

Candidate Name _____

Centre Number	Candidate Number

CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education Advanced Subsidiary Level
ENVIRONMENTAL SCIENCE
PAPER 2

8290/2

OCTOBER/NOVEMBER SESSION 2002

1 hour 45 minutes

Additional materials:
 Answer paper

TIME 1 hour 45 minutes

INSTRUCTIONS TO CANDIDATES

Write your name, Centre number and candidate number in the spaces at the top of this page and on all separate answer paper used.

Section A – Core

Answer **all** questions.

Write your answers in the spaces provided on the question paper.

Section B – Options

Answer **all** questions from **one** of the three Options.

For your chosen Option, write your answers to the first five questions in the spaces provided on the question paper. Answer the final question on separate answer paper.

At the end of the examination,

1. fasten all separate answer paper securely to the question paper;
2. enter the question numbers from your chosen Option in the grid opposite.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets [] at the end of each question or part question.

The marks allocated are an indication of the length of answer required.

The Options are as follows.

- 1 – The Exploitation of Natural Energy Resources
- 2 – The Management of Non-Biological Resources
- 3 – The Conservation of Biological Resources

FOR EXAMINER'S USE	
Section A	/
1	
2	
3	
Section B	/
TOTAL	

This question paper consists of 20 printed pages and 4 blank pages.

Section A

Answer **all** the questions.

Write your answers in the spaces provided.

- 1 Fig. 1.1 shows a world map and Fig. 1.2 compares the mean summer and winter temperatures for the northern and southern hemispheres.

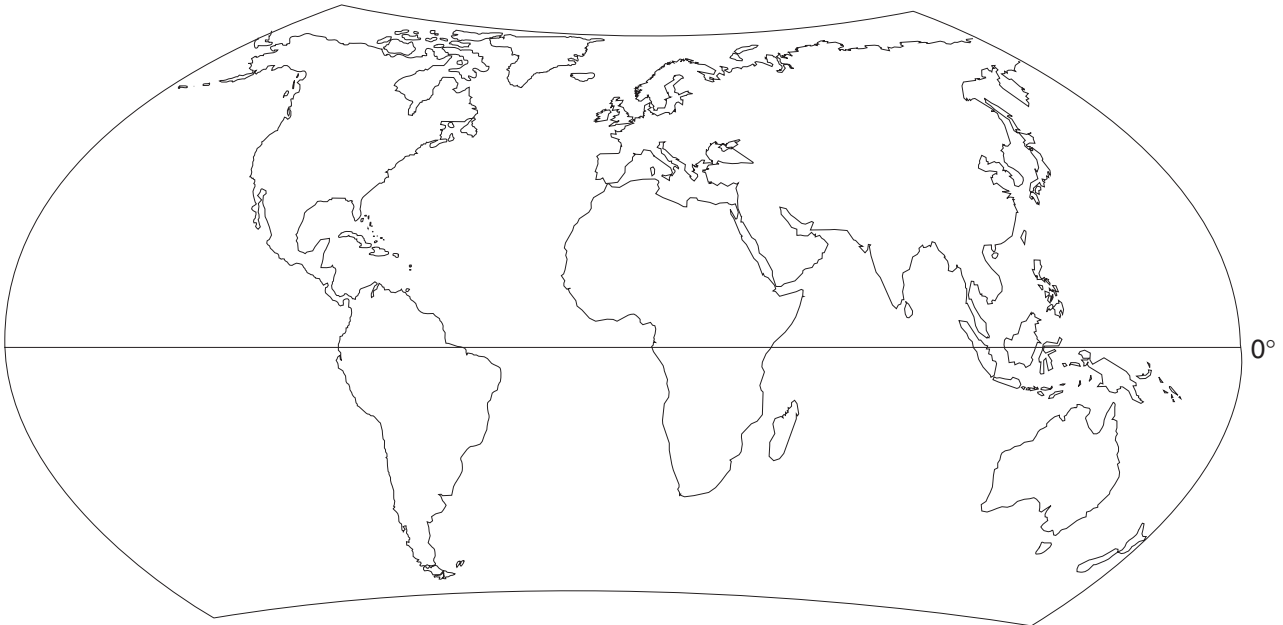


Fig. 1.1

hemisphere	mean summer temperature / °C	mean winter temperature / °C
north	22.4 °C	8.1 °C
south	17.1 °C	9.7 °C

Fig. 1.2

(a) Explain why mean summer temperatures are higher in northern summers than in southern summers and why mean winter temperatures are higher in southern winters than in northern winters.

.....
.....
.....
.....
.....[4]

(b) Why do temperatures at the poles remain low in summer although they receive very long periods of sunlight?

.....
.....
.....[2]

(c) Water freezes at 0 °C but its maximum density is at 4 °C. Explain why this is important to organisms living in a lake that freezes over in winter.

.....
.....
.....
.....[3]

2 (a) Fig. 2.1 shows isobars from part of a weather map for the northern hemisphere.

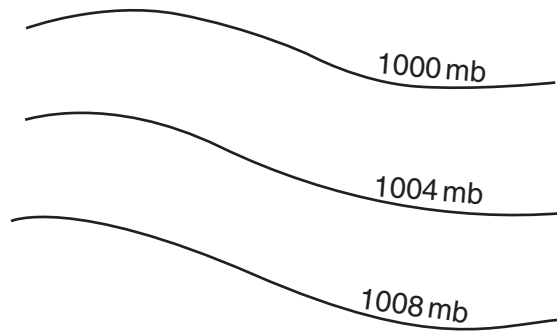


Fig. 2.1

(i) What are *isobars*?

.....[1]

(ii) On Fig. 2.1, indicate the direction of the wind at the Earth's surface. [2]

(iii) Explain the effect on wind strength when isobars are very close together.

.....
.....[2]

(b) Fig. 2.2 shows part of a weather map.

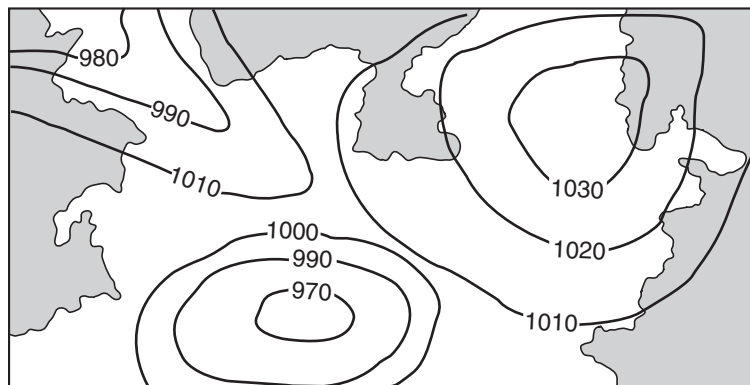


Fig. 2.2

(i) On Fig. 2.2, mark the position of an anticyclone with an **A**. [1]

(ii) What are the typical features of weather associated with an anticyclone?

.....
.....
.....[2]

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- 3 Fig. 3.1 shows three species of Indonesian squirrel, Fig. 3.2 shows the composition of their diets and Fig. 3.3 shows their distribution within a forest.

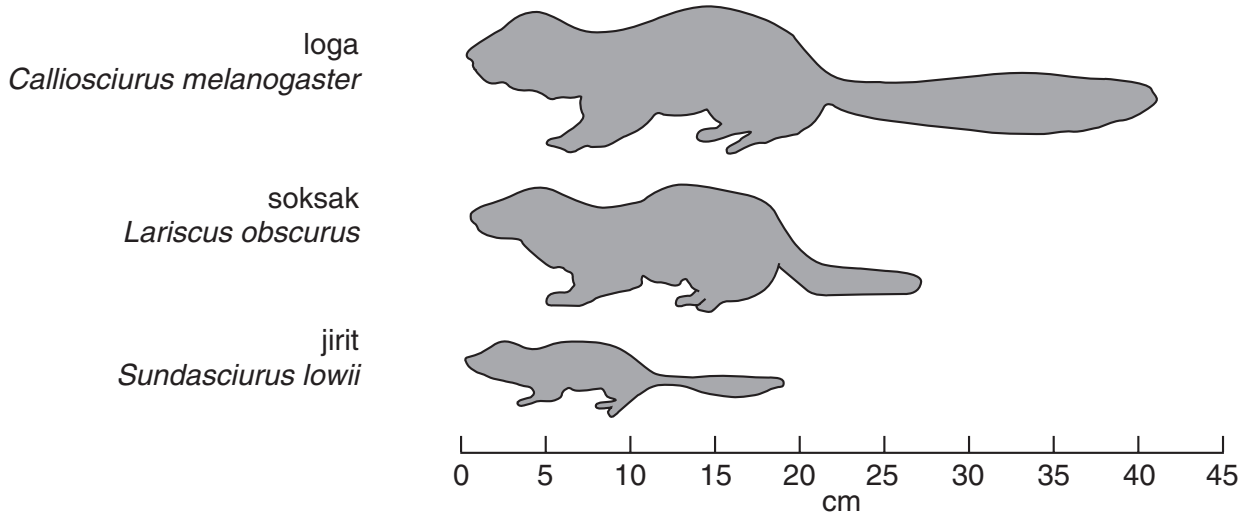


Fig. 3.1

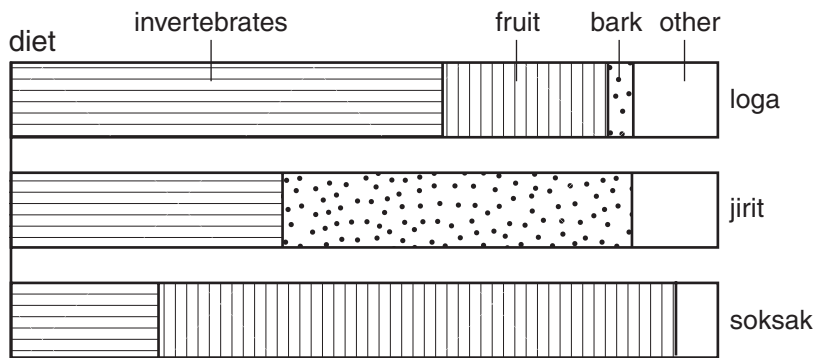


Fig. 3.2

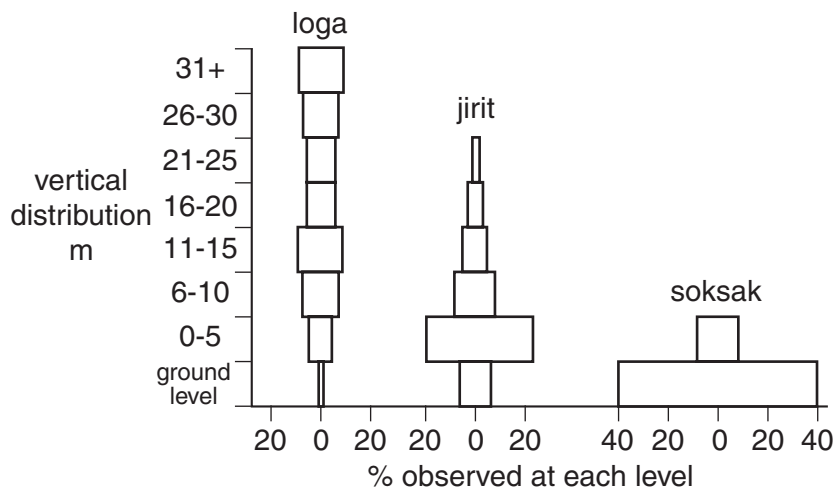


Fig. 3.3

Section B

Answer **all** the questions from **one** of the three Options.

OPTION 1 – THE EXPLOITATION OF NATURAL ENERGY RESOURCES

- 4 (a) An electric water heater has a power rating of 2400 W.
- (i) Which units are represented by W?[1]
 - (ii) What are the units of energy?[1]
 - (iii) How much energy will the heater supply in two minutes? Show your working.

[3]

- (b) How is the potential energy, stored in a water reservoir behind a dam, converted to electrical energy?

.....

.....

.....

.....[3]

5 (a) (i) State the sources of energy which are fossil fuels.
.....[1]

(ii) Which of the fossil fuels has the highest available energy content per kilogram?
.....[1]

(b) Fig. 5.1 shows the use of different energy sources in the USA between 1850 and 1992.

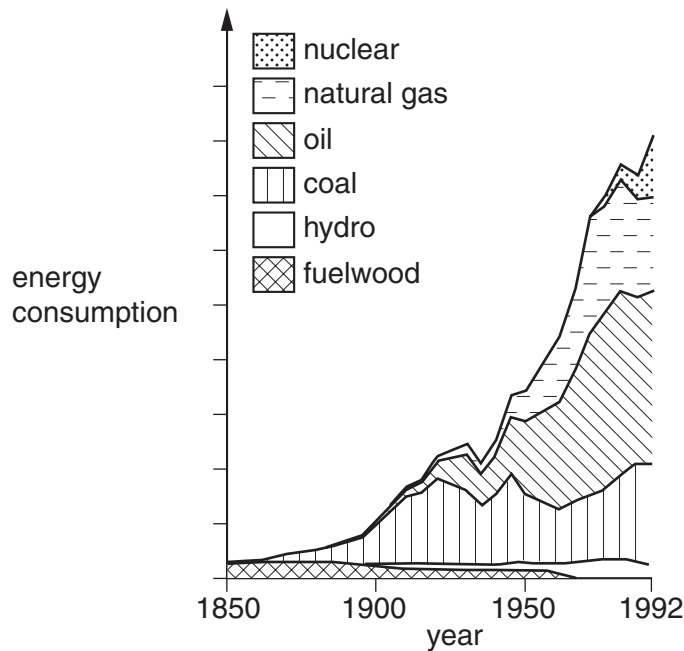


Fig. 5.1

(i) Which energy source appears to have fallen out of use?[1]

(ii) Suggest a reason for this.
.....[1]

(iii) Which source supplies the largest amount of energy?[1]

(iv) Which source of energy is the most recent to be exploited?.....[1]

(v) In recent years, development of nuclear energy has slowed down. Suggest two reasons for this.

1.
.....
2.
.....[2]

6 (a) Outline **one** method of harnessing solar radiation.

.....

.....

.....

.....[3]

(b) State two advantages of solar energy.

1.

2.[2]

(c) Why is solar energy not used more widely?

.....

.....[1]

7 (a) What is the source of the energy stored in wind and waves?[1]

(b) The power developed by a wind turbine with a horizontal shaft is given by the formula $P = kAv^3$ where k is a constant, A is the area swept by the turbine and v is the wind speed.

(i) How will this affect the construction and siting of a wind turbine so as to generate as much power as possible?

.....

.....

.....[2]

(ii) What environmental objections may be raised to the use of wind turbines?

.....

.....

.....[2]

(iii) State two problems of harnessing wind power to generate electricity.

1.

2.[2]

(c) (i) Briefly outline the way in which a barrage can be used to harness tidal energy.

.....
.....
.....
.....
.....
.....
.....[5]

(ii) State **one** disadvantage of such a barrage.

.....[1]

8 (a) What is the *geothermal gradient*?

.....[1]

(b) What are the conditions in which this gradient is likely to be steepest?

.....[1]

(c) Outline **one** method used to exploit geothermal energy.

.....
.....
.....
.....[3]

Answer this question on the separate answer paper provided.

9 (a) Explain what is meant by a photochemical smog and describe how it forms. [8]

(b) Discuss ways in which the causes of photochemical smog can be reduced. [7]

OPTION 2 – THE MANAGEMENT OF NON-BIOLOGICAL RESOURCES

10 (a) What is an *aquifer*?

.....[1]

(b) Fig. 10.1 shows a section through rocks in which aquifers occur.

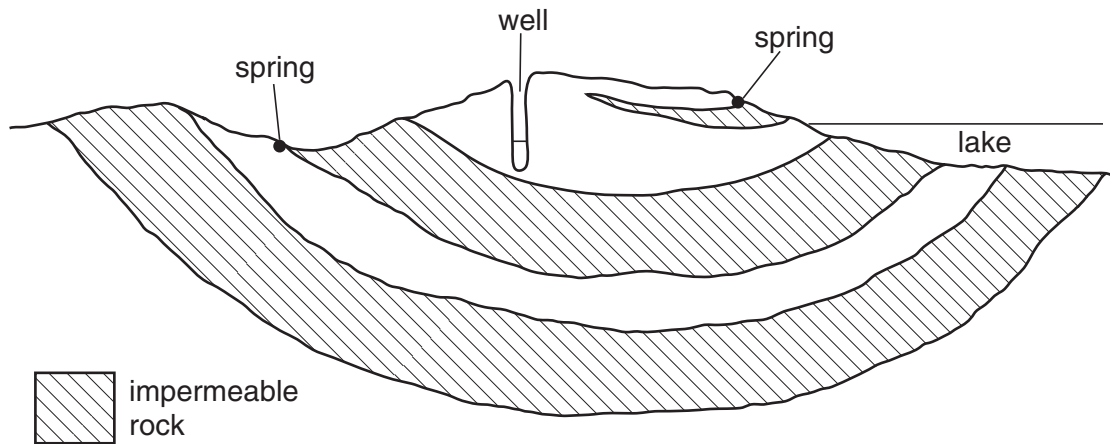


Fig. 10.1

On the diagram, mark the positions of

- | | |
|--|-----|
| (i) a confined aquifer with a C , | [1] |
| (ii) an unconfined aquifer with a U , | [1] |
| (iii) a perched aquifer with a P . | [1] |

(c) Fig. 10.2 shows the discharge of drainage water, following heavy rain, into a river before a housing development took place. Fig. 10.3 shows the discharge of drainage water, following heavy rain, into a river after this housing development was completed.

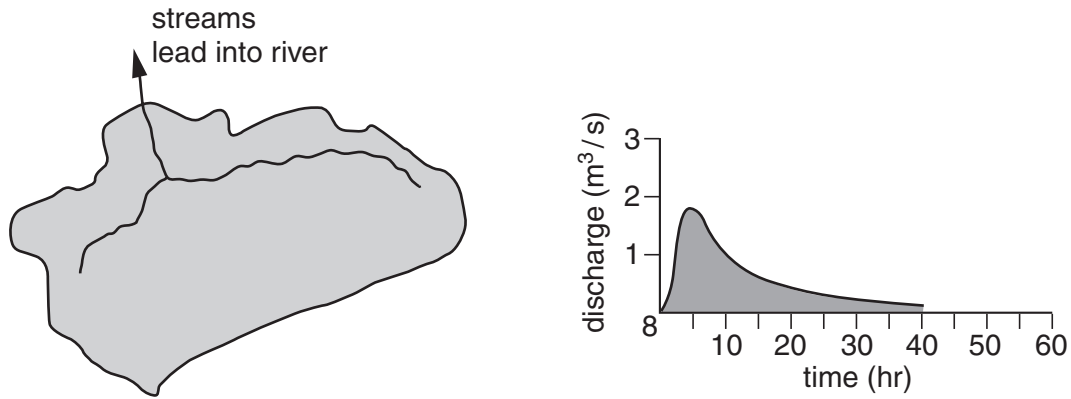


Fig. 10.2

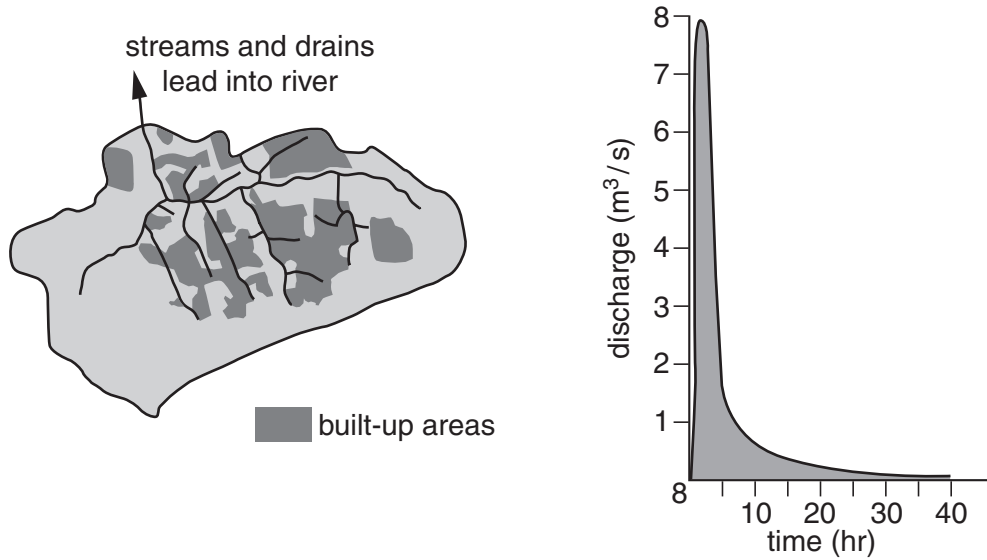


Fig. 10.3

(i) State two differences, shown on the graphs, in the discharge of water.

1.
2.[2]

(ii) Explain the reasons for these differences.

.....

.....

.....

.....[3]

11 In some countries, rivers used for bathing are contaminated with untreated sewage and untreated sewage may be used as a fertiliser.

(a) Explain how these practices can lead to

(i) cholera,

.....

.....

.....

(ii) schistosomiasis (bilharzia).

.....

.....

.....[6]

(b) State **one** method of control for each of these diseases.

cholera

.....

schistosomiasis

.....[2]

12 (a) Fig. 12.1 shows the percentages of four types of waste, produced in a developed country, which are recycled.

type of waste	total amount	percentage recycled
aluminium	2 million cans	1
glass	6 million bottles	13
paper	9 million tonnes	28
plastics	3 million tonnes	4

Fig. 12.1

(i) Suggest why the percentage of glass recycled is much higher than that of plastic.

.....

.....[1]

(ii) State two reasons why the recycling of plastics should be encouraged.

- 1.
- 2.[2]

(iii) Name two other types of waste, not shown on the table, that can be recycled.

- 1.
- 2.[2]

(b) Incineration is one method of waste disposal. Outline two problems associated with incineration.

- 1.
-
- 2.
-[2]

13 (a) (i) What is *leaching*?

.....

.....[1]

(ii) In which type of soil is leaching greatest?

.....[1]

(iii) State **one** problem that leaching can produce.

.....[1]

(b) The fertility of dry areas may be improved with irrigation, but constant irrigation in such areas may lead to infertility. Explain how this occurs.

.....

.....

.....

.....

.....[4]

14 (a) (i) What are *placer deposits*?

.....
.....[1]

(ii) Streams draining from areas where gold deposits are found carry sedimentary grains. Grains of gold may become concentrated in the upper reaches of these streams. Why is this?

.....
.....
.....[2]

(b) (i) What are *bulk materials*?

.....[1]

(ii) Name three bulk materials and state a different use for each.

1. material
use

2. material
use

3. material
use[3]

(iii) Bulk materials may be extracted by quarrying. State two problems that may be caused by quarrying.

1.
.....

2.
.....[2]

Answer this question on the separate answer paper provided.

15 (a) State what is meant by *eutrophication*. Outline the ways in which it is brought about in rivers and lakes and the effects that it produces. [8]

(b) Describe the main processes involved in a sewage treatment plant. [7]

OPTION 3 – THE CONSERVATION OF BIOLOGICAL RESOURCES

16 (a) Explain the difference between a *variety* and a *species*.

.....
.....
.....[2]

(b) Fig. 16.1 shows a wooded valley in which a species of snail is found. A road is built through the valley dividing the wood into two isolated sections.

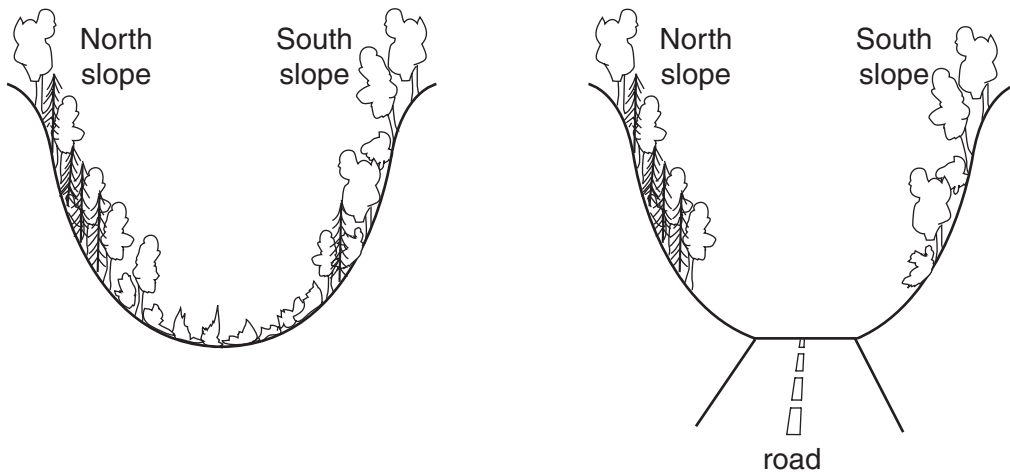


Fig. 16.1

Outline the effects that this could have on the two resulting populations of snails.

.....
.....
.....
.....
.....
.....
.....[4]

17 An investigation into soil erosion was carried out over two years. Plots of sloping land were used to compare the effects of different types of plant cover and no plant cover. Fig. 17.1 shows the results.

plot	plant cover	soil lost by erosion / tonnes per hectare	water lost by run-off as a % of rainfall
1	ungrazed thicket (bushes and small trees)	0	0.4
2	grass	0	2
3	millet	78	20
4	no plant cover	150	50

Fig. 17.1

(a) State two ways in which plant cover helps to prevent soil erosion.

1.
2.[2]

(b) Millet is a cereal crop. Suggest why grass was more efficient than millet in preventing soil loss and run-off.

.....

[2]

(c) Slopes may be terraced before cultivation to help prevent erosion. How could information from Fig. 17.1 be used to suggest ways of stabilising the terraces?

.....

[2]

18 (a) An increasing interest is being shown in fish farming in many areas of the world. State two reasons for this.

1.

2.[2]

(b) State three advantages and three problems associated with fish farming.

advantages

1.

.....

2.

.....

3.

.....

problems

1.

.....

2.

.....

3.

.....[6]

19 (a) Outline the difference between *genetic engineering* (by means of transgenics) and *artificial selection*.

.....
.....
.....
.....[3]

(b) Give **one** example of genetic engineering and state an advantage of genetic engineering shown by this example.

.....
.....
.....[2]

(c) State three problems that may arise from genetic engineering.

1.
2.
3.[3]

20 (a) Forests are a source of many useful products but deforestation is occurring at a rapid rate.

(i) List **four** products obtained from forests.

.....
.....[4]

(ii) State two reasons why deforestation occurs.

1.
2.[2]

(b) Wood is the main source of fuel in many developing countries. Populations were originally thinly scattered and supplies could be obtained locally by most people. Now rural people are having to travel greater distances to find wood. Populations are increasing and becoming concentrated in cities.

How can these facts account for increasing deforestation in these countries?

.....
.....
.....
.....[3]

(c) (i) Tropical forest is being cut down to create open areas for ranching.

State two problems associated with this.

1.
2.[2]

(ii) State **one** way in which farmers can ensure that open grassland, used for grazing, does not deteriorate.

.....[1]

Answer this question on the separate answer paper provided.

21 (a) Why is the maintenance of biological diversity important? [7]

(b) Discuss the problems involved in the conservation of the African elephant. [8]

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