Biodiversity

Question Paper 1

Level	International A Level
Subject	Biology
Exam Board	CIE
Topic	Biodiversity, classification and conservation
Sub Topic	Biodiversity
Booklet	Theory
Paper Type	Question Paper 1

Time Allowed : **68 minutes**

Score : **/ 56**

Percentage : **/100**

Grade Boundaries:

A*	A	B	C	D	E	U
>85%	'77.5%	70%	62.5%	57.5%	45%	<45%

1 **(a)** Sentences **(i)** and **(ii)** are extracted from longer definitions of ecological terms. Each has one or more missing words.

Complete **(i)** and **(ii)** using the correct terms chosen from the list below.

a population	**a community**	**an ecosystem**
a niche	**a habitat**	**trophic level**
producers	**organisms**	**consumers**

(i) ……. is the particular location and type of local environment occupied by ……. or organism, characterised by its physical features or by its dominant ……. . [3]

(ii) ……. is the functional role or place of a species of organism within ……. . [2]

(b) Only a small proportion of the light energy striking the leaves of producers becomes converted to chemical energy. The proportion that is converted is known as the photosynthetic efficiency (PE).

(i) Outline the possible reasons why a large proportion of light energy striking the leaves of plants is **not** converted into chemical energy.

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(ii) Most crops have a PE of 1% to 4%. Sugar cane, an important crop plant for food production and for the production of biofuel, has a PE of 7% to 8%.

Suggest the advantages of growing crops with high PE for food production or for biofuel.

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.....[2]

(iii) Fertilisers containing nitrate are added to improve or maintain yield of crops such as sugar cane.

Name two organic compounds containing nitrogen that are made by plants and state one function of each in plant growth.

organic compound 1 .....

function .....

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organic compound 2 .....

function .....

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.....[2]

[Total: 12]

2 In the oceans, parts of the nitrogen cycle involve different bacteria from those that are involved on the land.

A bacterium found in oceans is *Nitrococcus mobilis*, which carries out the following step in the nitrogen cycle:

$$NO_2^- \longrightarrow NO_3^-$$

nitrite n ate

(a) (i) Name the stage in the nitrogen cycle in which this step occurs.

.....[1]

(ii) Describe how nitrogen in nitrate can be returned to the atmosphere in the form of nitrogen gas.

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.....[2]

(b) Phytoplankton are microscopic photosynthetic organisms that are the main producers in ocean ecosystems. Their habitat is the upper layers of the oceans where sunlight can penetrate through the water.

Define the terms:

(i) ecosystem

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.....[2]

(ii) producer

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.....[1]

(iii) habitat.

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.....[1]

[Total: 7]

3 The Italian agile frog, *Rana latastei*, lives in woodlands in northern Italy. The adults breed by laying eggs in water in spring. The eggs hatch into tadpoles, which grow and develop for several weeks, before metamorphosing (changing) into adults and leaving the water. This must take place before cool weather arrives in autumn.

Fig. 4.1 shows an adult agile frog.

Fig. 4.1

This frog is now an endangered species. Many woodlands have been destroyed, leaving only isolated patches in which small populations of the frogs live. In order to try to prevent some of these small populations dying out completely, it has been suggested that tadpoles from larger populations could be introduced into the small populations, in order to increase genetic diversity.

(a) Suggest why increasing genetic diversity could help to conserve populations of Italian agile frogs.

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..... [3]

(b) An argument against introducing individuals from one population into another is that there may be genetic differences between them that have evolved in response to exposure to different selection pressures. These genetic differences could be lost.

An investigation was carried out into the time it takes for tadpoles to develop into frogs in two groups of populations:

- populations living in the cool foothills of mountains
- populations living in the warmer lowlands.

(i) Frogs, like all amphibians, are not able to control their body temperatures. In the wild, tadpoles in the foothills take about one month longer to develop into adult frogs than tadpoles in the lowlands.

Suggest why tadpoles in the foothills take longer to develop into adults than tadpoles in the lowlands.

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..... [2]

(ii) The researchers collected eggs from foothill populations and from lowland populations, and kept them in identical conditions in the laboratory. They measured the masses of samples of the tadpoles until they metamorphosed into adult frogs.

The results are shown in Fig. 4.2. The drop in mass towards the end of development shows when the tadpole changes into a frog.

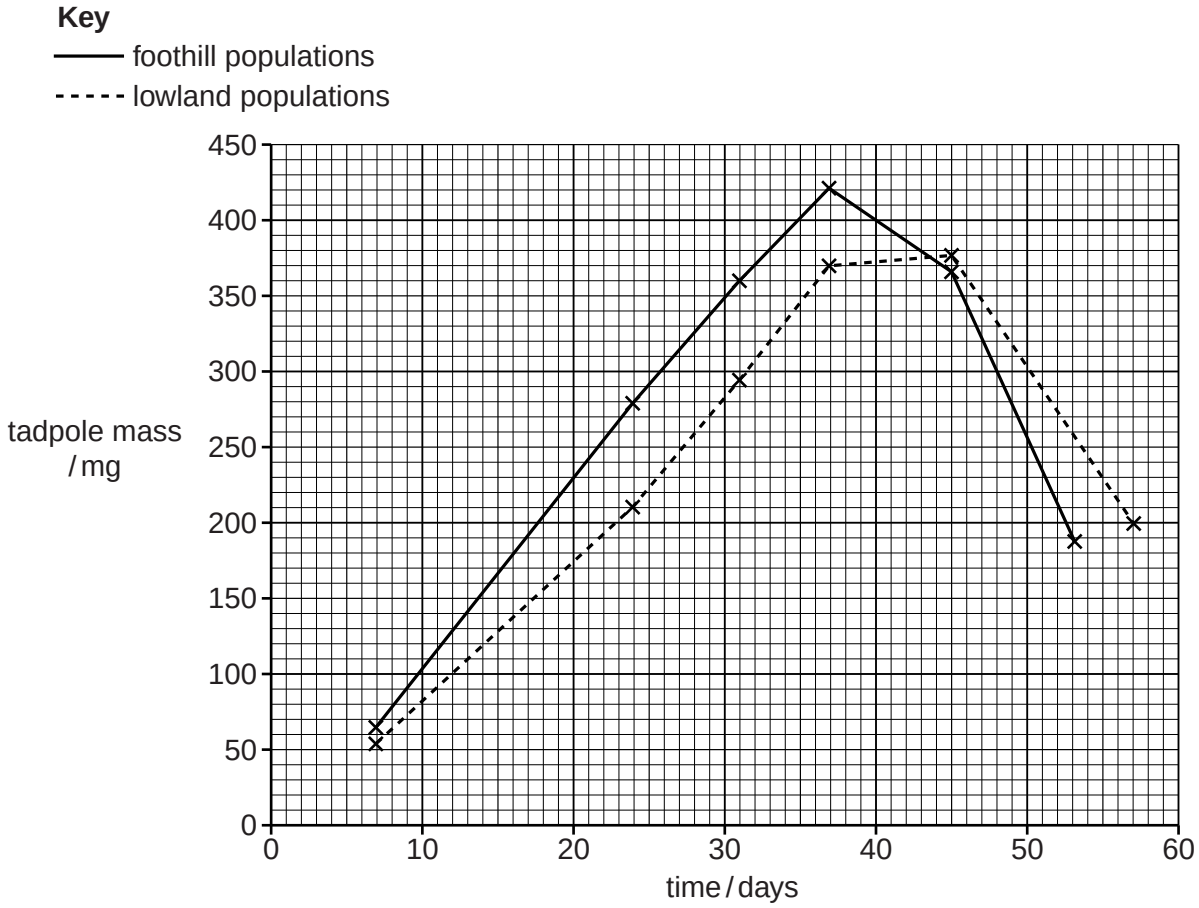

Fig. 4.2

With reference to Fig. 4.2, describe the differences in the growth of tadpoles from foothill and lowland populations.

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(iii) Explain how the results shown in Fig. 4.2 suggest that there are **genetic** differences between the foothill populations and the lowland populations of agile frogs.

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(iv) Suggest how these genetic differences may be important in increasing the chances of survival of the foothill populations in their natural habitat.

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(c) With reference to the evidence from this investigation, explain why it may **not** be good conservation policy to introduce tadpoles of agile frogs from lowland populations to foothill populations.

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..... [2]

[Total: 14]

4 *Azolla filiculoides* is an aquatic fern that floats on the surface of lakes.

The nitrogen-fixing microorganism, *Anabaena azollae*, lives within the leaves of the fern. The beetle, *Stenopelmus rufinasus*, feeds on *A.filiculoides*.

(a) State the ecological terms applied to each of the following descriptions of these species.

description	ecological term
all the members of the species *A. filiculoides* floating on a lake	
all the organisms, including *A. filiculoides, A. azollae* and *S. rufinasus*, found living in and on the lake	
organisms, such as *A. filiculoides*, that absorb light energy, fix carbon dioxide and make organic compounds available to animals that eat them	
the role of species, such as *A. filiculoides*, *A. azollae* and *S. rufinasus*, in the lake ecosystem	

[4]

(b) Explain the importance of nitrogen-fixing organisms, such as *A. azollae*, in ecosystems.

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[Total: 7]

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5 Fig. 1.1 is a summary of energy flow in a forest ecosystem. The width of the arrows is proportional to the energy that flows between each component in the ecosystem.

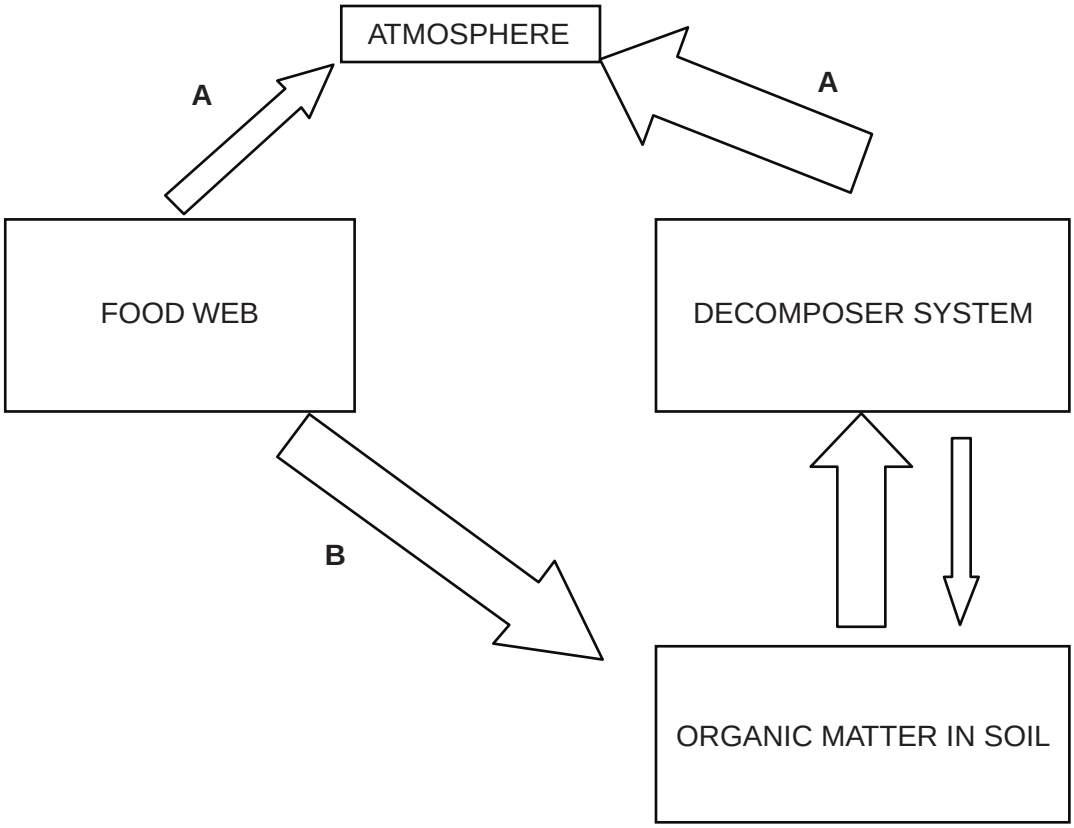

Fig. 1.1

(a) Add an arrow to Fig. 1.1 to show where the ecosystem receives its initial input of energy. [1]

(b) State the process represented by **A**.

.....[1]

(c) State one type of organism that is a member of the decomposer system.

.....[1]

(d) Name two processes represented by arrow **B**.

1. .....

2. .....
[2]

[Total: 5]

6 Fig. 3.1 shows part of the nitrogen cycle.

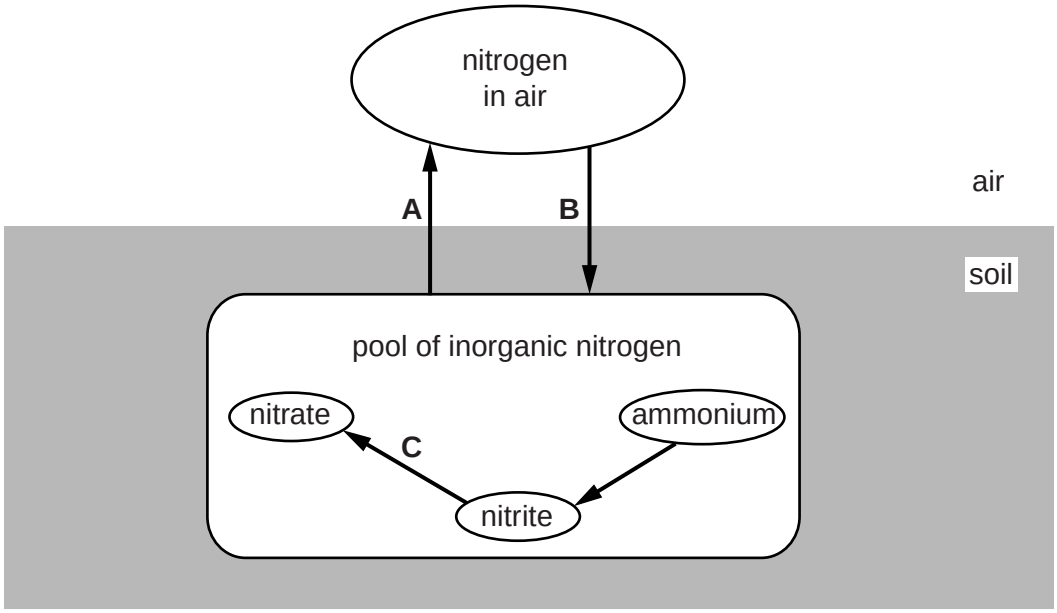

Fig. 3.1

(a) **(i)** Name processes **A**, **B** and **C**.

A .....

B .....

C .....

[3]

(ii) Dead animal and plant material can also contribute to the pool of inorganic nitrogen in soil.

Describe how this happens.

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..... [3]

(b) Other inorganic substances, such as phosphate, are cycled entirely within the soil.

(i) State **one** use for phosphate and **one** use for nitrate in organisms.

phosphate .....

nitrate .....

[2]

(ii) Nitrogen and phosphate are both cycled more rapidly in ecosystems where there are high rates of growth within trophic levels and high rates of energy flow between trophic levels.

With reference to the use of **both** nitrogen and phosphate in organisms, explain this statement.

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[Total: 11]