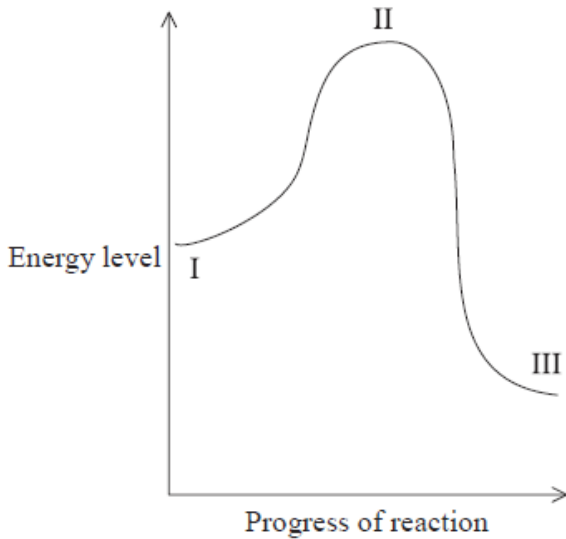


HL Paper 1

The graph below shows energy changes during a chemical reaction that occurs without a catalyst. What would change if the reaction was catalysed by an enzyme?



- A. The initial energy level (I) would be higher, speeding up the reaction.
- B. The maximum energy level (II) would be higher, speeding up the reaction.
- C. The maximum energy level (II) would be lower, speeding up the reaction.
- D. The final energy level (III) would be lower, speeding up the reaction.

Markscheme

C

Examiners report

[N/A]

How does a competitive inhibitor interact with an enzyme?

- A. It binds to the active site, denaturing the enzyme.
- B. It binds to the active site, preventing substrate binding.
- C. It binds to an allosteric site, causing conformational change of the enzyme.
- D. It binds to the allosteric site, causing competition with the substrate.

Markscheme

B

Examiners report

N/A

Which technological advance enabled Calvin to perform his lollipop experiment on the light-independent reactions of photosynthesis in 1949?

- A. Methods for tracing radioactive carbon incorporated in molecules produced by the alga *Chlorella*
- B. Development of electron microscopes enabling the molecules produced by the alga *Scenedesmus* to be viewed
- C. Methods for changing the wavelength of light shining on the alga *Scenedesmus* contained in the lollipop
- D. Development of X-ray diffraction techniques enabling the molecules produced by the alga *Chlorella* to be identified

Markscheme

A

Examiners report

[N/A]

Which of the following factors influence(s) the rate of oxygen production in photosynthesis?

- I. Temperature
- II. Wavelength of light
- III. Number of mitochondria

- A. I only
- B. I and II only
- C. II and III only
- D. I, II and III

Markscheme

B

Examiners report

N/A

Where precisely in the cell do the reactions of the Krebs cycle take place?

- A. In the cytoplasm
- B. In the space between the inner and outer membrane of the mitochondria
- C. On the surface of cristae in the mitochondria
- D. In the fluid matrix of the mitochondria

Markscheme

D

Examiners report

N/A

What reaction, involving glycerate 3-phosphate, is part of the light-independent reactions of photosynthesis?

- A. Glycerate 3-phosphate is carboxylated using carbon dioxide.
- B. Two glycerate 3-phosphates are linked together to form one hexose phosphate.
- C. Glycerate 3-phosphate is reduced to triose phosphate.
- D. Five glycerate 3-phosphates are converted to three ribulose 5-phosphates.

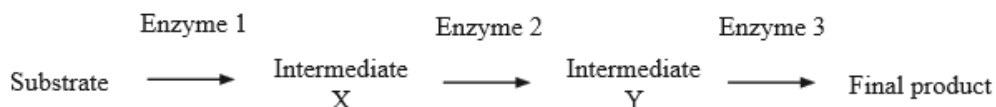
Markscheme

C

Examiners report

[N/A]

A substrate undergoes a series of enzyme-catalysed reactions to form intermediate substances X, Y and then the final product.



What would be the effect on the reaction of adding a competitive inhibitor to enzyme 2?

- A. The substrate would not react to form intermediate X.
- B. The concentration of intermediate X would increase.
- C. The activity of enzyme 3 would increase to compensate.
- D. No final product would be formed.

Markscheme

B

Examiners report

Fewer than half of candidates answered question 26 correctly. Many thought that a competitive inhibitor of an intermediate enzyme in a pathway would prevent any final product from being formed. This is not likely because whatever the quantity of inhibitor, the substrate of the inhibited enzyme would still sometimes manage to bind to the active site and there would be some final product. The expected answer was that the substrate of the inhibited enzyme would accumulate.

Which reaction does **not** cause a net release of energy?

- A. ADP combines with inorganic phosphate to form ATP
- B. ATP releases inorganic phosphate to form ADP
- C. Loss of hydrogen from reduced NAD
- D. Oxidation of reduced FAD

Markscheme

A

Examiners report

[N/A]

In the light-dependent reactions of photosynthesis what supplies low energy electrons to photosystem II?

- A. Photolysis of water
- B. Reduction of NADP⁺
- C. Chemiosmosis
- D. Photosystem I

Markscheme

A

Examiners report

N/A

Which describes the role of amino acids in the channels of membrane proteins used for facilitated diffusion?

- A. Polar amino acids create a channel through which hydrophilic molecules can pass.
- B. Polar amino acids create a channel through which hydrophobic molecules can pass.
- C. Non-polar amino acids create a channel through which hydrophilic molecules can pass.
- D. Non-polar amino acids create a channel through which hydrophobic molecules can pass.

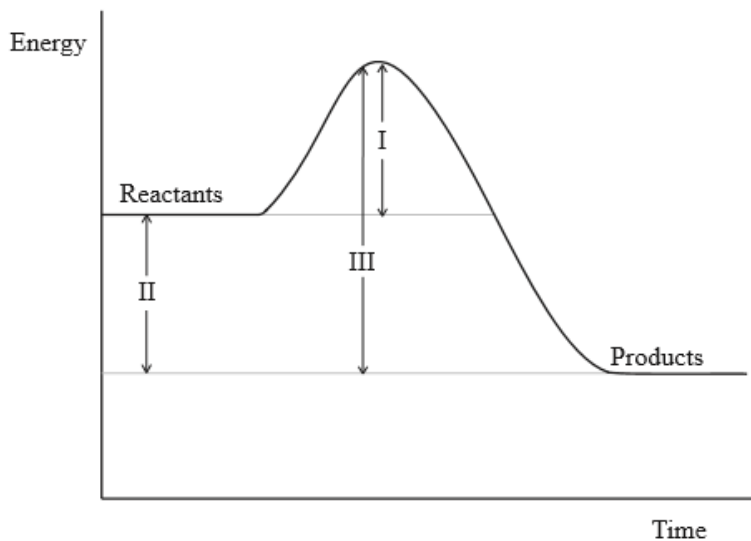
Markscheme

A

Examiners report

This was answered less successfully than expected. Many candidates thought that channel proteins are used to convey hydrophobic molecules across a membrane when it is hydrophilic particles whose diffusion has to be facilitated.

What effect would adding an enzyme have on energy changes during the reaction?



- A. Reduce energy change I
- B. Reduce energy change II
- C. Increase energy change II
- D. Increase energy change III

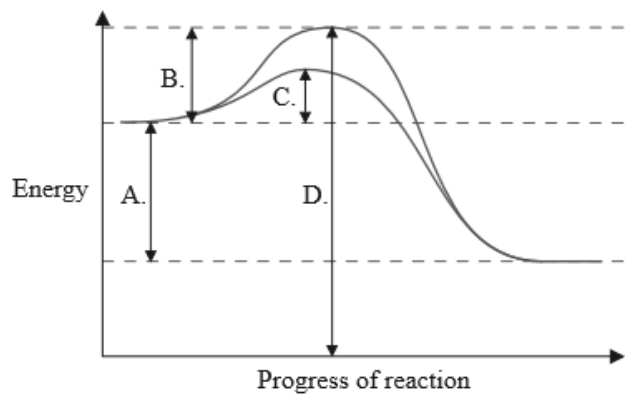
Markscheme

A

Examiners report

N/A

The following graph shows energy changes with and without enzymes during a chemical reaction. Which letter represents the activation energy required to carry out this reaction without an enzyme catalyst?



Markscheme

B

Examiners report

N/A

What process occurs during the light-independent reactions of photosynthesis?

- A. Oxygen is released into the atmosphere.
- B. Protons are pumped from the thylakoid space to the stroma.
- C. RuBP is carboxylated then regenerated in the Calvin cycle.
- D. Triose phosphate is converted to glycerate 3-phosphate.

Markscheme

C

Examiners report

[N/A]

Which of the following is a role of ATP in photosynthesis?

- A. It provides the energy to make carbohydrate molecules.
- B. It splits water molecules to form oxygen and hydrogen.
- C. It breaks down pyruvate into carbon dioxide.
- D. It converts light energy into chemical energy.

Markscheme

A

Examiners report

N/A

What occurs during the light-independent reactions of photosynthesis?

- A. ATP is produced.
- B. Ribose reacts with carbon dioxide to form glucose.
- C. Energy for the cycle is provided by the light-dependent reaction.
- D. Darkness stimulates the conversion of glucose to starch.

Markscheme

C

Examiners report

Question 30 was answered relatively poorly. Many thought that ATP is produced during the light independent reactions of photosynthesis, perhaps through misreading the question as light dependent reactions. Even more candidates thought that ribose reacts with carbon dioxide during the light independent reactions. Perhaps these candidates were thinking that the abbreviation RuBP means ribose bisphosphate, rather than ribulose bisphosphate. In assessment statement 8.2.5, the name of this chemical is given in full in the teachers' note and the abbreviation in parentheses, so the full name should be taught. Abbreviations of chemical names can be very ambiguous and in most cases Higher Level students should be familiar with the full name, not just the abbreviation.

What is the role of NADH + H⁺ in aerobic cell respiration?

- A. To transfer hydrogen to the electron transport chain
- B. To reduce intermediates in the Krebs cycle
- C. To accept electrons from the electron transport chain
- D. To combine with oxygen to produce water

Markscheme

A

Examiners report

[N/A]

What is an allosteric site?

- A. The area on an enzyme that binds the end-product of a metabolic pathway
- B. The area on a competitor molecule that inhibits an enzyme reaction
- C. The site on an enzyme where the substrate binds
- D. The active part of a non-competitive inhibitor of an enzyme reaction

Markscheme

A

Examiners report

N/A

How has the transmission of HIV been reduced?

- A. Delaying the progression of HIV to AIDS
- B. Single use of disposable needles
- C. Treatment with antibiotics
- D. Vaccination

Markscheme

B

Examiners report

[N/A]

What is the total number of ATP molecules used and produced during glycolysis?

	ATP used during glycolysis	ATP produced during glycolysis
A.	2	2
B.	0	2
C.	2	4
D.	4	4

Markscheme

C

Examiners report

There was a small typographical error in a column heading of the table in Question 28 but this did not seem to affect candidates' answers and more than 80% showed good knowledge of the numbers of ATP molecules produced and used in glycolysis.

On sites polluted with heavy metals, some grasses show tolerance to concentrations of those metals that are normally toxic. What explains this tolerance?

- A. Grasses continually exposed to high doses of heavy metals mutate.
- B. Rapid reproduction rate of grasses produces little genetic variation.
- C. Grasses not killed by the heavy metals reproduce and pass on their genes.
- D. Heavy metals become less toxic over time.

Markscheme

C

Examiners report

[N/A]

In the mitochondrial electron transport chain, what is the last electron acceptor?

- A. CO₂
- B. H₂O
- C. O₂
- D. NAD

Markscheme

C

Examiners report

N/A

What products of the light-dependent reactions are used in the light-independent reactions?

- A. ATP and NADPH
- B. NADPH and ribulose biphosphate (RuBP)
- C. CO₂ and ATP
- D. ATP and O₂

Markscheme

A

Examiners report

[N/A]

What causes cyclic photophosphorylation to occur in photosynthesis?

- A. Reduced NADP is accumulating in the stroma.
- B. Photoactivation of photosystem II is inhibited.
- C. Light-dependent reactions are slower than light-independent reactions.
- D. ATP is not required for the Calvin cycle.

Markscheme

A

Examiners report

Comments on this question varied from congratulations on a novel approach to the fact that it was tough and not on the syllabus. It is covered by 8.2.3 'explain the light dependent reactions'.

Which is correct for the non-competitive inhibition of enzymes?

	Inhibitor resembles substrate	Inhibitor binds to active site
A.	+	+
B.	+	-
C.	-	+
D.	-	-

Markscheme

D

Examiners report

There have been complaints about the fact that some candidates found it hard to understand that a plus meant present and a minus meant absent. Having said this, this was the most discriminating question of the paper, showing most good candidates did understand it.

When is energy released in a cell?

- A. ADP combines with inorganic phosphate.
- B. ATP releases inorganic phosphate.
- C. NAD^+ combines with hydrogen.
- D. NAD^+ releases hydrogen.

Markscheme

B

Examiners report

N/A

From which substrate is the first carbon dioxide molecule released during cellular respiration?

- A. Glucose
- B. Pyruvate
- C. Acetyl CoA
- D. Citrate (a C₆ intermediate compound in the Krebs cycle)

Markscheme

B

Examiners report

[N/A]

Where are complex carbohydrates made in the chloroplast?

- A. In the intermembrane space
- B. In the stroma
- C. On the inner membrane
- D. In the thylakoid space

Markscheme

B

Examiners report

N/A

What describes non-competitive inhibition?

- A. Inhibiting molecule does not resemble substrate and binds to an area other than active site
- B. Inhibiting molecule resembles substrate and binds to active site

- C. Inhibiting molecule does not resemble substrate and binds to active site
- D. Inhibiting molecule resembles substrate and binds to an area other than active site

Markscheme

A

Examiners report

[N/A]

What is chemiosmosis?

- A. Coupling of ATP synthesis to the electron transport and proton movement
- B. Phosphorylation of glucose in the mitochondrial matrix
- C. H⁺ ions moving down a concentration gradient into the mitochondrial matrix
- D. Activation of ATPase in order to synthesize ATP

Markscheme

A

Examiners report

This caused more difficulty to candidates than expected though the better-prepared candidates mostly answered it correctly. In AS 8.1.5 and AS 8.2.4 it is clear that chemiosmosis involves the synthesis of ATP. This is achieved using potential energy stored in the form of a proton gradient and this gradient is built up by electron transport. The correct answer was therefore A. Answer C should have been rejected because it does not include ATP synthesis and it refers to the mitochondrion only, excluding chemiosmosis in photosynthesis.

What is the difference between movement of the knee joint and hip joint?

- A. The knee only allows flexion whereas the hip allows flexion and extension.
- B. The knee allows more rotation than the hip.
- C. The knee is used to walk forwards whereas the hip is used for running around corners.
- D. The knee allows movement in one plane whereas the hip allows movement in three planes.

Markscheme

D

Examiners report

[N/A]

What is produced by the light-dependent reactions of photosynthesis and used in the Calvin cycle?

- A. Hydrogen and oxygen
- B. ATP and NADPH
- C. NADPH and oxygen
- D. ATP and CO₂

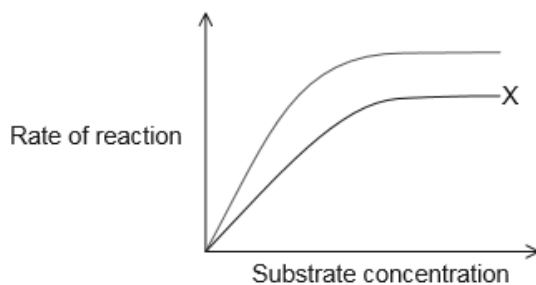
Markscheme

B

Examiners report

N/A

The graph shows an example of an enzyme-catalysed reaction.



What does the curve labelled X represent?

- A. No inhibition
- B. Competitive inhibition
- C. Non-competitive inhibition
- D. Reversible inhibition

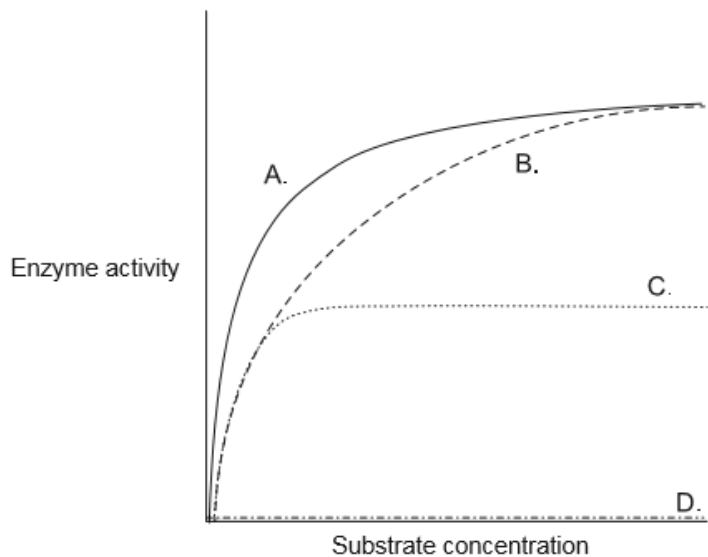
Markscheme

C

Examiners report

[N/A]

In one of the curves in the graph, the rate of an enzyme-catalysed reaction has been plotted against the substrate concentration in presence of a small quantity of a competitive inhibitor. Which curve represents competitive inhibition?



Markscheme

B

Examiners report

This question had very high discrimination; good candidates were able to answer it well. It is true that the question ought to have clearly stated that A was the graph showing enzyme activity without inhibitor, therefore allowing candidates to compare with the activity using an inhibitor. As this graph is in most books, candidates did not seem to have any problems answering that B was the curve showing competitive inhibition.

Where is chlorophyll found in a plant cell?

- A. Thylakoid membranes
- B. Stroma
- C. Matrix
- D. Cristae

Markscheme

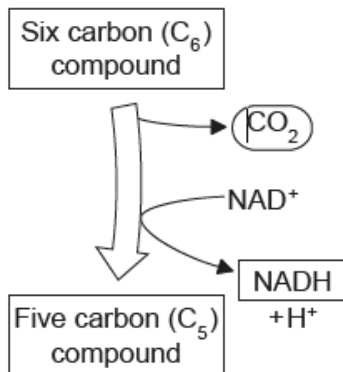
A

Examiners report

While the majority of candidates correctly answered that chlorophyll is found in the thylakoid membranes, a sizable group chose the stroma instead.

In AS 8.2.6 the structure and function of the chloroplast is covered. Photosystems embedded in the membrane would be expected.

This reaction occurs in mitochondria.



What explains that this reaction enables energy to be converted into a usable form?

- A. The oxidized NAD⁺ will transfer the energy from the C₆ compound to ATP.
- B. The chemical energy stored in the C₆ compound is used to reduce NAD⁺ allowing ATP production.
- C. Energy stored in the CO₂ molecule will generate an electron gradient.
- D. The C₆ compound is reduced and the energy resulting from the removal of one carbon is used to oxidize NAD⁺.

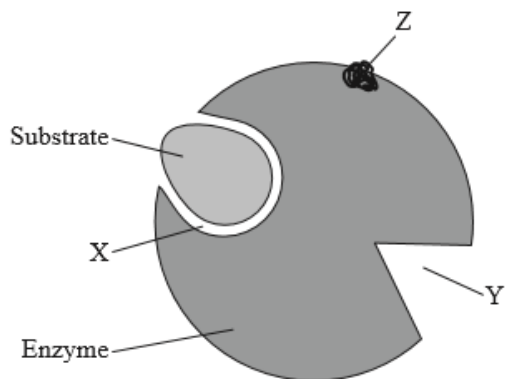
Markscheme

B

Examiners report

[N/A]

The diagram represents an allosteric enzyme.



Where would the following inhibitors be most likely to bind?

	End-product inhibitor	Competitive inhibitor	Non-competitive inhibitor
A.	X	Y	Z
B.	Y	Z	X
C.	X	Z	Y
D.	Y	X	Z

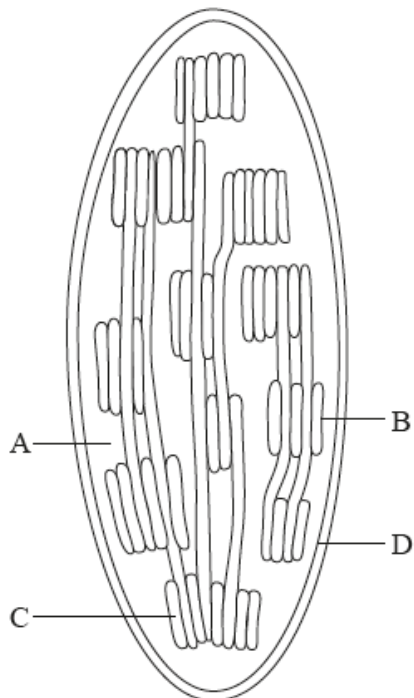
Markscheme

D

Examiners report

There were some comments from teachers about the clarity of the diagram. More than three quarters of candidates answered it correctly, and in fact all that was needed was the identification of the active site as the position at which a competitive inhibitor would bind. The diagram might be useful in future teaching as it distinguishes between the binding sites of three types of inhibitor: competitive, non-competitive allosteric and non-competitive non-allosteric.

Where is ATP synthase located?



Markscheme

B

Examiners report

There was a comment that C was not clearly pointing to the intermembrane space. However it is clearly not pointing to the same as B and is sufficiently clear. This proved to be a discriminating question, due to the subject area not the diagram.

In a chloroplast where are the enzymes of the Calvin cycle located?

- A. Thylakoid membranes
- B. Stroma
- C. Grana
- D. Outer membrane of chloroplast

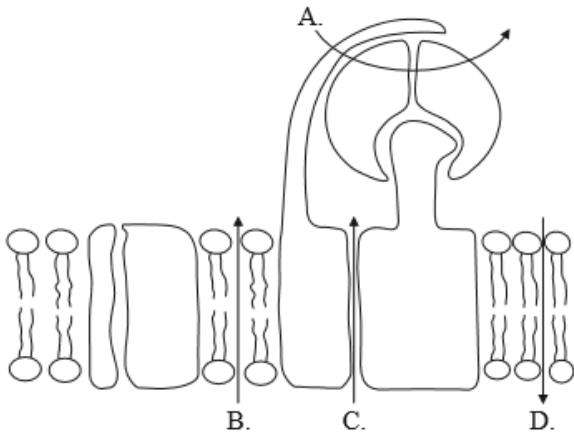
Markscheme

B

Examiners report

N/A

The diagram represents components of the cristae in mitochondria. Which arrow indicates how protons (H^+) move to generate ATP directly?



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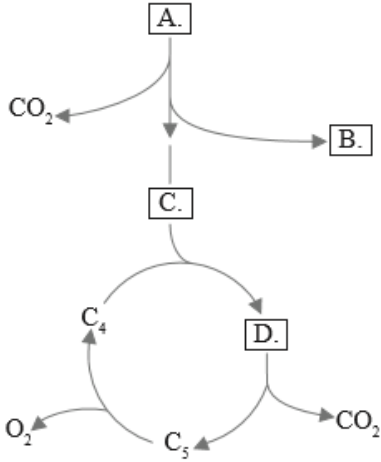
Markscheme

C

Examiners report

N/A

In the following diagram of a metabolic pathway, which letter represents acetyl CoA?



Markscheme

C

Examiners report

N/A

What happens for each glucose during glycolysis?

- A. Four ATP are used.
- B. Two three-carbon compounds are formed.
- C. Two NADPH + H⁺ are formed.
- D. Two pyruvates are decarboxylated

Markscheme

B

Examiners report

N/A

Which molecule would first contain ^{14}C if the alga *Chlorella* was grown in the presence of light and radioactive CO_2 ?

- A. Glycerate 3-phosphate
- B. Glucose
- C. Rubisco
- D. Ribulose biphosphate (RuBP)

Markscheme

A

Examiners report

Teachers complained that this was a tricky question. Most candidates chose the correct answer of G3P, but some believed that RuBP was the first to contain radioactive carbon. The major complaint was that in the question the fact that ^{14}C was radioactive was not stated in the question. This is in the guide, so part of the testing required candidates to infer this from the question.

During glycolysis a hexose sugar is broken down to two pyruvate molecules. What is the correct sequence of stages?

- A. Phosphorylation → oxidation → lysis
- B. Oxidation → phosphorylation → lysis
- C. Phosphorylation → lysis → oxidation
- D. Lysis → oxidation → phosphorylation

Markscheme

C

Examiners report

Some teachers complained that the sequence of glycolysis is not needed, only the processes. It is hard to imagine how one can teach the process without doing so in a sequence.

What is the link reaction in aerobic respiration?

- A. Pyruvate is carboxylated, acetyl reacts with coenzyme A, reducing NADH + H⁺
- B. Pyruvate is decarboxylated, acetyl reacts with coenzyme A, forming NADH + H⁺
- C. Pyruvate reacts with coenzyme A, forming NADH + H⁺
- D. Pyruvate is decarboxylated, reacting with coenzyme A, reducing NADH + H⁺

Markscheme

B

Examiners report

This was not as well answered as expected. Nearly two thirds chose B, which was the correct answer but substantial numbers also chose D, which contained the incorrect statement that NADH is reduced in the link reaction of aerobic respiration. Candidates should be advised always to check carefully whether statements concerning oxidation or reduction are correct.

Which process requires oxygen in aerobic cell respiration?

- A. Oxidation of triose phosphate
- B. Reduction of hydrogen carriers
- C. Maintaining an oxygen concentration gradient in mitochondria
- D. Accepting electrons at the end of the electron transport chain

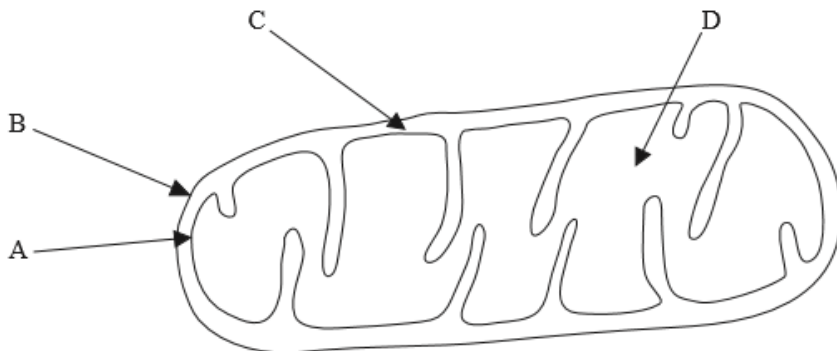
Markscheme

D

Examiners report

[N/A]

Where is carbon dioxide produced in the mitochondrion?



Markscheme

D

Examiners report

N/A

Where in the cell does the Calvin cycle take place?

- A. Stroma of chloroplast
- B. Mitochondrial matrix
- C. Cytoplasm
- D. Inside thylakoid

Markscheme

A

Examiners report

N/A

What is used to reduce NADP in the light-dependent reactions of photosynthesis?

- A. Conversion of ATP into ADP+P_i
- B. Electrons from Photosystem I
- C. Protons from the thylakoid space
- D. Oxygen released by photolysis of water

Markscheme

B

Examiners report

[N/A]

What happens to triose phosphate (TP) in the light-independent reactions of photosynthesis?

- A. TP is reduced to glycerate-3-phosphate (GP).
- B. TP is linked to CO_2 by ribulose biphosphate carboxylase (Rubisco).
- C. TP is oxidized by $\text{NADPH} + \text{H}^+$.
- D. TP is regenerated into ribulose biphosphate (RuBP).

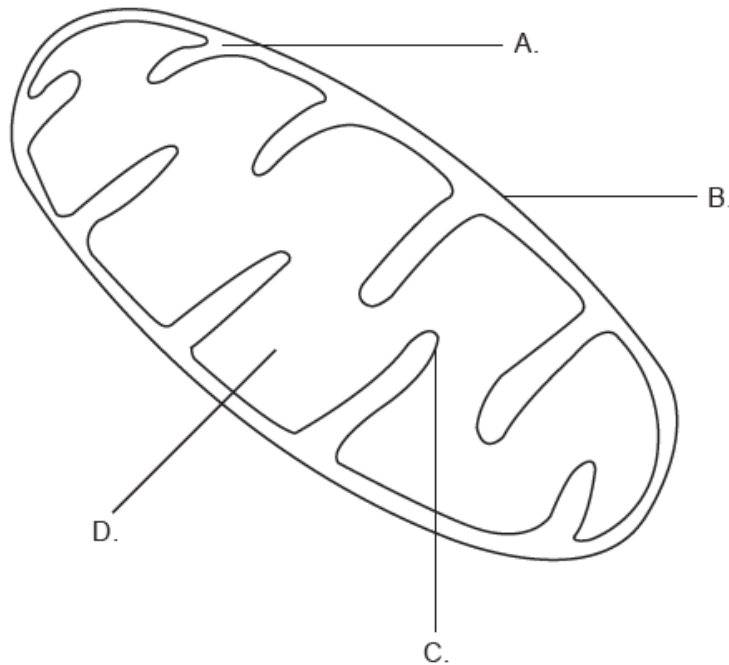
Markscheme

D

Examiners report

N/A

The diagram shows a mitochondrion. Which letter indicates the structure where ATP synthase is located?



Markscheme

C

Examiners report

[N/A]

Which process occurs during the light-dependent reaction of photosynthesis?

- A. ATP, CO₂ and H₂O are produced.
- B. CO₂ is used to produce carbohydrates.
- C. ATP and O₂ are produced.
- D. RuBP is phosphorylated.

Markscheme

C

Examiners report

[N/A]

What occurs during oxidative phosphorylation?

- A. ATP production using electrons from NADP
- B. Coupling of ATP synthesis to electron transport
- C. Chemiosmosis in the matrix of the mitochondrion
- D. Release of energy as ATP reacts with oxygen

Markscheme

B

Examiners report

This was the hardest question on the paper, with only 28% of candidates answering correctly. If all candidates had guessed the answer we would expect 25% to be correct, but we should not assume that only 3% of candidates got the answer here by deduction rather than guesswork. The discrimination index shows that most candidates were not guessing. The commonest answer chosen by candidates was A, and was incorrect; ATP is not produced using electrons from NADP during oxidative phosphorylation. This may be another case of candidates not reading the question carefully enough, with the letter P making all the difference.

What is the advantage of having a small volume inside the thylakoids of the chloroplast?

- A. High proton concentrations are rapidly developed.
- B. High electron concentrations are rapidly developed.
- C. Photosynthetic pigments are highly concentrated.
- D. Enzymes of the Calvin cycle are highly concentrated.

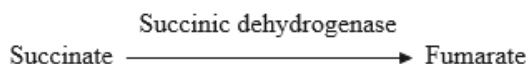
Markscheme

A

Examiners report

[N/A]

The enzyme succinic dehydrogenase catalyses the conversion of succinate to fumarate.



The addition of malonate to the reaction mixture decreases the rate of the reaction. If more succinate is added, the reaction rate will increase. What is the role of malonate in this reaction?

- A. End-product inhibitor
- B. Non-competitive inhibitor
- C. Catalyst
- D. Competitive inhibitor

Markscheme

D

Examiners report

Some teachers felt that Question 27 required specific knowledge of malonate as an inhibitor of succinate dehydrogenase. This was an example of a question where one answer is distinctly the best. Although increases in substrate concentration reduce the effect of both competitive and non-competitive inhibitors, the effect is greater with competitive inhibitors. Students seemed to have less of an issue with this question than teachers with two thirds answering it correctly and the discrimination index being high.

What happens during oxidative decarboxylation of pyruvate?

- A. Reduction of NAD^+ and oxidation of CO_2
- B. Oxidation of NADH and production of CO_2
- C. Reduction of NAD^+ and production of CO_2
- D. Oxidation of NADH and reduction of CO_2

Markscheme

C

Examiners report

[N/A]

If both parents are heterozygous for sickle-cell anemia ($\text{Hb}^A \text{Hb}^S$), what percentage of their offspring will have a homozygous genotype?

- A. 25
- B. 50
- C. 75
- D. 0

Markscheme

B

Examiners report

[N/A]

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

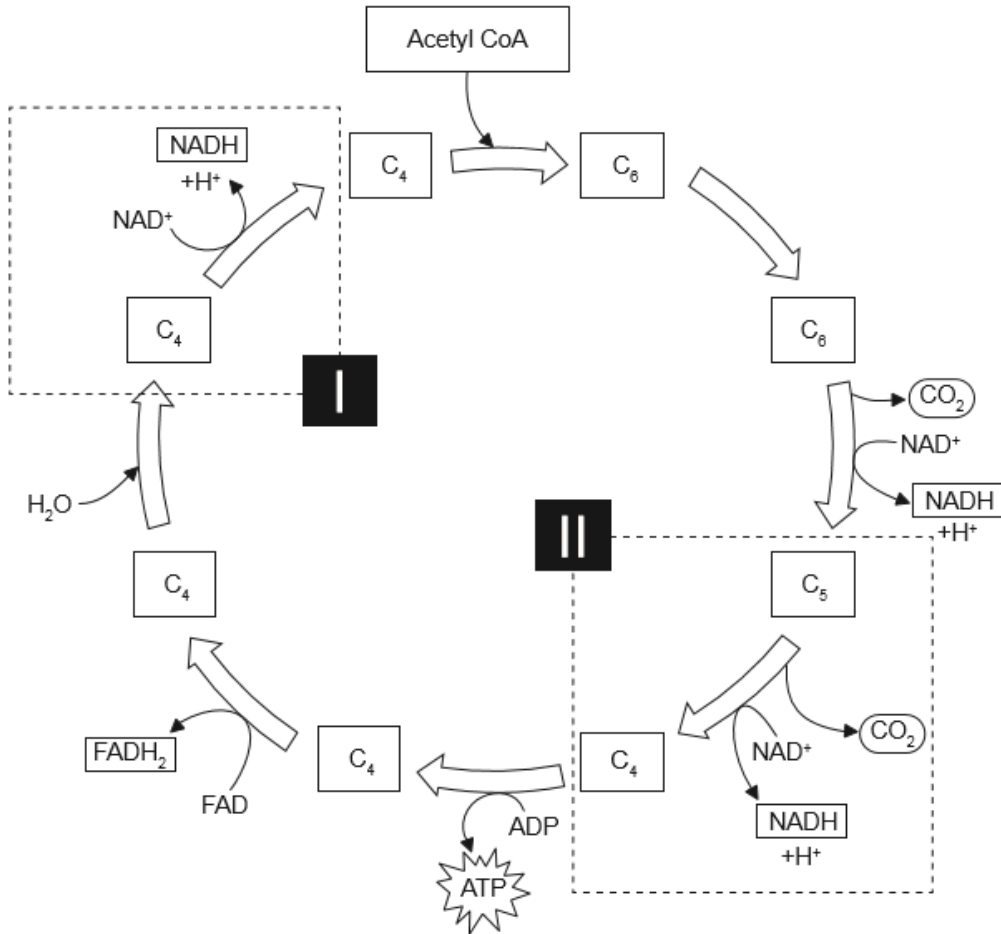
- A. In the cytoplasm
- B. Between the inner and outer membranes of the mitochondria
- C. In the matrix of the mitochondria
- D. On the surface of the cristae

Markscheme

Examiners report

[N/A]

The diagram represents the Krebs cycle.



[Source: CAMPBELL, NEILA.; REECE, JANE B., *BIOLOGY*, 7th, ©2005, p.68. Reprinted by permission of Pearson Education, Inc., New York, New York.]

What processes are occurring at I and II?

	Process I	Process II
A.	C ₄ is being reduced	NAD ⁺ is being oxidized
B.	NAD ⁺ is being decarboxylated	C ₅ is being oxidized
C.	NADH is being reduced	C ₅ is being decarboxylated
D.	NAD ⁺ is being reduced	C ₅ is being decarboxylated

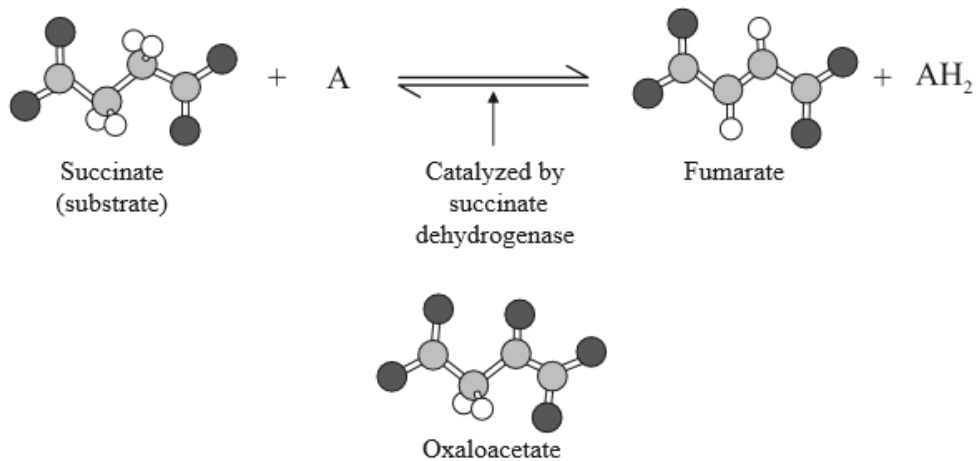
Markscheme

D

Examiners report

N/A

Why is oxaloacetate a competitive inhibitor?



[Source: image from WK Purves, *et al.*, (2003) *Life: The Science of Biology*, 4, Sinauer Associates (www.sinauer.com) and WH Freeman (www.whfreeman.com)]

- A. It causes a conformational change to the active site.
- B. It binds to the enzyme away from the active site.
- C. It is structurally similar to succinate.
- D. It is structurally similar to succinate dehydrogenase.

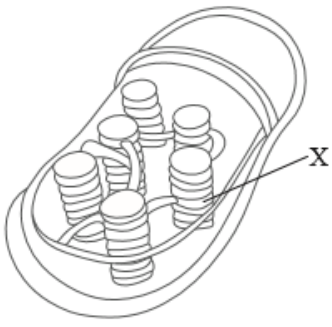
Markscheme

C

Examiners report

N/A

The diagram below shows the structure of a chloroplast.



What is the structure labelled X?

- A. Ribosome
- B. Stroma
- C. Inner membrane
- D. Thylakoid

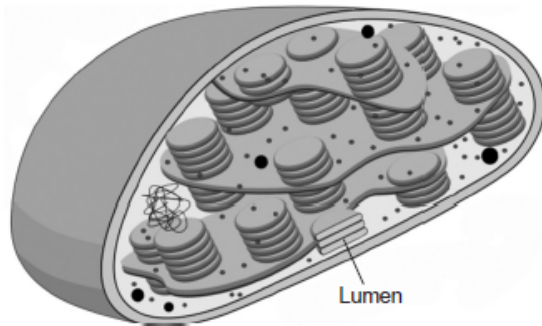
Markscheme

D

Examiners report

N/A

The image shows a chloroplast.



[Source: adapted from <http://evolutionaryroutes.files.wordpress.com>]

During photosynthesis, what happens in the chloroplast at the location labelled lumen?

- A. Protons accumulate.
- B. Pyruvate undergoes decarboxylation.
- C. NADH is oxidized.
- D. Oxygen is produced.

Markscheme

A

Examiners report

There were many comments in the G2s on this question. Most good candidates answered that protons accumulate in the lumen. This is the best answer to the question, as there are many protons throughout the lumen. Photolysis occurs in the photosystem II, in the oxygen-evolving complex; therefore oxygen is produced in the inner surface of the membrane (so A is the correct answer).

The image shows a lady picking tea (*Camellia sinensis*) leaves.



[Source: adapted from www.superstock.com]

Once the leaves have been picked, all further metabolism must be stopped. By what means could this be accomplished?

- A. Heating
- B. Adding water
- C. Mechanical cutting
- D. Spraying with anti-fungal agent

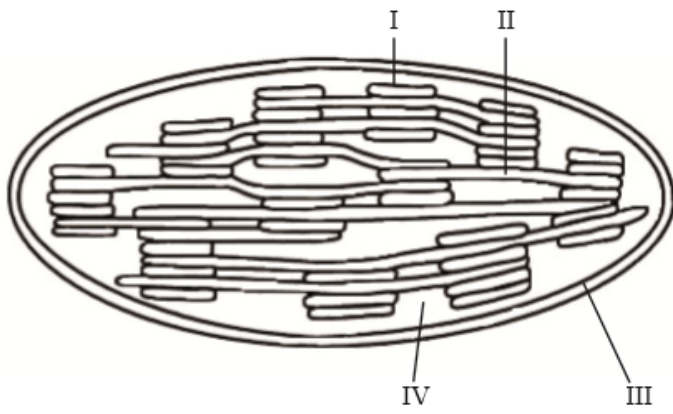
Markscheme

A

Examiners report

[N/A]

Where are the light-dependent and light-independent reactions taking place in the diagram below?



	Light-dependent	Light-independent
A.	I	IV
B.	II	III
C.	III	II
D.	IV	I

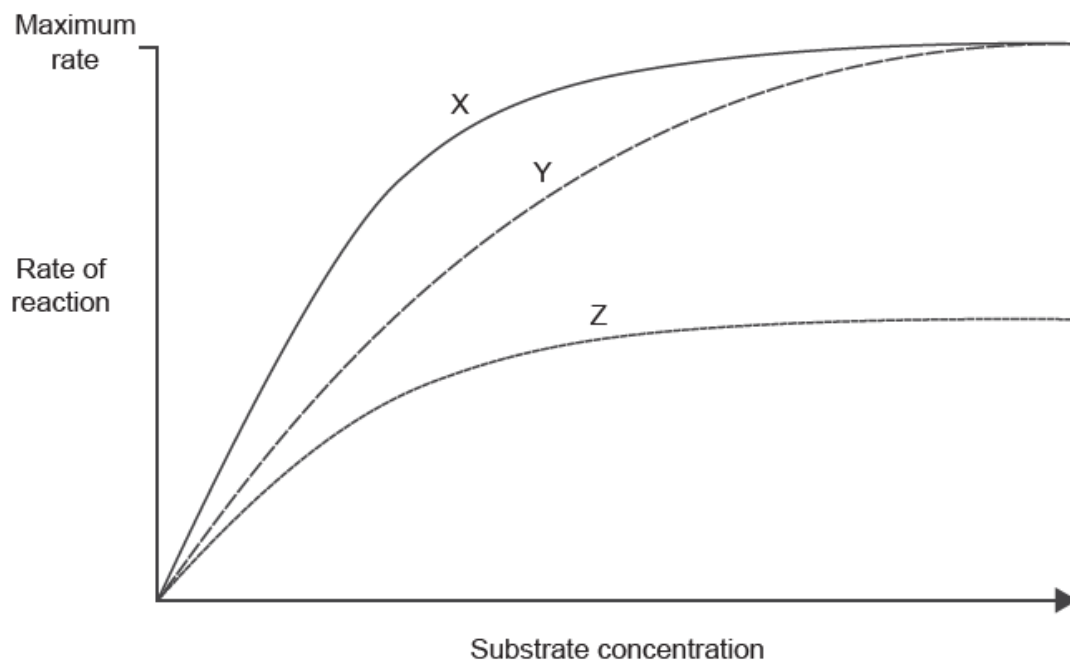
Markscheme

A

Examiners report

N/A

The graph shows the rate of an enzymatic reaction versus the substrate concentration, in the absence or presence of an enzyme inhibitor.



Which condition is indicated by lines Y and Z?

	Y	Z
A.	Non-competitive inhibitor present	No inhibitor present
B.	Non-competitive inhibitor present	Competitive inhibitor present
C.	Competitive inhibitor present	Non-competitive inhibitor present
D.	Competitive inhibitor present	No inhibitor present

Markscheme

C

Examiners report

[N/A]

The electron micrograph below shows an organelle in a eukaryotic cell. What is the area labelled X and what is the type of reaction occurring there?



[Source: http://scienceblogs.com/clock/2006/11/cell_structure.php]

	X	Reaction
A.	matrix	photolysis
B.	stroma	Krebs cycle
C.	stroma	photolysis
D.	matrix	Krebs cycle

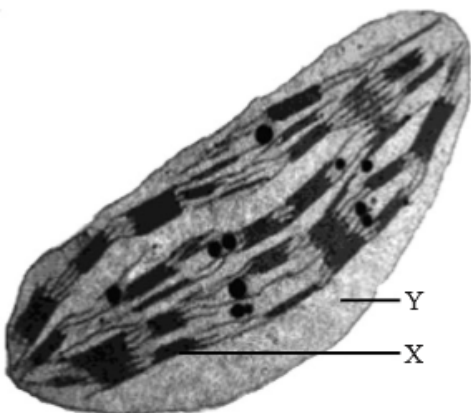
Markscheme

D

Examiners report

N/A

Questions 29 and 30 refer to the following electron micrograph of a chloroplast.



[Source: www.uic.edu/classes/bios/bios100/lecturesf04am/lect10.htm]

What is the structure labelled X?

- A. Stroma
- B. Granum
- C. Crista
- D. Starch granule

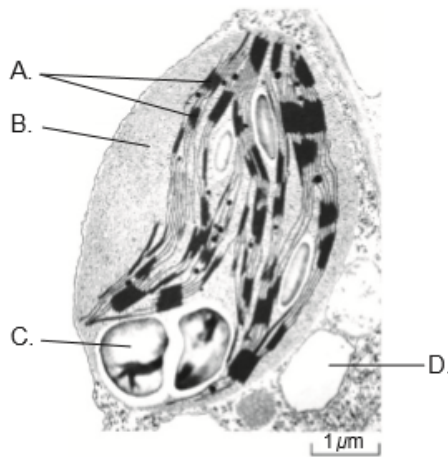
Markscheme

B

Examiners report

N/A

The electron micrograph shows part of a plant cell. Where do the light-independent reactions of photosynthesis take place?



[Source: adapted from <http://themicroscopicplant.weebly.com>]

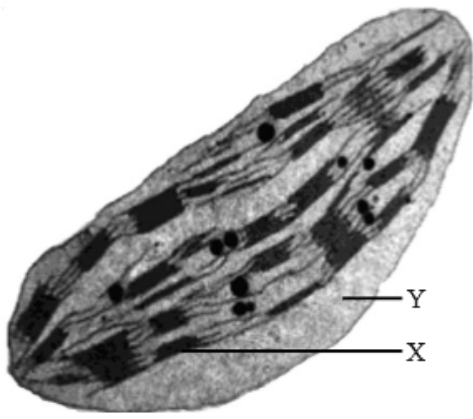
Markscheme

B

Examiners report

[N/A]

Questions 29 and 30 refer to the following electron micrograph of a chloroplast.



[Source: www.uic.edu/classes/bios/bios100/lecturesf04am/lect10.htm]

What is a function of Y?

- A. Carbon fixation
- B. Absorption of light
- C. Storage of glucose
- D. Production of ATP

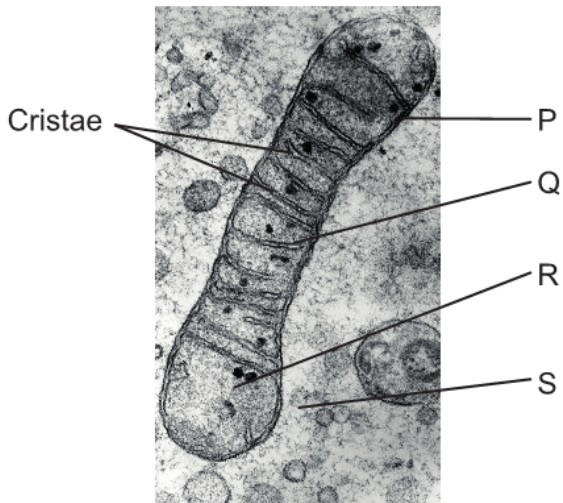
Markscheme

A

Examiners report

N/A

The image shows a portion of a cell containing a mitochondrion.



[Source: 'TEM of a mitochondrion' by Prof. R. Bellairs. Credit: Prof. R. Bellairs. CC BY 4.0.]

Where do glycolysis and electron transport occur?

	Glycolysis	Electron transport
A.	P	R
B.	R	Q
C.	R	R
D.	S	Q

Markscheme

D

Examiners report

[N/A]
