OCR GCSE 21ST CENTURY BIOLOGY B · J257

BIOLOGY



EXAM QUESTION PACK

B3.3 HOW ARE ORGANISMS IN AN ECOSYSTEM INTERDEPENDENT? (HIGHER)

SCORE	PERCENTAGE
/74	%

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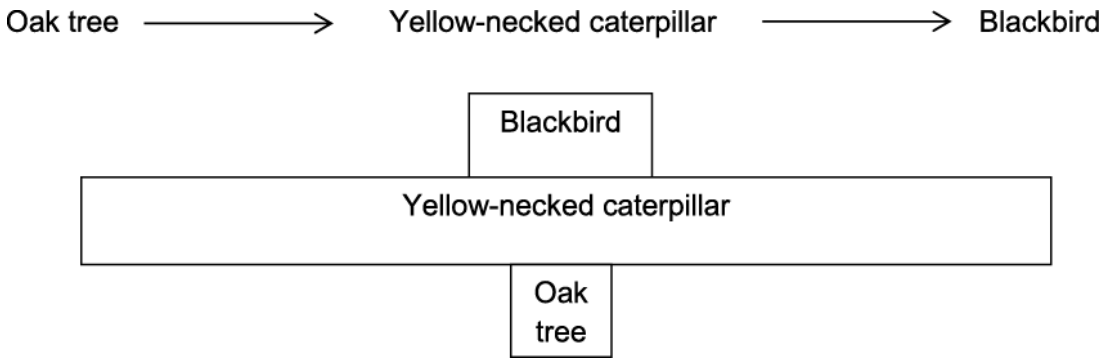
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1(a). Sundip considers different options for displaying data about the organisms found in a woodland ecosystem.

One option is a pyramid of numbers for the simple food chain, as in the example below:



Draw a pyramid of biomass for this food chain in the space below.

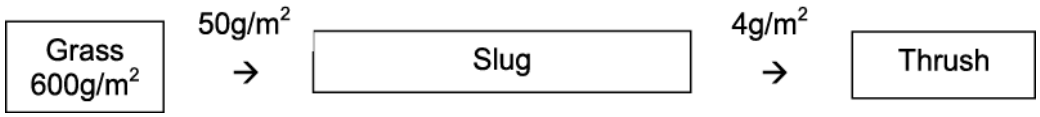
[1]

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(b). Biomass in an ecosystem can be measured in g/m^2.

Values for a different food chain in the same woodland ecosystem as in **(a)** are shown below.



(i) Calculate the percentage of the biomass from the grass that is passed on to the thrush.

Show your working. Give your answer to two decimal places.

Biomass = % [1]

(ii) Give **one** reason why so little biomass from the grass is passed on to the thrush.

1

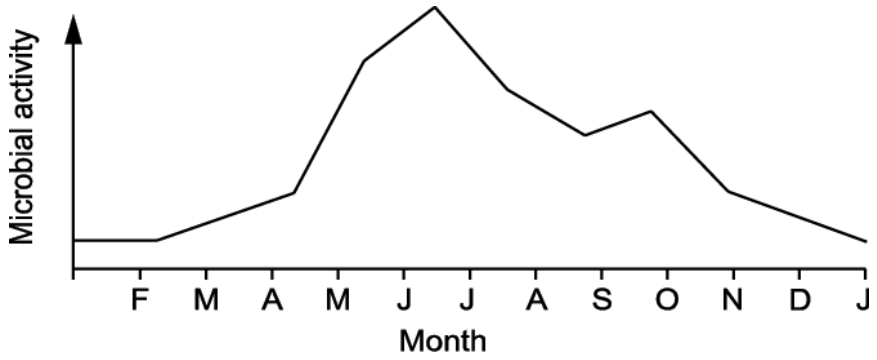
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(c). Decomposers are also an important part of ecosystems.

The graph below shows the activity of decomposers in a woodland ecosystem during a year, from January to December.



(i) Describe the pattern of microbial activity shown in the graph above.

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[2]

(ii) Explain the pattern you have described in **c) (i)**.

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[2]

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2. The rainforests are a valuable resource for everyone.

Timber is harvested from rainforests by local people.

Describe the impact of removing timber from the rainforests and explain why many people feel that this should be done in a sustainable way.
You should consider the needs of different groups of people in your answer.



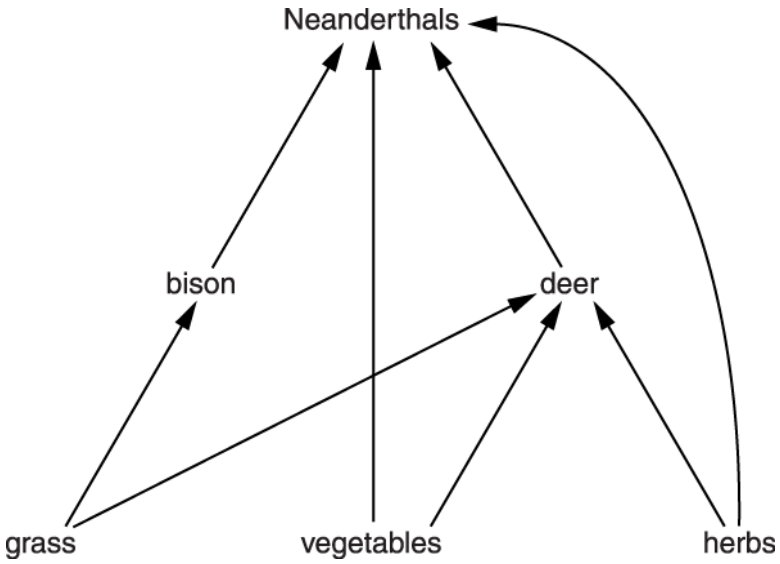
The quality of written communication will be assessed in your answer.

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[6]

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3. The diagram shows part of the Neanderthals' food web.



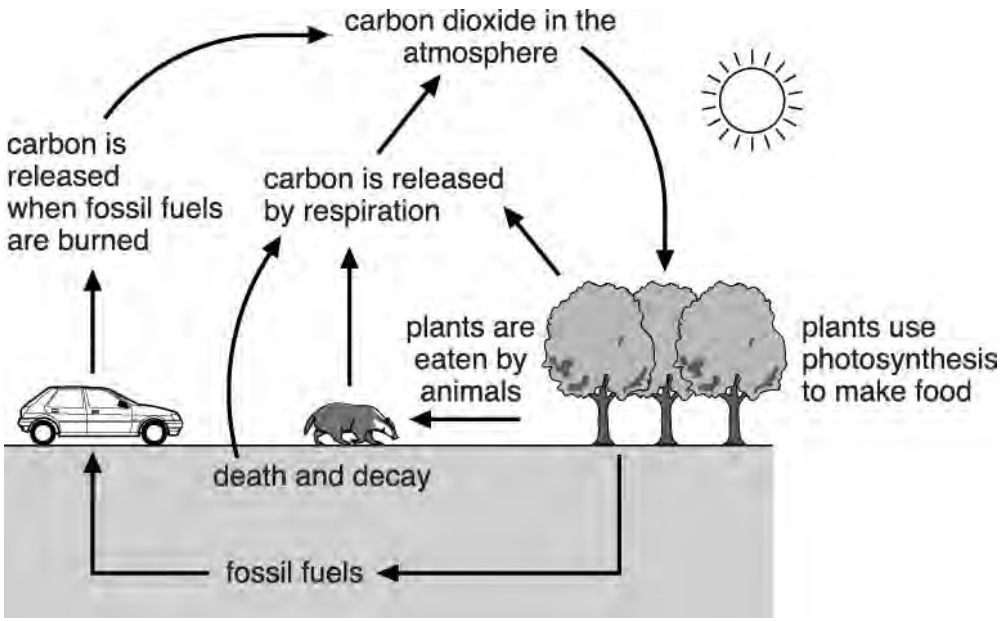
Use the food web to explain why the sizes of the bison population and the deer population are interdependent.

---

[3]

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4(a). Look at the diagram of the carbon cycle.



Some students think that the carbon cycle is a closed-loop system.

Use ideas about carbon atoms and energy to suggest reasons for and against this conclusion.

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[3]

(b). Rainforests are sometimes called stable ecosystems.

Why are they described as stable?

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[1]

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5. Organisms in an ecosystem are dependent on each other.
A farmer sprays a crop with an insecticide to kill insect pests.

Explain how insecticides can have harmful effects on other organisms in an ecosystem.

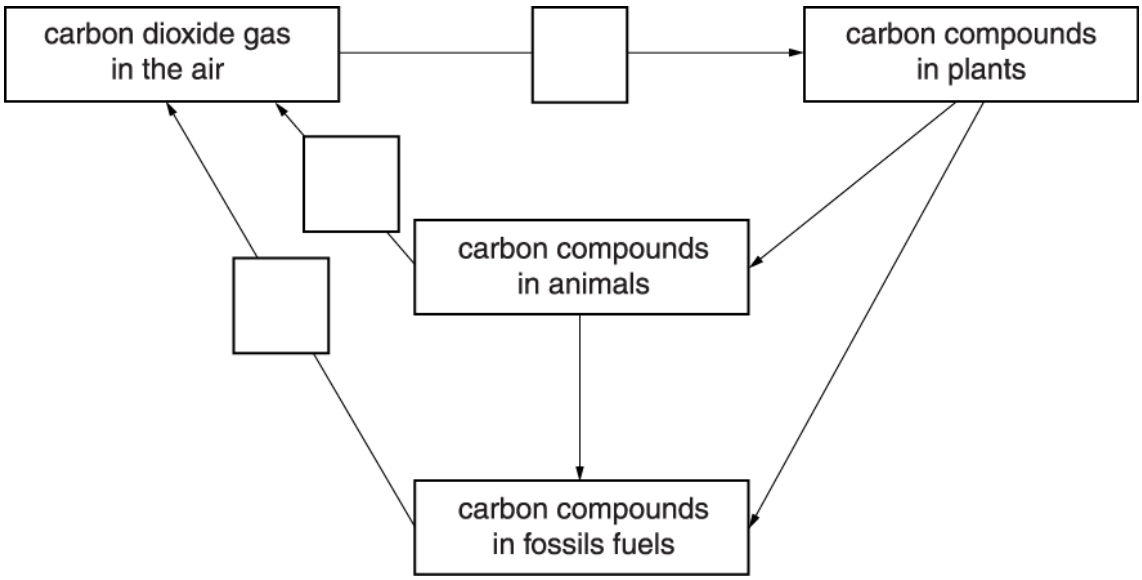


The quality of written communication will be assessed in your answer.

[6]

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6(a). The diagram shows some of the processes involved in the carbon cycle.



Look at the following processes:

A Combustion

B Excretion

C Feeding

D Photosynthesis

E Respiration.

Write the correct three letters, **A**, **B**, **C**, **D** or **E**, in the correct boxes to complete the diagram.

[3]

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(b). Explain the role of detritivores in the carbon cycle.

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[2]

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7. Natural ecosystems are a type of closed loop system.
Describe what is meant by a closed loop system and give examples to explain how human activity can unbalance ecosystems so that they no longer work effectively as closed loop systems.

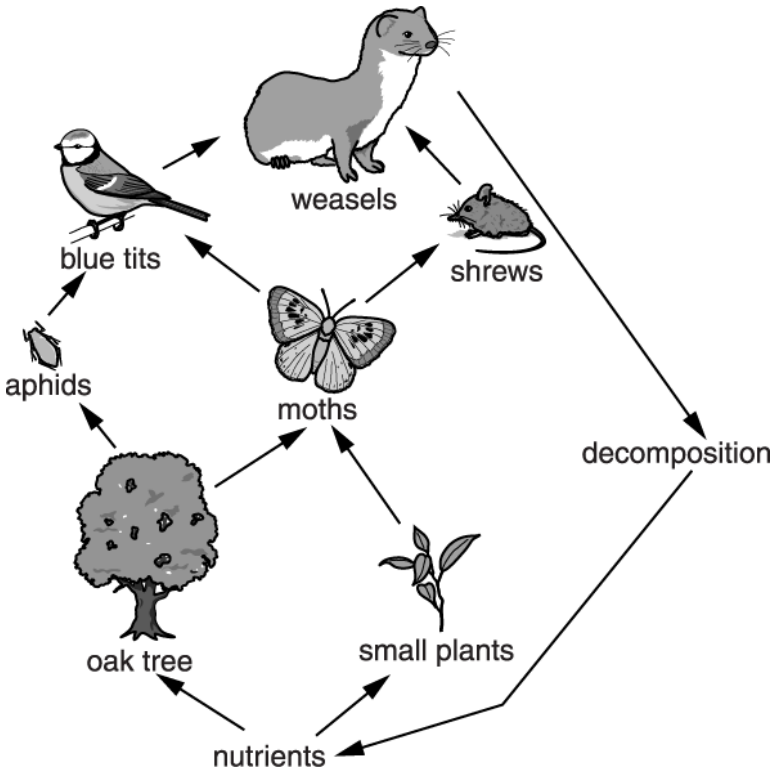


The quality of written communication will be assessed in your answer.

[6]

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8(a). The diagram shows the flow of nutrients through a food web.



Which of the following are shown by the diagram?
Put ticks (✓) in the boxes next to the correct answers.

The diagram shows…

… competition. ☐

… evolution. ☐

… natural selection. ☐

… part of an ecosystem. ☐

… transfer of nutrients. ☐

… selective breeding.

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… interdependence.

[3]

(b). Microorganisms are part of an ecosystem.
Microorganisms can reproduce very rapidly.

(i) If a single microorganism divides into two every 20 minutes, how many microorganisms will there be after 3 hours?
Show your working.

number of microorganisms = _____ [2]

(ii) Some microorganisms are decomposers.
Suggest why this ability to reproduce so rapidly is important.

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[1]

(iii) There are many different species of microorganisms in an ecosystem.
Write down **two** processes that are involved in the production of a new species.

1

2

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[1]

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9. Nitrates enter plant roots from the soil.

Plants use the nitrogen in nitrates to make some chemicals.

Which nitrogen-containing chemicals do plants make?

Put a ring around the **two** correct answers.

amino acids | cellulose | enzymes | oxygen | starch | water

[2]

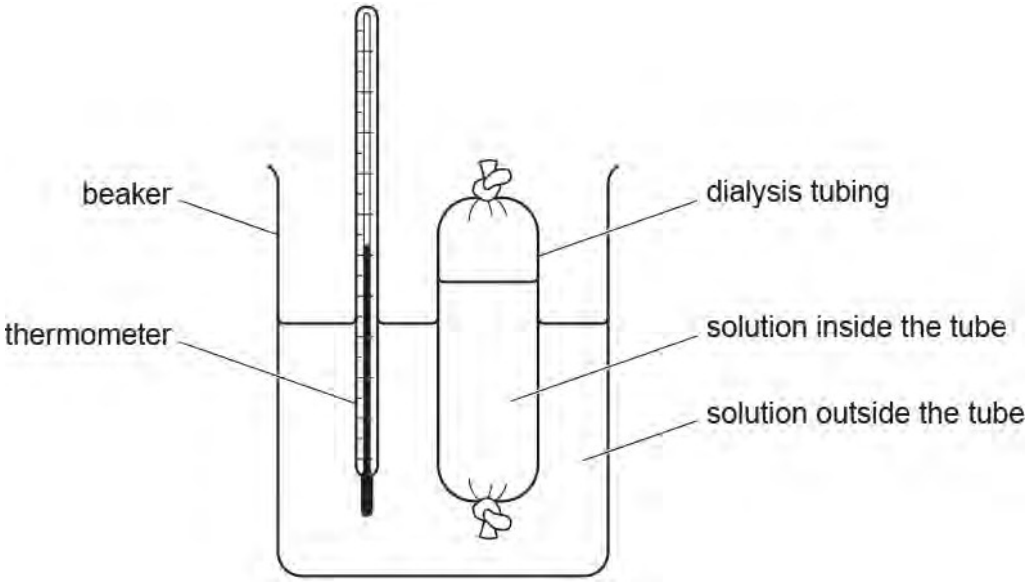
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10(a) Eve sets up three experiments using dialysis tubing.

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Dialysis tubing is a partially-permeable membrane.

Each experiment is set up as shown in the diagram:



Eve sets up the solutions as shown in **Table 2.1**.

Amylase is an enzyme.

Experiment	Solution inside the tube	Solution outside the tube
1	starch + tap water	tap water
2	glucose + tap water	tap water
3	starch + amylase + tap water	tap water

Table 2.1

After 3 minutes she removes a small sample of each solution.

Describe how she could test each sample for the presence of glucose.

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[2]

(b). She also uses iodine solution to test each sample for the presence of starch.

Her results are shown in **Table 2.2**.

Experiment	Sample from inside the tube		Sample from outside the tube	
	Test for starch	Test for glucose	Test for starch	Test for glucose
1	positive	negative	negative	negative
2	negative	positive	negative	positive
3	positive	positive	negative	positive

Table 2.2

(i) What conclusions can you make from Eve's results?

[4]

(ii) Eve repeats experiment 3, but this time she boils the amylase before using it.

Write a testable prediction for this repeat of experiment 3.

Explain the science behind your prediction.

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Prediction

Explanation ---

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[3]

(c). Eve sets up one more experiment as shown in **Table 2.3**.

Experiment	Solution inside the tube	Solution outside the tube
4	starch + tap water	tap water + iodine solution

Table 2.3

The molecules of iodine in the iodine solution are smaller than molecules of glucose.

Eve watches this experiment for 5 minutes.

Describe and explain the changes she is likely to observe during the 5 minutes.

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[4]

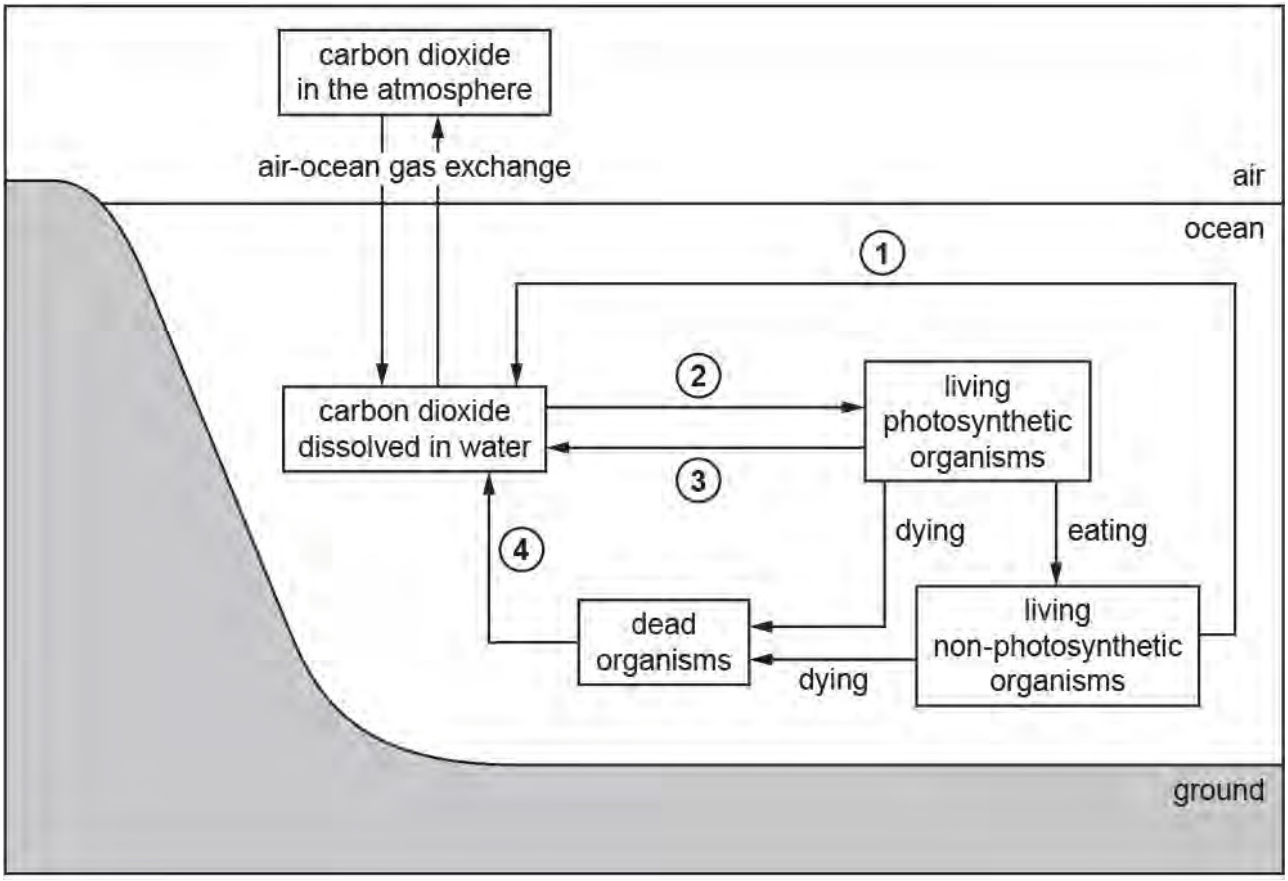
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11. Oceans cover two thirds of the Earth's surface and absorb one third of the carbon dioxide created by human activities.

Oceans play a very important part in cycling carbon.

The diagram shows the parts of the carbon cycle that take place in the ocean.



(i) Write down the names of the processes that have been labelled **1**, **2**, **3** and **4** in the diagram.

1 ----------

2 ----------

3 ----------

4 ---------- **[3]**

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(ii) Explain the roles of microorganisms in the ocean carbon cycle shown in the diagram.

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[3]

(iii) The processes shown in the diagram cycle carbon relatively quickly.

Carbon in the ocean is also cycled back to the atmosphere very slowly via another set of processes.

Describe these other processes and explain why this way of cycling carbon is very slow.

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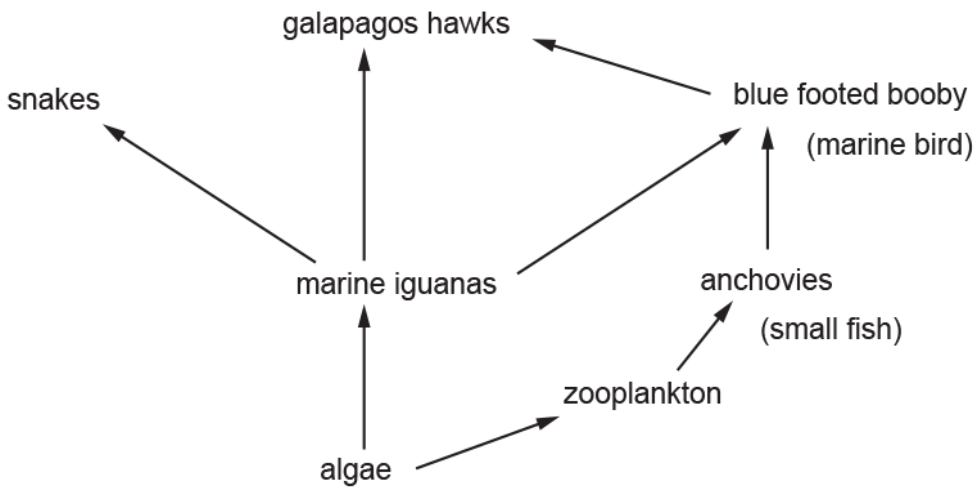
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12. The Galapagos Islands are a group of 13 islands found in the Pacific Ocean.

The food web shows the feeding relationships of some Galapagos Islands species.



(i) A weather event called El Niño occurs every three years. This causes the population of algae to decrease.

Explain what effect this could have on the population of marine iguanas.

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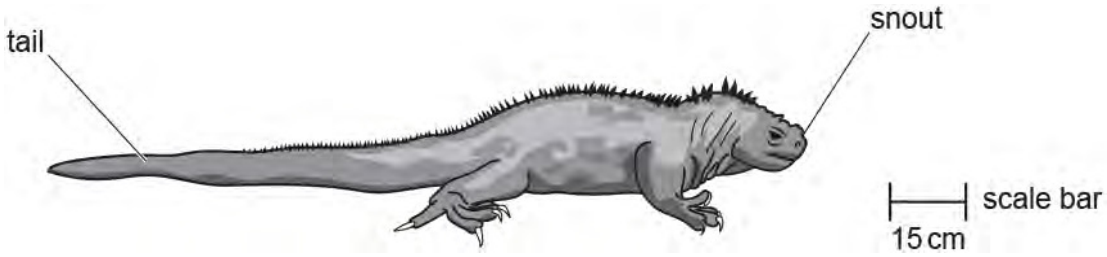
(ii) Scientists have discovered that during this event the marine iguanas can shrink in size.

The length of the marine iguana is determined by measuring the distance from the snout to the end of the tail.

Below is a drawing of a marine iguana.

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Use the scale bar to calculate the actual length of this marine iguana in metres.

Length of marine iguana = ... m **[2]**

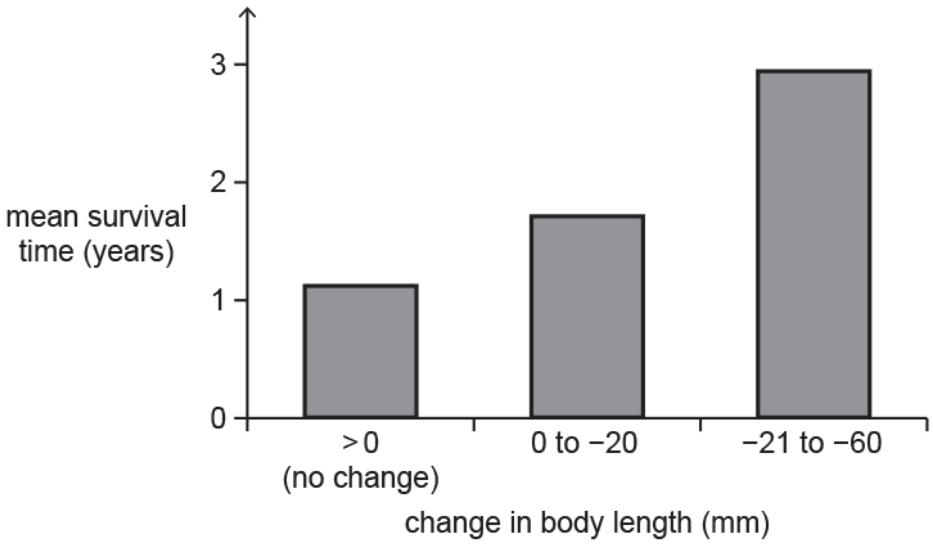
(iii) Some marine iguanas can shrink by up to 20% of their original length.

Calculate the length of this marine iguana after maximum shrinkage.

Length after maximum shrinkage = ... m **[1]**

Scientists calculated the change in body length of the iguanas and measured how long they survived during the El Niño event.

The results are shown in the graph.



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(iv) What can be concluded from the data?

Tick (✓) **two** boxes.

The marine iguanas that decreased in size the least survived longer. ☐

The change in body length made no difference to the survival time of the marine iguanas. ☐

The marine iguanas that decreased in size the most on average lived for a greater length of time. ☐

The marine iguanas that did not decrease in size survived for approximately 2 years less than the marine iguanas that decreased in size by up to 60 mm. ☐

The marine iguanas that decreased in size by 20 mm survived more than double the length of time than those that did not change in size. ☐

[2]

END OF QUESTION PAPER

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