PEARSON EDEXCEL IAL BIOLOGY · YBI11

BIOLOGY



EXAM QUESTION PACK

UNIT 4: ENERGY FLOW, ECOSYSTEMS AND THE ENVIRONMENT

SCORE	PERCENTAGE
/37	%

STEMUP

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Q1.

Answer the questions with a cross in the boxes you think are correct ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

The photograph shows a polar bear.



(Source: © Burcu Gultekin / Alamy Stock Photo)

Polar bears are adapted to live in the Arctic Circle.

Polar bears have a layer of fat beneath their skin. This fat insulates them from the cold and can be used to supply the polar bear with water (metabolic water).

They have a thick fur coat which also insulates them from the cold.

Polar bears feed on seals. The polar bear sits on the ice and waits for a seal to come to the surface of the water to breathe.

(a) Which row of the table describes the types of adaptation of polar bears?

(1)

	Anatomical	Behavioural	Physiological
☒ **A**	produces metabolic water	hunting by sitting on ice	thick fur coat
☒ **B**	hunting by sitting on ice	thick fur coat	produces metabolic water
☒ **C**	thick fur coat	produces metabolic water	hunting by sitting on ice
☒ **D**	thick fur coat	hunting by sitting on ice	produces metabolic water

(b) What is the niche of a polar bear?

(1)

☒ **A** produces metabolic water

☒ **B** the Arctic Circle

☒ **C** controls the population size of seals

☒ **D** uses the layer of fat beneath the skin

(c) Suggest why the polar bear needs to rely on the store of fat to provide it with water.

(2)

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(d) Climate change is resulting in habitat fragmentation. Habitat fragmentation causes groups of polar bears to become separated from one another.

Explain the effect that habitat fragmentation could have on the genetic diversity of polar bears.

(3)

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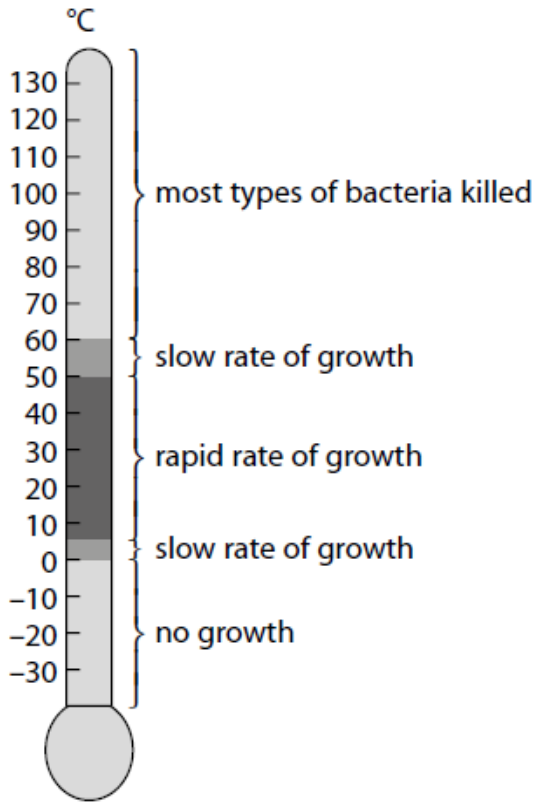
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(Total for question = 7 marks)

Q2.

Temperature affects the rate of growth of bacteria.

The diagram shows some information about the growth of bacteria in different ranges of temperature.



(a) Explain why most types of bacteria are killed at temperatures above 60 °C, but bacteria can grow slowly in a temperature range of 50 °C to 60 °C.

(4)

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(b) (i) The growth rate constant will be at its highest in the temperature range of 5 °C to 50 °C.

Calculate the growth rate constant (k) of bacteria that have increased from 5×10^3 cells per cm^3 to 1.3×10^5 cells per cm^3 in 4 hours.

(3)

$$k = \frac{\log_{10} N_t - \log_{10} N_0}{0.301 \times t}$$

Answer .....

(ii) The formula used to calculate the growth rate constant can only be applied to one phase of bacterial growth.

To which phase of bacterial growth can the formula be applied?

(1)

☒ **A** death

☒ **B** exponential

☒ **C** lag

☒ **D** stationary

(c) (i) Explain why some foods are kept in refrigerators at a temperature between 0 °C and 5 °C.

(3)

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(ii) Explain why there is no growth of bacteria in a freezer at a temperature of −18 °C.

(2)

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(Total for question = 13 marks)

Q3.

Chloroplasts and mitochondria are two organelles found in some plant cells.

(a) Compare and contrast the structure of a chloroplast with the structure of a mitochondrion.

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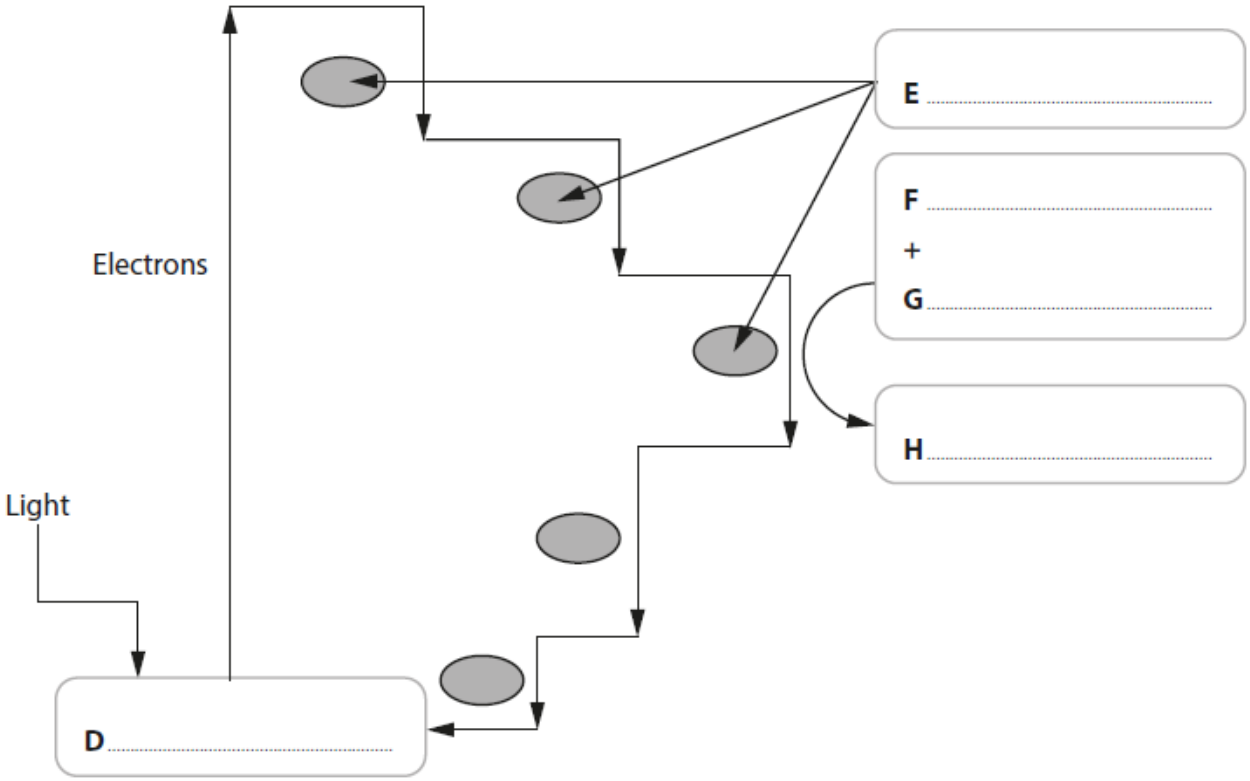
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(b) The light-dependent reactions of photosynthesis can result in either cyclic or non-cyclic photophosphorylation.

(i) The diagram shows cyclic photophosphorylation.

Complete the diagram by writing the correct word or words on the dotted lines, labelled D, E, F, G and H.

(3)



(ii) Name **one** molecule that is produced in non-cyclic photophosphorylation that is **not** produced in cyclic photophosphorylation.

(1)

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(iii) Describe the role of photolysis in non-cyclic photophosphorylation.

(2)

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(Total for question = 9 marks)

Q4.

Madagascar is a large island off the southeast coast of mainland Africa.

Lemurs are endemic to Madagascar.

(a) There are many different species of lemur, all of which evolved from one common ancestor. This common ancestor is thought to be a primate that was carried across the sea from mainland Africa on a raft of vegetation.

The photographs show two different species of lemur, Sifaka and Indri, found in the same region of Madagascar.



Sifaka



Indri

The diet of Sifakas is mostly seeds but also includes fruits, flowers and some types of leaves. The diet of Indri is mainly leaves.

Explain the types of speciation that have taken place in the evolution of Sifakas and Indri in this region of Madagascar.

(4)

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(b) Lemurs have been found on another island close to Madagascar.

Scientists have used DNA profiling to show that these lemurs originated from those on Madagascar.

(i) Explain the role of the polymerase chain reaction (PCR) in DNA profiling.

(2)

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(ii) Explain how DNA profiling could show that these lemurs originated from the lemurs on Madagascar.

(2)

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(Total for question = 8 marks)