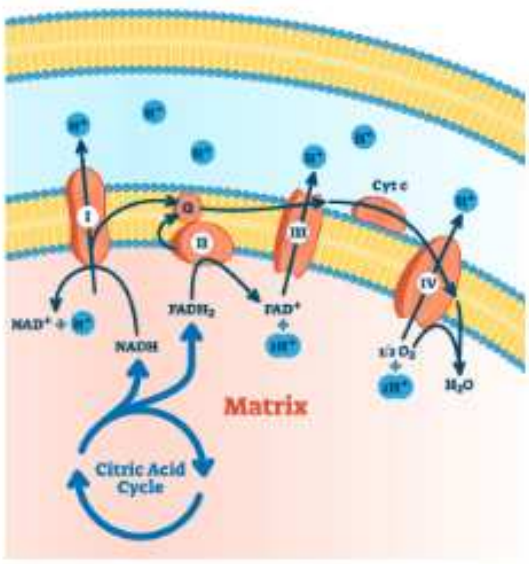
136. ★ **The figure shows the Krebs cycle and the preparatory reaction. How many ATP molecules are produced from the NADH released by the breakdown of one pyruvate molecule?**



A. 3
B. 6
C. 1
D. 12

Exam item Q24–25 · Page 44 · Figure 13

137. **What is the name of the process that occurs in the inner membrane of the mitochondrion shown in the figure?**



A. Krebs cycle
B. proton channel
C. ATP synthase
D. electron transport chain

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138. Where is the electron transport chain located in eukaryotic cells?

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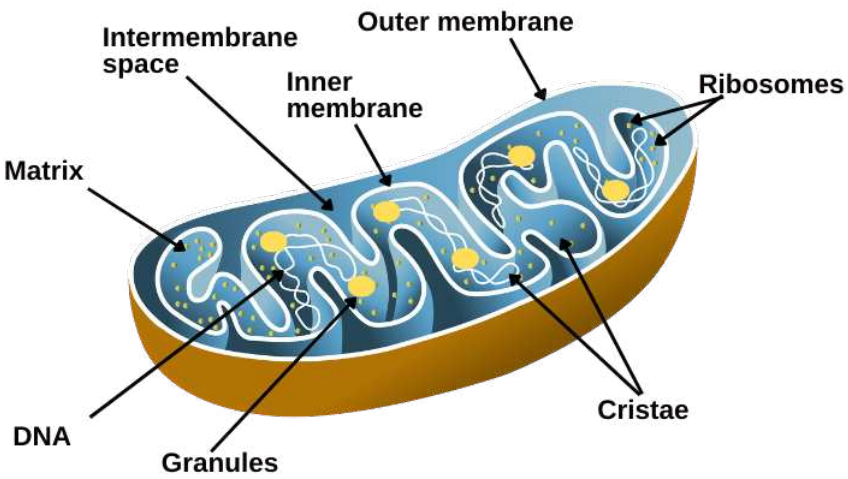

A. the mitochondrial matrix
B. the inner membrane of the mitochondrion
C. the intermembrane space
D. the outer membrane of the mitochondrion

139. Why is the electron transport chain an aerobic process?

A. It uses oxygen in its steps.
B. It produces carbon dioxide.
C. It does not use oxygen.
D. It does not produce CO_2.

140. What is the final electron acceptor in aerobic respiration?

A. NAD^+
B. hydrogen
C. FAD
D. oxygen

141. During which step of cellular respiration is H_2O formed?

A. Krebs cycle
B. chemiosmosis
C. electron transport chain
D. glycolysis

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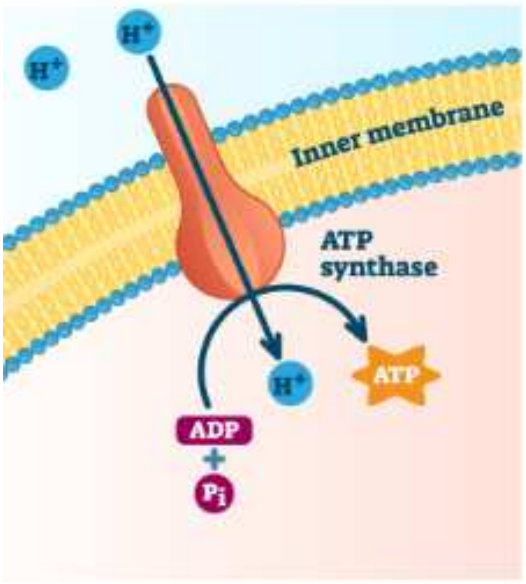
142. The process shown in the figure directly provides the energy for ATP production. It is called …



A. chemiosmosis
B. glycolysis
C. fermentation
D. diffusion

143. Which pair are BOTH products of the electron transport chain?

A. ATP and H_2O
B. CO_2 and NADH
C. O_2 and $FADH_2$
D. CO_2 and ATP

144. Which step happens FIRST in the electron transport chain?

A. NADH and $FADH_2$ release electrons and become NAD^+ and FAD.
B. H^+ ions diffuse through ATP synthase, converting ADP into ATP.
C. Oxygen accepts electrons and H^+ to form water.
D. H^+ build up in the intermembrane space.

145. In cellular respiration, where do the electrons in the electron transport chain come from, and where do they end up?

A. from NADH and $FADH_2$ → to oxygen
B. from water → to $NADP^+$
C. from oxygen → to glucose
D. from ATP → to ADP

146. Which correctly matches each process with its terminal electron acceptor?

A. photosynthesis: O_2 · aerobic respiration: $NADP^+$
B. photosynthesis: $NADP^+$ · aerobic respiration: O_2
C. photosynthesis: H_2O · aerobic respiration: CO_2
D. photosynthesis: FAD · aerobic respiration: NAD^+

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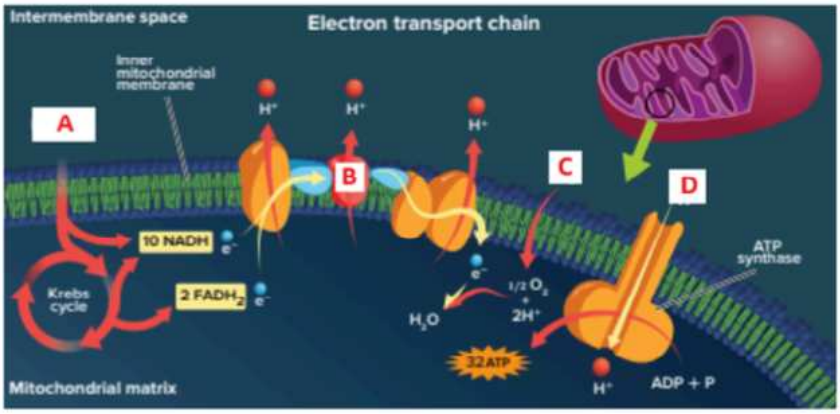
147. ★ **The figure shows the electron transport chain in a eukaryotic cell. Which letter refers to the final electron acceptor?**



A. A
B. B
C. D
D. C

Exam item Q24 · Page 44 · Text

148. **One molecule of glucose yields 38 ATP in cellular respiration in prokaryotes because …**

A. prokaryotes do not have mitochondria
B. prokaryotes do not have a nuclear membrane
C. prokaryotes are smaller
D. prokaryotes use the cell membrane for glycolysis

149. **In prokaryotic cells, where does the electron transport chain take place?**

A. inner mitochondrial membrane
B. cell (plasma) membrane
C. nucleus
D. thylakoid membrane

150. **In ANAEROBIC respiration, what do prokaryotes use as the terminal electron acceptor?**

A. oxygen
B. $NADP^+$
C. other molecules (not oxygen)
D. glucose

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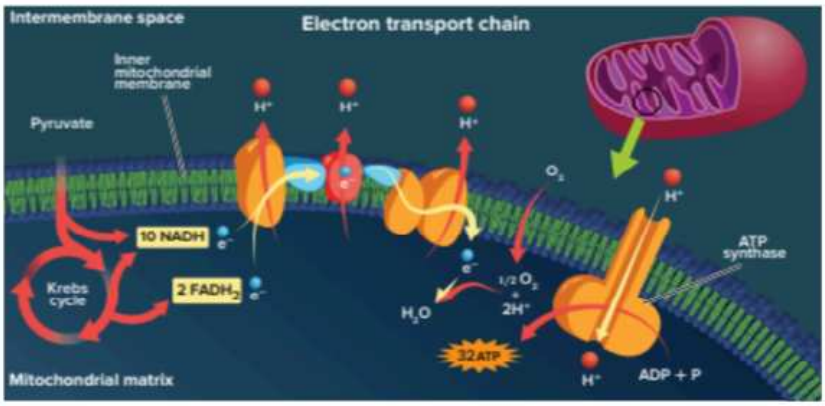
151. ★ The figure shows the electron transport chain in a eukaryotic cell. Which of the following steps does not occur in prokaryotic cells?



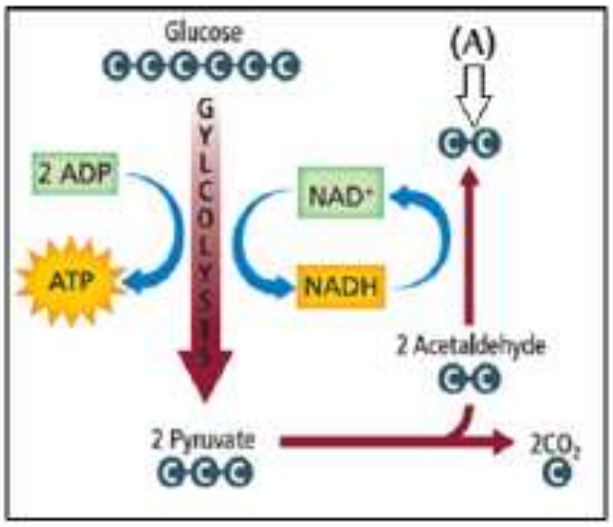
A. Krebs cycle
B. H^+ ion pumping
C. water formation
D. pyruvate transport

152. ★ Why does one molecule of glucose yield 36 ATP in cellular respiration in eukaryotic cells, compared with 38 ATP in prokaryotic cells?

A. because eukaryotic cells do not have mitochondria
B. because eukaryotic cells use the mitochondria as the location of the aerobic processes
C. because eukaryotic cells are smaller
D. because eukaryotic cells use the cell membrane as the location of glycolysis

Exam item Q26–27 · Page 45 · Figure 14

153. The graph represents the process of alcohol fermentation. Which of the following refers to the letter (A)?



A. lactic acid
B. ethanol
C. acetyl CoA
D. citric acid

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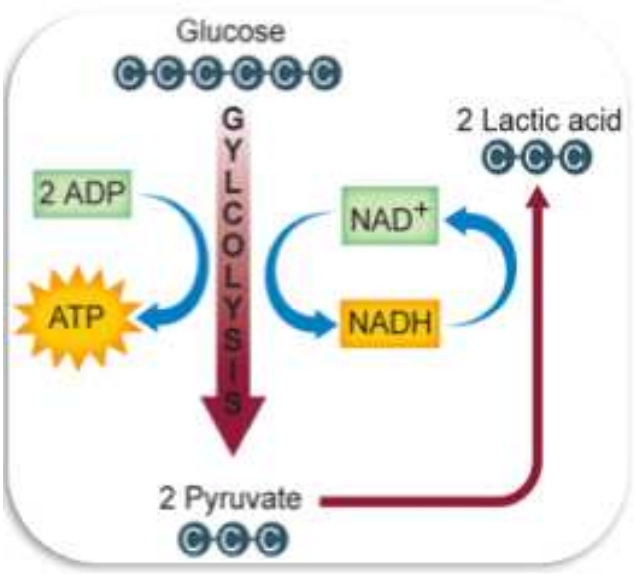
154. What prevents pyruvate from entering the Krebs cycle and instead results in the pathway shown?



A. a buildup of CO_2
B. a lack of oxygen
C. an excess of glucose
D. an increased demand for ATP

155. How are lactic acid fermentation and alcohol fermentation similar?

A. They have the same products.
B. They have the same reactants.
C. They both require oxygen.
D. They occur in the same organisms.

156. Fermentation is …

A. cellular respiration
B. photosynthesis
C. aerobic
D. anaerobic

157. Which is NOT a stage of aerobic cellular respiration?

A. glycolysis
B. Krebs cycle
C. electron transport chain
D. lactic acid fermentation

158. … occurs in the cytoplasm and regenerates the cell's supply of NAD^+ while producing a small amount of ATP.

A. Cellular respiration
B. Fermentation
C. Electron transport
D. Krebs cycle

159. Which describes the process of fermentation?

A. aerobic process that manufactures pyruvate
B. anaerobic process that manufactures pyruvate
C. anaerobic process that restores NAD^+ supply
D. aerobic process that restores NAD^+ supply

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160. Which is NOT a similarity between lactic acid fermentation and alcohol fermentation?

- **A.** Both occur in the cytoplasm.
- **B.** Both produce a small amount of ATP.
- **C.** Both produce lactic acid.
- **D.** Both regenerate the cell's supply of NAD^+.

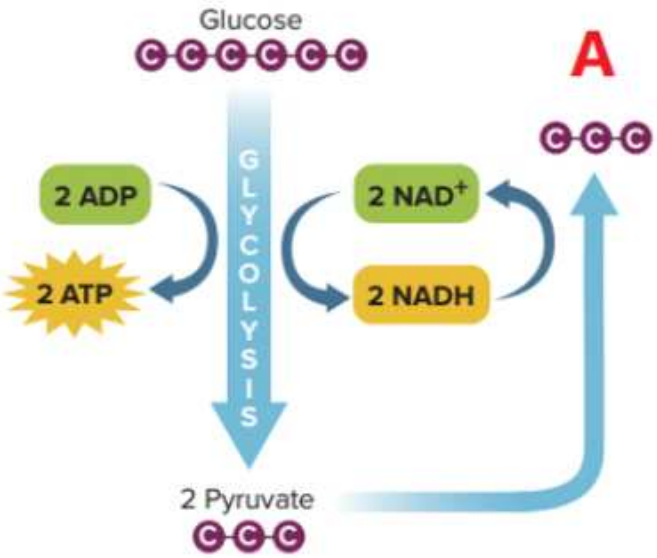
161. A football player feels soreness and fatigue in her leg muscles during a long match. What is the most likely cause?

- **A.** lactic acid fermentation when oxygen is limited
- **B.** alcohol fermentation in the muscles
- **C.** too much oxygen in the muscles
- **D.** photosynthesis in muscle cells

162. What are the products of alcohol fermentation by yeast?

- **A.** lactic acid and NAD^+
- **B.** ethyl alcohol, CO_2 and NAD^+
- **C.** glucose and O_2
- **D.** pyruvate and NADH

163. ★ The diagram shows lactic acid fermentation. What does the letter (A) refer to?



- **A.** one lactic acid molecule
- **B.** two lactic acid molecules
- **C.** three lactic acid molecules
- **D.** four lactic acid molecules

Exam item Q27–28 · Page 45 · Figure 14

164. Which are the products of alcohol fermentation?

- **A.** lactic acid and NAD^+
- **B.** ethyl alcohol, CO_2 and NAD^+
- **C.** pyruvate and NADH
- **D.** glucose and O_2

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165. Which reactants do lactic acid fermentation and alcohol fermentation share?

A. pyruvate and NADH
B. glucose and oxygen
C. lactic acid and CO_2
D. ATP and $FADH_2$

166. During a hard race, a runner's leg muscles feel tired and sore. What is the cause?

A. Lactic acid builds up because the body cannot supply enough oxygen.
B. Ethyl alcohol is produced in the muscle cells.
C. The muscles produce too much oxygen.
D. The Krebs cycle runs faster than normal.

Exam item Q29 · Page 46 · Figure 15

167. Which best identifies the relationship between photosynthesis and cellular respiration?

A. Both processes generate energy for cell use.
B. Both processes release energy for cell use.
C. The products of one process are the reactants of the other.
D. The reactants of one process are also the reactants of the other.

168. Which molecules released by cellular respiration are used as reactants in photosynthesis?

A. CO_2 and H_2O
B. O_2 and glucose
C. ATP and NADPH
D. pyruvate and O_2

169. Which statement correctly compares the two processes in terms of energy?

A. Photosynthesis stores energy in glucose; respiration releases it as ATP.
B. Both store energy in glucose.
C. Respiration stores energy; photosynthesis releases it.
D. Neither process involves energy change.

170. In Figure 15, in which organelles do the two processes take place?

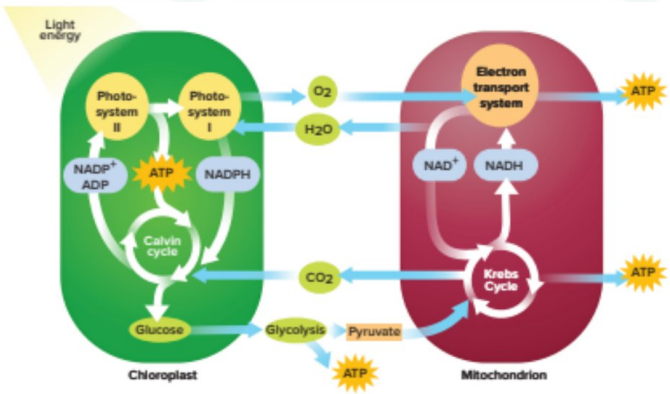

Figure 15 Photosynthesis and cellular respiration form a cycle.

A. photosynthesis: chloroplast · respiration: mitochondrion
B. photosynthesis: mitochondrion · respiration: chloroplast
C. both in the nucleus
D. both in the ribosome

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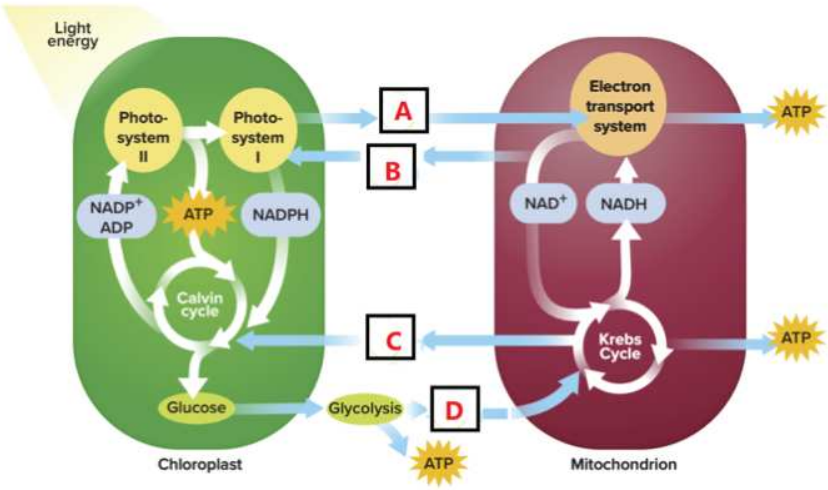
171. Building glycogen from glucose and breaking glucose down in glycolysis are examples of …

- **A.** an anabolic pathway (uses energy) and a catabolic pathway (releases energy)
- **B.** two catabolic pathways
- **C.** two anabolic pathways
- **D.** a catabolic pathway and an anabolic pathway

172. The UAE plants millions of mangrove trees along its coast. How does this help balance the carbon cycle?

- **A.** More photosynthesis removes CO_2 from the air.
- **B.** More respiration adds O_2 to the air.
- **C.** Mangroves burn fossil fuels.
- **D.** Mangroves stop all cellular respiration.

173. ★ The figure shows that photosynthesis and cellular respiration form a cycle. Which letter refers to pyruvate?



- **A.** A
- **B.** B
- **C.** C
- **D.** D

Exam item Q30 · Page 46 · Math

174. How many NADH and $FADH_2$ does the Krebs cycle produce from one glucose molecule?

- **A.** 2 NADH and 6 $FADH_2$
- **B.** 6 NADH and 2 $FADH_2$
- **C.** 3 NADH and 1 $FADH_2$
- **D.** 10 NADH and 2 $FADH_2$

175. Glycolysis produces 4 ATP. Why is its net gain only 2 ATP?

- **A.** Because 2 ATP are used to start the breakdown of glucose.
- **B.** Because 2 ATP are lost as carbon dioxide.
- **C.** Because 2 ATP are changed into NADH.
- **D.** Because the Krebs cycle uses 2 ATP.

176. How many NADH in total enter the electron transport chain from one glucose?

- **A.** 2
- **B.** 6
- **C.** 10
- **D.** 12

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Answer key

نموذج الإجابة

Quick key – grouped by exam item

Exam item	Question number – answer
Q1	1 – **C** 2 – **A** 3 – **D**
Q4	4 – **B** 5 – **B** 6 – **B** 7 – **B** 8 – **B** 9 – **D** 10 – **A** 11 – **B** 12 – **B** 13 – **B**
Q5–6	14 – **B** 15 – **D** 16 – **B** 17 – **B** 18 – **B** 19 – **D** 20 – **C** 21 – **D** 22 – **C**
Q7	23 – **A** 24 – **B** 25 – **C**
Q8	26 – **A** 27 – **C** 28 – **A** 29 – **A** 30 – **D** 31 – **A** 32 – **A** 33 – **B** 34 – **D**
Q2·3·5	35 – **A** 36 – **B** 37 – **B**
Q9	38 – **C** 39 – **A** 40 – **B** 41 – **A** 42 – **B** 43 – **A** 44 – **B** 45 – **B** 46 – **A** 47 – **B**
Q10	48 – **D** 49 – **A** 50 – **C** 51 – **B** 52 – **B** 53 – **C** 54 – **B** 55 – **B** 56 – **D**
Q11	57 – **B** 58 – **B** 59 – **C** 60 – **A** 61 – **B** 62 – **B** 63 – **D**
Q11–13	64 – **B** 65 – **B** 66 – **A**
Q14	67 – **B** 68 – **B** 69 – **B** 70 – **B** 71 – **B** 72 – **C** 73 – **A** 74 – **B** 75 – **B** 76 – **B** 77 – **C**
Q15	78 – **A** 79 – **C** 80 – **B** 81 – **A** 82 – **B** 83 – **D**
Q16	84 – **D** 85 – **D** 86 – **C** 87 – **D** 88 – **C** 89 – **C** 90 – **C** 91 – **A** 92 – **B** 93 – **A** 94 – **D**
Q17	95 – **A** 96 – **B** 97 – **C** 98 – **C** 99 – **A** 100 – **B** 101 – **D** 102 – **A** 103 – **A**
Q18–19	104 – **C** 105 – **B** 106 – **A** 107 – **D** 108 – **A** 109 – **B** 110 – **B** 111 – **B** 112 – **B** 113 – **A**
Q20–21	114 – **A** 115 – **A** 116 – **D** 117 – **A** 118 – **B** 119 – **A** 120 – **B** 121 – **B** 122 – **C** 123 – **A** 124 – **D**
Q22–23	125 – **D** 126 – **A** 127 – **B** 128 – **A** 129 – **C** 130 – **A** 131 – **C** 132 – **A** 133 – **A** 134 – **B** 135 – **B** 136 – **D**
Q24–25	137 – **D** 138 – **B** 139 – **A** 140 – **D** 141 – **C** 142 – **A** 143 – **A** 144 – **A** 145 – **A** 146 – **B** 147 – **D**
Q24	148 – **A** 149 – **B** 150 – **C** 151 – **D** 152 – **B**
Q26–27	153 – **B** 154 – **B** 155 – **B** 156 – **D** 157 – **D** 158 – **B** 159 – **C** 160 – **C** 161 – **A** 162 – **B** 163 – **B**
Q27–28	164 – **B** 165 – **A** 166 – **A**
Q29	167 – **C** 168 – **A** 169 – **A** 170 – **A** 171 – **A** 172 – **A** 173 – **D**
Q30	174 – **B** 175 – **A** 176 – **C**

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Full answers – the correct choice written out

No.	Answer	Correct answer	Exam item
1	C	Energy can be converted from one form to another, but it cannot be created or destroyed.	Q1
2	A	Energy cannot be converted without the loss of usable energy (entropy increases).	Q1
3	D	Chemical energy in the log is converted to heat and light.	Q1
4	B	daisy	Q4
5	B	a photoautotroph	Q4
6	B	heterotroph	Q4
7	B	heterotroph	Q4
8	B	B and C	Q4
9	D	D – the ladybug	Q4
10	A	the Sun	Q4
11	B	It decreases; some is lost as heat.	Q4
12	B	Only B	Q4
13	B	hydrogen sulfide	Q4
14	B	catabolic pathway that breaks molecules into energy	Q5–6
15	D	Energy is released by the breakdown of molecules.	Q5–6
16	B	cellular respiration	Q5–6
17	B	reactions in which the product of one reaction is the substrate for the next	Q5–6
18	B	More light and CO_2 increase the rate	Q5–6
19	D	(D) chlorophyll	Q5–6
20	C	building muscle tissue	Q5–6
21	D	cellular respiration	Q5–6
22	C	metabolic pathways (chemical reactions in a cell)	Q5–6
23	A	chemical energy → mechanical energy	Q7
24	B	ATP	Q7
25	C	in the bonds of biological molecules	Q7
26	A	a phosphate group	Q8
27	C	It stores and releases chemical energy.	Q8
28	A	ADP	Q8
29	A	anabolic	Q8
30	D	in the bonds between phosphate groups	Q8
31	A	when a phosphate group is removed	Q8
32	A	adenine, ribose, three phosphate groups	Q8
33	B	muscle contraction	Q8
34	D	(2) AMP, (1) ATP	Q8
35	A	A plant converts light energy into chemical energy stored in glucose.	Q2·3·5
36	B	Anabolic pathways use energy to build large molecules; catabolic pathways break them down and release energy.	Q2·3·5
37	B	Some energy is lost as heat (second law).	Q2·3·5
38	C	sunlight, carbon dioxide and water	Q9
39	A	True	Q9
40	B	CO_2 and H_2O (with light energy)	Q9
41	A	$C_6H_{12}O_6$ and O_2	Q9
42	B	Phase 1 is light-dependent in the thylakoids; phase 2 is light-independent in the stroma.	Q9
43	A	oxygen	Q9
44	B	light → chemical	Q9
45	B	the process autotrophs use to make sugar	Q9
46	A	Glucose	Q9
47	B	Light energy splits water into oxygen and hydrogen ions.	Q9
48	D	chlorophyll	Q10
49	A	A thylakoid is a saclike membrane arranged in stacks; the space inside it is the thylakoid space.	Q10
50	C	thylakoids	Q10
51	B	thylakoid (membrane)	Q10
52	B	granum	Q10
53	C	chloroplasts	Q10
54	B	2 – stroma	Q10

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No.	Answer	Correct answer	Exam item
55	B	the fluid-filled space outside the grana	Q10
56	D	4	Q10
57	B	500–600 nm	Q11
58	B	500 nm	Q11
59	C	pigments	Q11
60	A	400–500 nm	Q11
61	B	Chlorophyll breaks down, revealing other pigments.	Q11
62	B	Chlorophyll reflects green light.	Q11
63	D	Chlorophylls reflect light in the green region.	Q11
64	B	Chlorophyll breaks down, revealing the colours of the other pigments.	Q11–13
65	B	Chlorophylls reflect green light.	Q11–13
66	A	It would absorb less light in the wavelengths that chlorophyll b absorbs, so photosynthesis decreases.	Q11–13
67	B	chemiosmosis	Q14
68	B	H_2O	Q14
69	B	water	Q14
70	B	Photosystem II	Q14
71	B	2	Q14
72	C	NADPH and ATP	Q14
73	A	ATP	Q14
74	B	True	Q14
75	B	$NADP^+$	Q14
76	B	No NADPH would form, so the Calvin cycle could not make sugars.	Q14
77	C	H_2O	Q14
78	A	ferredoxin	Q15
79	C	H_2O	Q15
80	B	thylakoid space	Q15
81	A	ADP is converted to ATP.	Q15
82	B	$NADP^+$	Q15
83	D	D	Q15
84	D	to store chemical energy in more stable organic molecules	Q16
85	D	3-PGA → G3P → RuBP	Q16
86	C	ribulose 1,5-bisphosphate (RuBP)	Q16
87	D	glucose	Q16
88	C	RuBP	Q16
89	C	(C) – G3P	Q16
90	C	3	Q16
91	A	rubisco	Q16
92	B	False – it is phase II, light-independent	Q16
93	A	starch	Q16
94	D	3-phosphoglycerate + ATP + NADPH → G3P	Q16
95	A	C_4 plants fix CO_2 into 4-carbon molecules instead of 3-carbon molecules.	Q17
96	B	hot and dry	Q17
97	C	They help the plant conserve water.	Q17
98	C	They include cacti and pineapple and fix CO_2 into organic molecules at night.	Q17
99	A	sugarcane and corn	Q17
100	B	enough CO_2 uptake while water loss is minimized	Q17
101	D	sugarcane	Q17
102	A	deserts and salt marshes	Q17
103	A	More light and CO_2 increase the rate.	Q17
104	C	$C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O$ + energy	Q18–19
105	B	glycolysis → Krebs cycle → electron transport	Q18–19
106	A	glycolysis	Q18–19
107	D	It does not require oxygen.	Q18–19
108	A	$C_6H_{12}O_6$ and O_2	Q18–19
109	B	CO_2, H_2O and energy (ATP)	Q18–19
110	B	mitochondria	Q18–19

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No.	Answer	Correct answer	Exam item
111	B	True	Q18–19
112	B	to break down food and store its energy in ATP	Q18–19
113	A	glycolysis	Q18–19
114	A	two ATP and two pyruvate molecules	Q20–21
115	A	glycolysis	Q20–21
116	D	It does not use oxygen in its steps.	Q20–21
117	A	2 ATP are used to begin glycolysis.	Q20–21
118	B	anaerobic process that breaks down glucose	Q20–21
119	A	glycolysis	Q20–21
120	B	NADH + CO_2	Q20–21
121	B	False – it is the electron transport chain	Q20–21
122	C	4	Q20–21
123	A	six NADH and six pyruvate molecules	Q20–21
124	D	pyruvate	Q20–21
125	D	12	Q22–23
126	A	30	Q22–23
127	B	CO_2	Q22–23
128	A	8 NADH, 6 CO_2, 2 $FADH_2$, 2 ATP	Q22–23
129	C	They are used in the electron transport chain.	Q22–23
130	A	Krebs cycle	Q22–23
131	C	36	Q22–23
132	A	protons (H^+) moving down a concentration gradient	Q22–23
133	A	H_2O	Q22–23
134	B	citric acid (TCA) cycle	Q22–23
135	B	mitochondrial matrix	Q22–23
136	D	12	Q22–23
137	D	electron transport chain	Q24–25
138	B	the inner membrane of the mitochondrion	Q24–25
139	A	It uses oxygen in its steps.	Q24–25
140	D	oxygen	Q24–25
141	C	electron transport chain	Q24–25
142	A	chemiosmosis	Q24–25
143	A	ATP and H_2O	Q24–25
144	A	NADH and $FADH_2$ release electrons and become NAD^+ and FAD.	Q24–25
145	A	from NADH and $FADH_2$ → to oxygen	Q24–25
146	B	photosynthesis: $NADP^+$ · aerobic respiration: O_2	Q24–25
147	D	C	Q24–25
148	A	prokaryotes do not have mitochondria	Q24
149	B	cell (plasma) membrane	Q24
150	C	other molecules (not oxygen)	Q24
151	D	pyruvate transport	Q24
152	B	because eukaryotic cells use the mitochondria as the location of the aerobic processes	Q24
153	B	ethanol	Q26–27
154	B	a lack of oxygen	Q26–27
155	B	They have the same reactants.	Q26–27
156	D	anaerobic	Q26–27
157	D	lactic acid fermentation	Q26–27
158	B	Fermentation	Q26–27
159	C	anaerobic process that restores NAD^+ supply	Q26–27
160	C	Both produce lactic acid.	Q26–27
161	A	lactic acid fermentation when oxygen is limited	Q26–27
162	B	ethyl alcohol, CO_2 and NAD^+	Q26–27
163	B	two lactic acid molecules	Q26–27
164	B	ethyl alcohol, CO_2 and NAD^+	Q27–28
165	A	pyruvate and NADH	Q27–28
166	A	Lactic acid builds up because the body cannot supply enough oxygen.	Q27–28

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No.	Answer	Correct answer	Exam item
167	**C**	The products of one process are the reactants of the other.	Q29
168	**A**	CO_2 and H_2O	Q29
169	**A**	Photosynthesis stores energy in glucose; respiration releases it as ATP.	Q29
170	**A**	photosynthesis: chloroplast · respiration: mitochondrion	Q29
171	**A**	an anabolic pathway (uses energy) and a catabolic pathway (releases energy)	Q29
172	**A**	More photosynthesis removes CO_2 from the air.	Q29
173	**D**	D	Q29
174	**B**	6 NADH and 2 $FADH_2$	Q30
175	**A**	Because 2 ATP are used to start the breakdown of glucose.	Q30
176	**C**	10	Q30

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