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ENVIRONMENTAL SYSTEMS AND SOCIETIES
STANDARD LEVEL
PAPER 1

Candidate session number

| 0 | 0 | | | | | | | | |

Monday 17 May 2010 (afternoon)

1 hour

Examination code

| 2 | 2 | 1 | 0 | – | 6 | 3 | 0 | 1 |

INSTRUCTIONS TO CANDIDATES

- Write your session number in the boxes above.
- Do not open this examination paper until instructed to do so.
- Answer all questions.
- Write your answers in the boxes provided.

1. (a) Identify **two** sources of each of the following greenhouse gases. *[3]*

Methane:

1. ....

2. ....

Chlorofluorocarbons (CFCs):

1. ....

2. ....

Carbon dioxide:

1. ....

2. ....

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(Question 1 continued)

(b)   (i)   Distinguish between *negative feedback* and *positive feedback*.   *[2]*
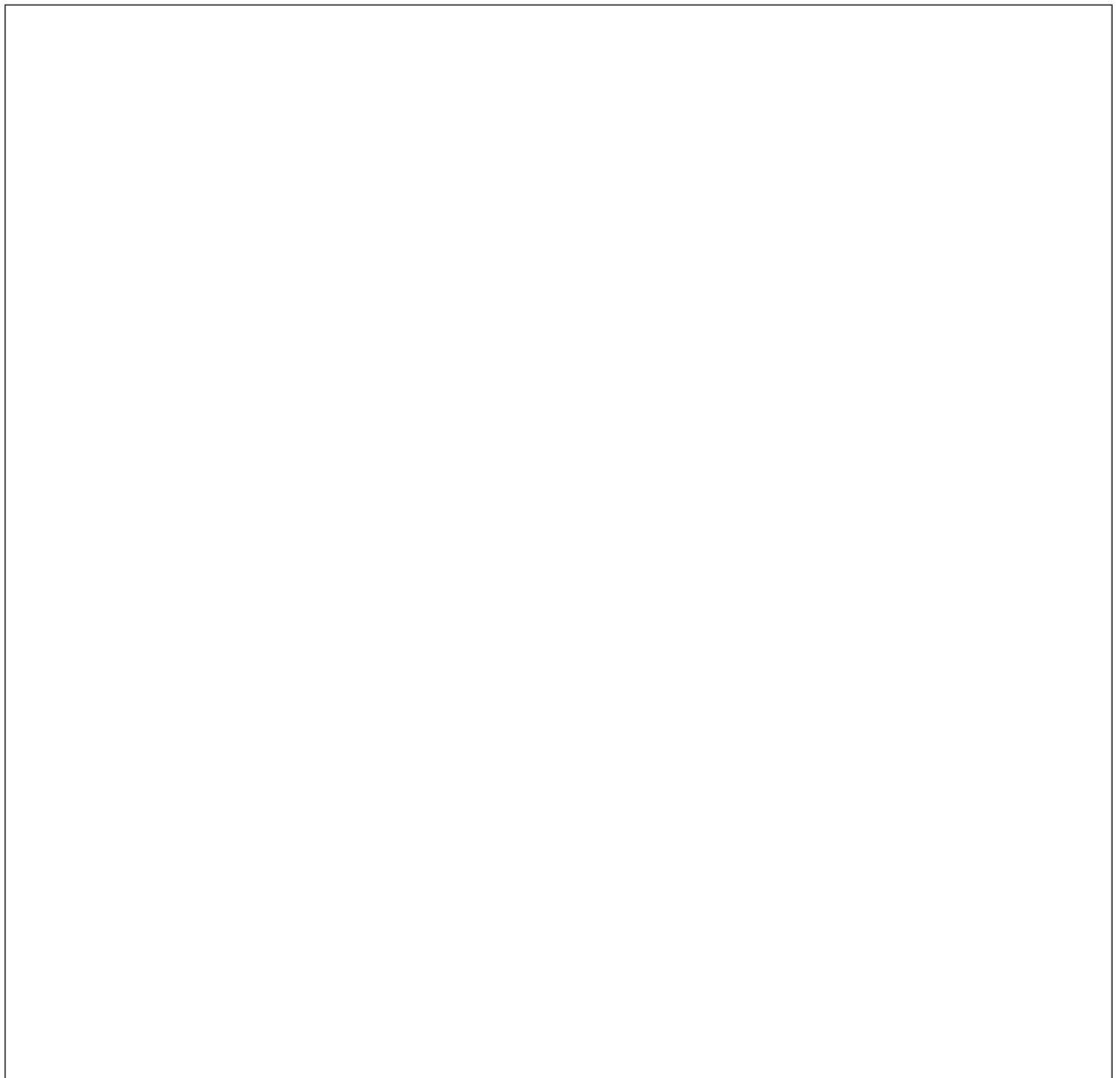
    (ii)   Construct a diagram to show how a positive feedback process involving **methane** may affect the rate of global warming.   *[2]*
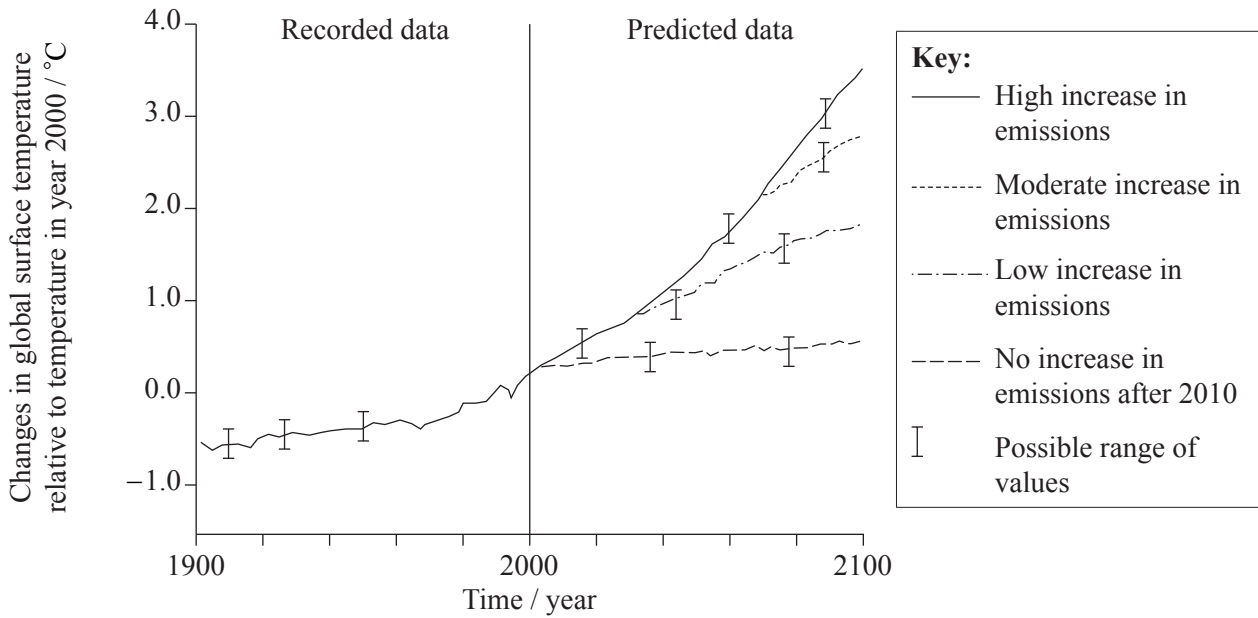
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(Question 1 continued)

(c)   Figure 1 below shows how increases in greenhouse gas emissions are predicted to affect global surface temperatures beyond the year 2000.

Figure 1

[Source: adapted from http://www.ipcc.ch/publications_and_data/ar4/wg1/en/spm.html]

(i)   Explain why the changes in global surface temperature between the years 1900 and 2000 are likely to have some degree of uncertainty, even though they are based on recorded data.   *[1]*

....

....

(This question continues on the following page)

(Question 1 continued)

    (ii)   State **two** reasons why computer models cannot predict exactly how global surface temperatures will change during the twenty-first century. *[2]*

    (d)   As well as being powerful greenhouse gases, chlorofluorocarbons (CFCs) affect atmospheric absorption of ultraviolet radiation.

    (i)   State the **name** of the atmospheric gas that significantly reduces the amount of ultraviolet radiation reaching the Earth's surface. *[1]*
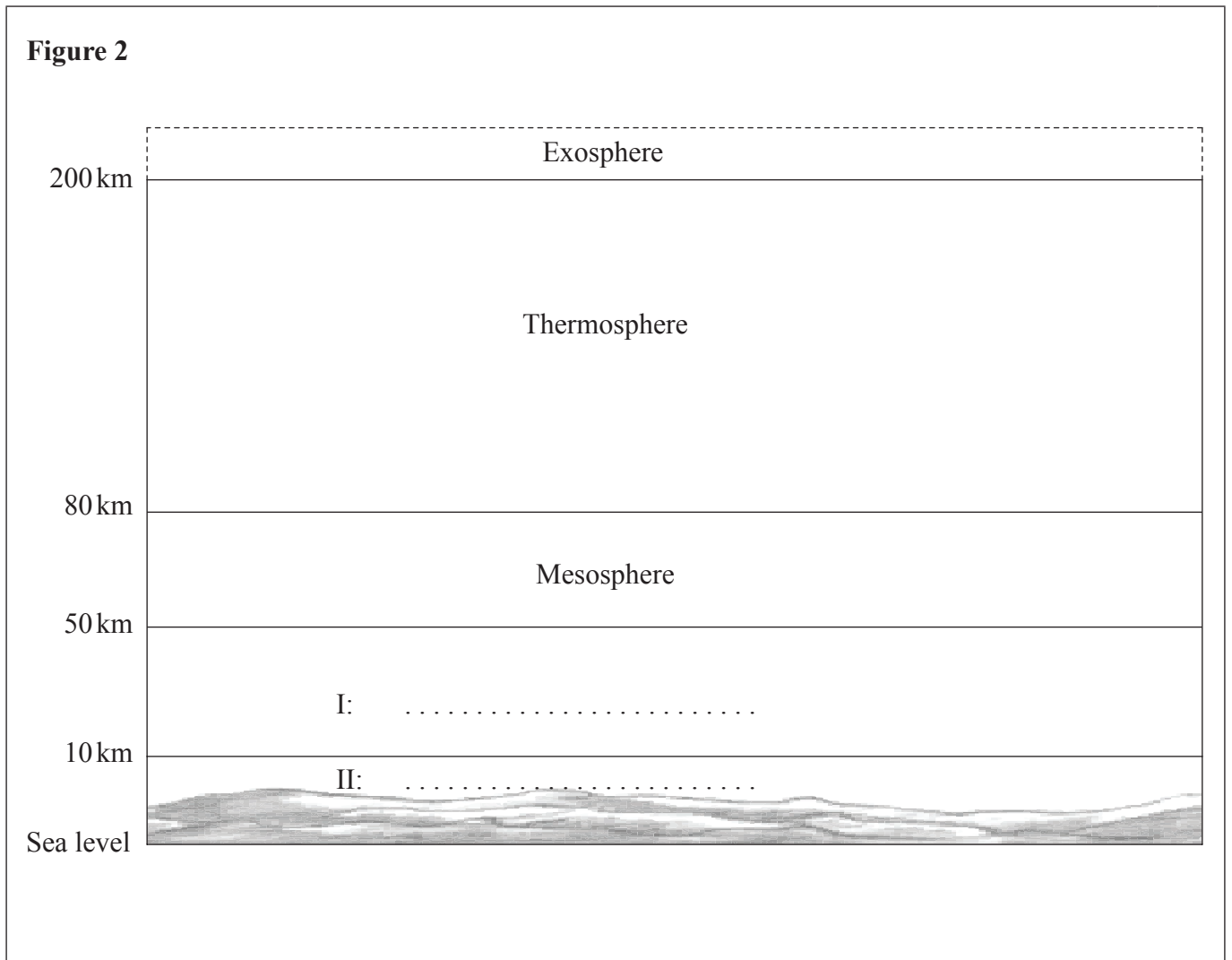
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Turn over

(Question 1 continued)

(ii)   Figure 2 below shows the structure of the Earth's atmosphere. Label the **two** lowest
         layers of the atmosphere on the diagram.   *[1]*

Figure 2

200 km	Exosphere
	Thermosphere
80 km	
	Mesosphere
50 km	
	I: . . . .
10 km	II: . . . .
Sea level	

(iii)   State **one** effect of ultraviolet radiation on living organisms.   *[1]*

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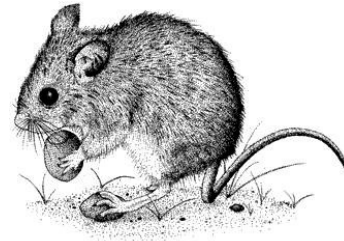
2. Owls are predators that hunt mainly at night. They feed on small mammals such as mice, voles and shrews. The owls vomit up pellets which contain the parts of the prey that they cannot digest, such as jaw bones. These jaw bones can be used to identify prey species.

Barn owl (*Tyto alba*)

[Source: Reproduced with the permission of the Barn Owl Trust]

Wood mouse (*Apodemus sylvaticus*)

[Source: Reprinted with permission]

Figure 3 below shows how an owl produces a pellet and Figure 4 shows the features of the mammal jaw bones used to identify the owl's prey.

Figure 3

undigested parts form a pellet and are vomited up

[Source: Ward's Natural Science]

Figure 4

incisor tooth (front of jaw)

tooth roots

length of jaw bone
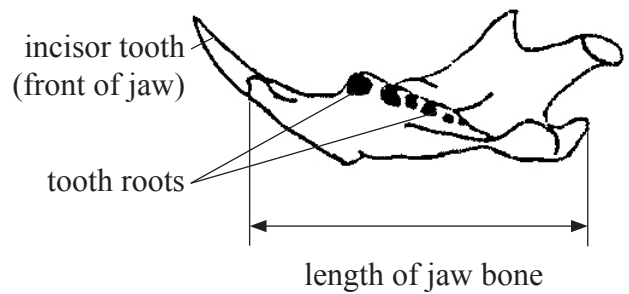
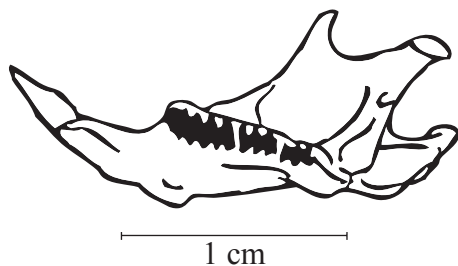[Source: Reproduced with the permission of the Barn Owl Trust]

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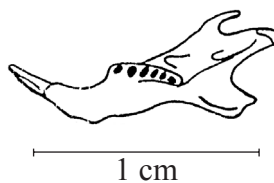
Turn over

(Question 2 continued)

(a) Using the key, identify the prey species A to F from the lower jaw bones found in owl pellets, from a European woodland. *[3]*

A.

1 cm

B.

1 cm

C.

1 cm

D.

1 cm

E.

1 cm

F.

1 cm
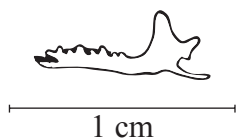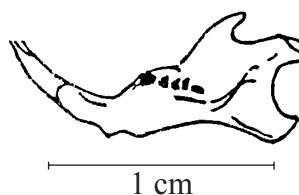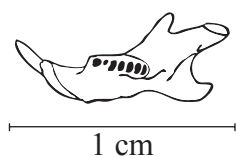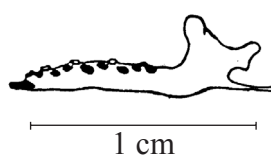
[Source: Reproduced with the permission of the Barn Owl Trust]

Key to lower jaw bones found in owl pellets			Diagram letter
1	Large upward-pointing incisor tooth at front of jaw	Go to 2	
	No large upward-pointing incisor tooth visible at front of jaw	Go to 3	
2	Six or more tooth roots visible	Go to 4	
	Five or fewer tooth roots visible	**House mouse**	
3	Length of jaw is equal to or more than 1 cm	**Common shrew**	
	Length of jaw is less than 1 cm	**Pygmy shrew**	
4	Length of jaw is equal to or more than 1.5 cm	**Field vole**	
	Length of jaw is less than 1.5 cm	Go to 5	
5	Tooth roots are all of equal size	**Wood mouse**	
	Second tooth root from front of jaw is smaller than the others	**Harvest mouse**	

(This question continues on the following page)

[3]

(Question 2 continued)

(b)   To estimate the populations of small mammals in a woodland, ecologists set traps in the area before sunset and the following morning marked all the captured animals before releasing them again.

(i)   State what information the ecologists must record before releasing the animals.   *[1]*

....

....

(ii)   A week later the traps are set again as before. State what data must be recorded when the traps are opened and explain how these data may be used to estimate the small mammal populations in the area.   *[2]*

....

....

....

....

(ii)   A student suggests that the relative abundance of jaw bones from different prey species found in owl pellets might be proportional to the relative sizes of the populations of those species.

Suggest **two** reasons why data from owl pellets may not reflect the relative sizes of the small mammal populations in an area.   *[2]*

....

....

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....

3. (a) Distinguish between the terms *ecological footprint* and *carrying capacity* of a human population. *[2]*

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. . . .

. . . .

. . . .

(b) For the resources listed below, identify whether each is considered to be renewable, non-renewable **or** replenishable. Groundwater is shown as an example. *[2]*

Groundwater: . . . . *Replenishable* . . . .

Rice crop from a paddy field: . . . .

Copper minerals in rocks: . . . .

Animal wool: . . . .

Ozone layer: . . . .

(c) (i) Distinguish between *transfer processes* and *transformation processes*. *[2]*

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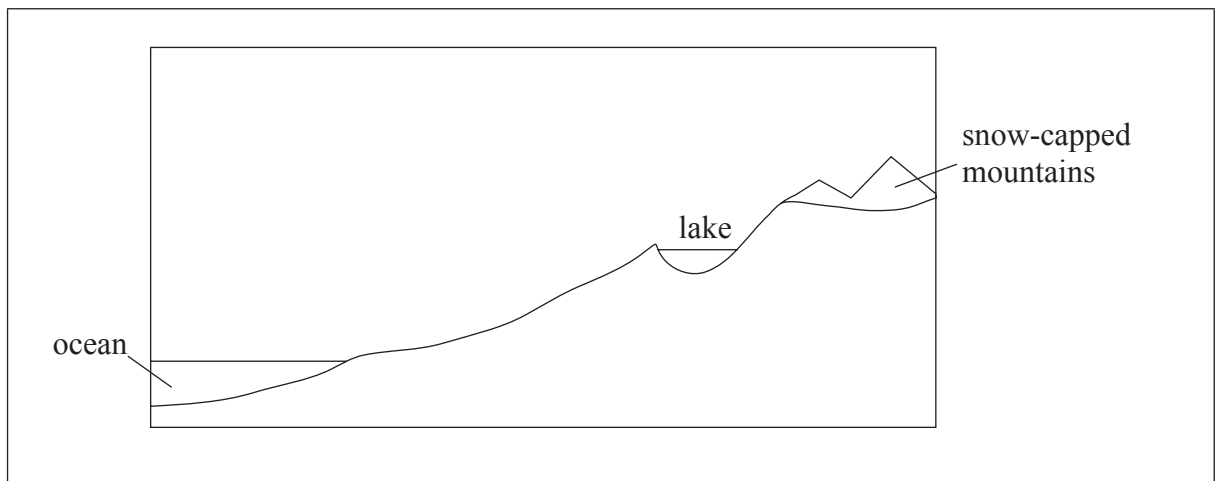
(Question 3 continued)

Figure 5 below shows a freshwater lake in a temperate forest biome, close to an ocean.

Figure 5

[Source: Photo by Peter Moore. http://en.wikipedia.org/wiki/Wast_Water]

(ii) Annotate the diagram below to show the natural transfer and transformation processes which move water from the ocean to the lake.   *[2]*

(iii) The land around the lake is used for livestock farming. State and explain **one** impact this may have on the lake ecosystem.   *[2]*

. . . .

. . . .

. . . .

. . . .

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Turn over

(Question 3 continued)

(iv)   Suggest **two** reasons why fresh water supplies may be insufficient to meet the
         demands of human societies in the future.   *[2]*

. . . .

. . . .

. . . .

. . . .

4. Figure 6 below shows the estimated size of some global energy flows for one year.

Figure 6

Energy type	Total energy flow / joules $\times 10^{20}$ yr^{-1}
Sunlight reaching surface of Earth	30 000
Net primary productivity (NPP)	30–50
Human food consumption	0.2

[Source: E I Newman, 2002, Applied Ecology and Environmental Management, Vol. 2, Blackwell Science, Oxford. Copyright Wiley-Blackwell, reproduced with permission.]

(a) State **two** processes that reduce the amount of sunlight reaching the Earth's surface, as the light travels through the atmosphere. *[1]*

(b) Using the data in Figure 6, calculate, as a percentage range, the proportion of global NPP used for human food consumption in one year. *[2]*

(c) Suggest **two** reasons why food is in short supply in some societies. *[2]*

Turn over

5.   (a)   Define the term *environmental impact assessment*.   *[2]*

> . . . .
>
> . . . .

(b)   Figure 7 below shows three alternative locations for a landfill site (A, B and C).

Figure 7
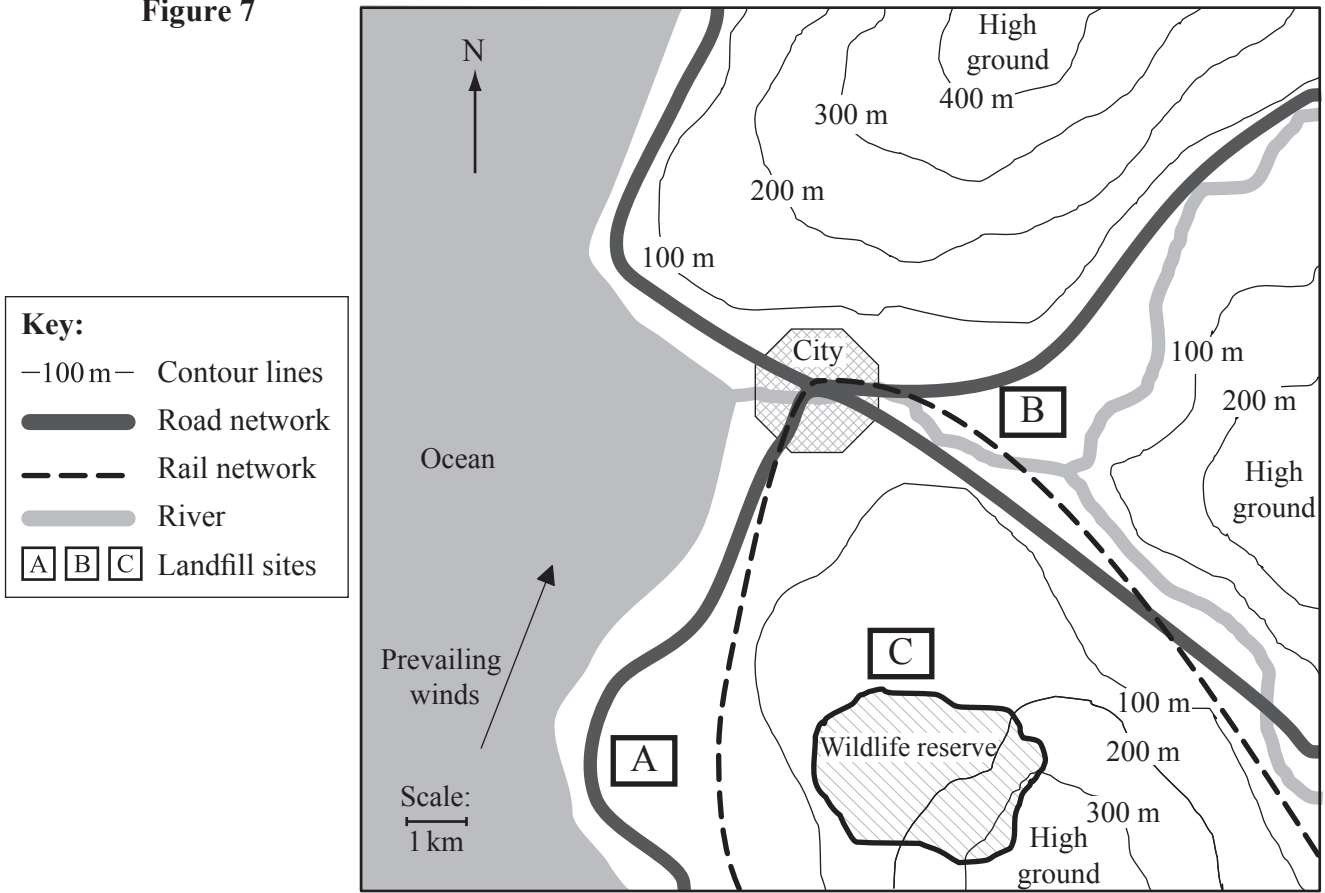
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(Question 5 continued)

Choose **one** landfill site and state **two** advantages and **two** disadvantages of your choice.   *[2]*

Landfill site chosen: . . . .

Advantages: 1.   . . . .

2.   . . . .

Disadvantages: 1.   . . . .

2.   . . . .

(c)   (i)   List **three** types of solid domestic waste.   *[1]*

1. . . . .
2. . . . .
3. . . . .

(ii)   Discuss the advantages and disadvantages of **one** named management strategy, other than landfill, for dealing with solid domestic waste.   *[2]*

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