

Centre Number	Candidate Number	Name
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CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education
Advanced Subsidiary Level and Advanced Level

ENVIRONMENTAL SCIENCE

8290/02

Paper 2

October/November 2003

1 hour 45 minutes

Additional Materials: Answer Paper

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use a soft pencil for any diagrams, graphs, tables or rough working.
Do not use staples, paper clips, highlighters, glue or correction fluid.

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.

For Examiner's Use	
Section A	/
1	
2	
3	
Section B	/
Total	

If you have been given a label, look at the details. If any details are incorrect or missing, please fill in your correct details in the space given at the top of this page.

Stick your personal label here, if provided.

This document consists of **26** printed pages and **2** blank pages.

Section A

Answer **all** the questions.

Write your answers in the spaces provided

- 1 (a) Fig. 1.1 is a cross-section showing the structure of the Earth.

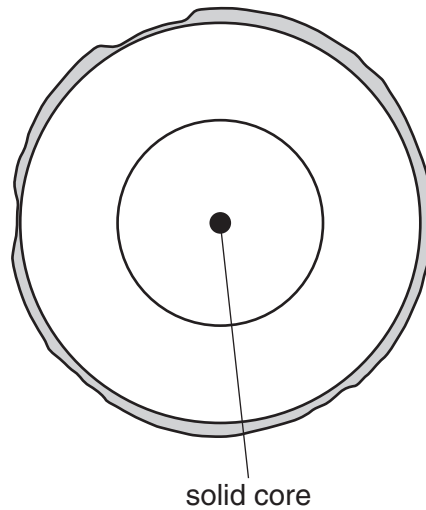


Fig. 1.1

On the diagram, label,

- (i) the mantle,
- (ii) continental crust,
- (iii) oceanic crust.

[3]

- (b) Rocks can be divided into three types, each with a different origin.

Complete Table 1.1 to show the three types of rock, their origins and an example of each type.

Table 1.1

rock type	origin	example
igneous	magma	
metamorphic		

[6]

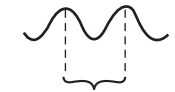
2 Fig. 2.1 shows the *electromagnetic spectrum*.

gamma rays	X-rays	ultraviolet	Z	infra-red	micro-waves	radio waves
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Fig. 2.1

(a) What is represented by **Z**?[1]

gamma rays



1 wavelength

radio waves

Fig. 2.2

(b) On Fig. 2.2, sketch what the waveform will look like towards

- (i) the gamma rays,
- (ii) the radio waves.

[2]

(c) As frequency of electromagnetic radiation increases, what happens to the wavelength?

.....[1]

(d) The Sun emits electromagnetic radiation which reaches the Earth. Gamma rays, X-rays and ultraviolet radiation are all damaging to living organisms. How is this damage prevented?

.....

.....[1]

(e) Fig. 2.3 shows the temperature distribution, in °C, from the centre of a city to its edge.

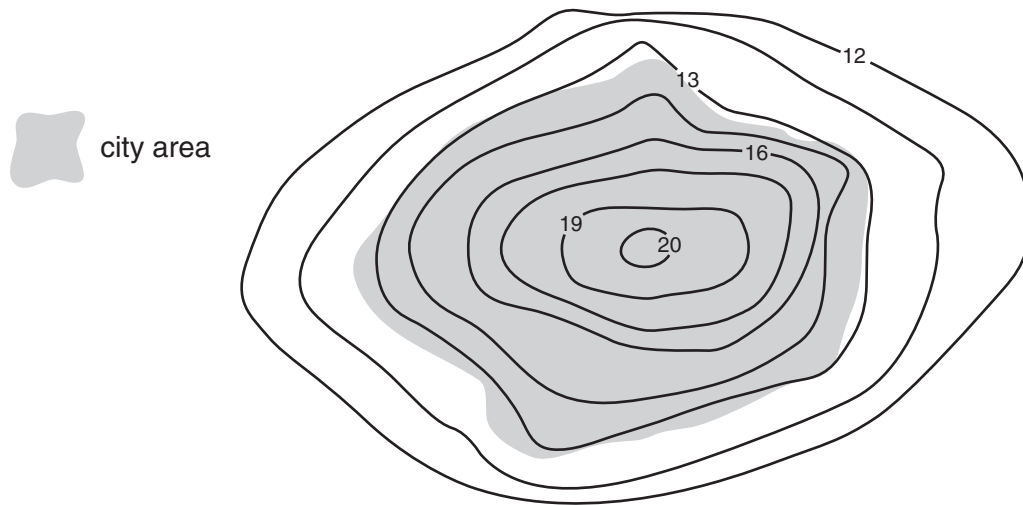


Fig. 2.3

Fig. 2.4 shows the reflection of the Sun's radiation from a city area and from a rural area.

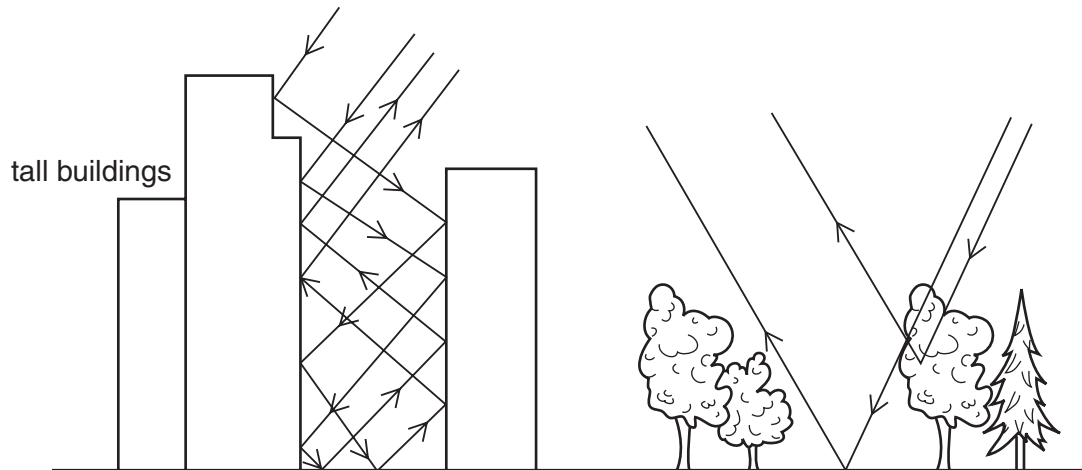


Fig. 2.4

Explain the temperature distribution seen in Fig. 2.3.

.....

.....

.....

.....

.....

.....[3]

3 The atmosphere of Venus has a high concentration of CO₂. The atmosphere of Mars lacks an ozone layer. Explain how these factors would prevent life forms, found on Earth, surviving on these two planets.

.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....

[8]

Section B

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

OPTION 1 - THE EXPLOITATION OF ENERGY RESOURCES

Answer questions 4, 5, 6, 7 and 8 in the spaces provided.

4 Fig. 4.1 shows an *oil trap*.

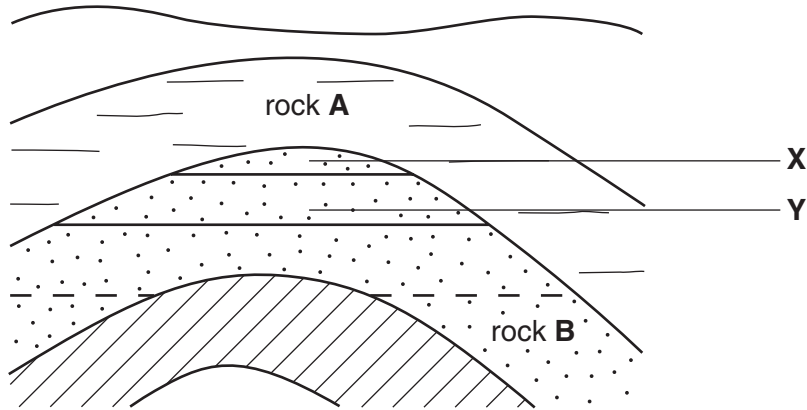


Fig. 4.1

(a) (i) What collects in **X** and **Y**?

X

Y[2]

(ii) State **one** essential property of rock **A** and **one** essential property of rock **B**.

rock **A**

rock **B**[1]

(b) Outline the way in which oil forms in an oil trap.

.....

[5]

- 5 Fig. 5.1 shows the worldwide use of energy from different sources and the extent to which these energy sources are used in developed and developing countries.

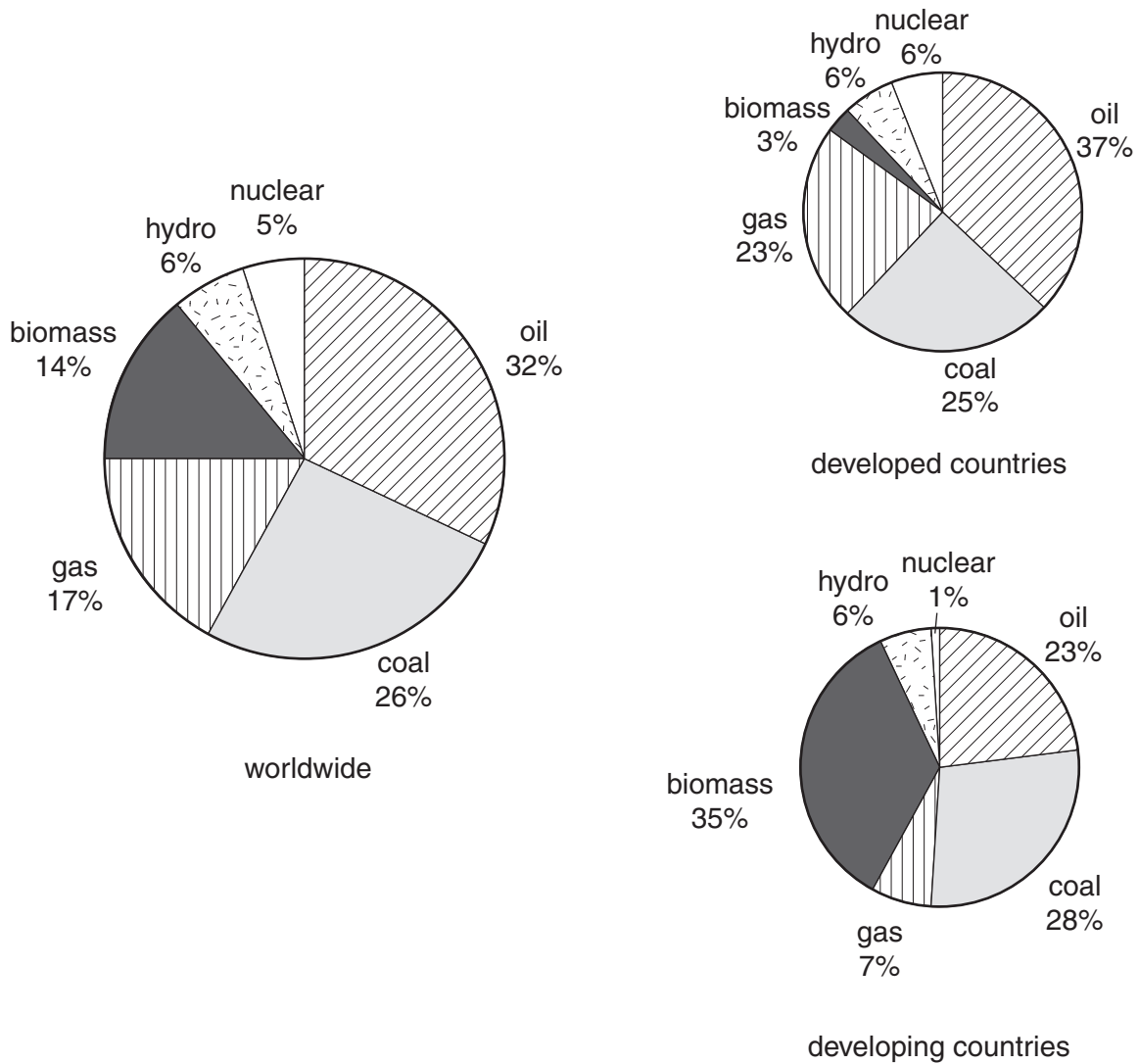


Fig. 5.1

- (a) Describe worldwide energy use shown in Fig. 5.1. (Refer to all the pie charts.)

.....

.....

.....

.....[3]

- (b) Using information from Fig. 5.1, calculate the % (percentage) of worldwide energy that is obtained from fossil fuels. (Show your working.)

% obtained from fossil fuels[2]

(c) Using information from Fig. 5.1, approximately how many times greater is the use of biomass in developing countries than in developed countries?

.....[1]

(d) Suggest reasons for the difference in the use of biomass between developed and developing countries.

.....

.....

.....

.....[2]

- 6 (a) Fuel alcohol can be produced, by a fermentation process, from sugar cane, sugar beet or cereals. This form of fuel is very low in sulphur.

State and explain two advantages of this fuel over oil-based fuel.

1. advantage

explanation

.....

2. advantage

explanation

.....[4]

- (b) Research has shown that the pH of a lake has changed over the past 700 years. These changes are shown in Fig. 6.1.

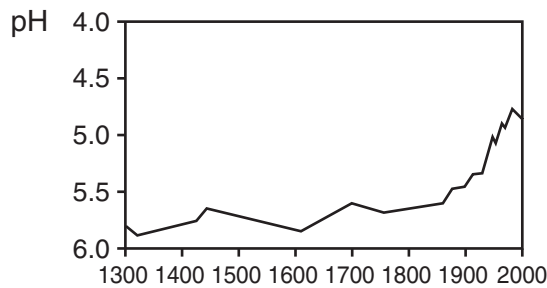


Fig. 6.1

- (i) Describe the changes shown by the graph in Fig. 6.1.

.....

[2]

- (ii) Suggest reasons for these changes.

.....

[2]

7 (a) Electricity is generated in nuclear power stations by a process using an element represented by the symbol U.

(i) What is this process called?

.....[1]

(ii) Which element is represented by U?

.....[1]

(b) Fig. 7.1 represents the reaction that takes place in a nuclear reactor.

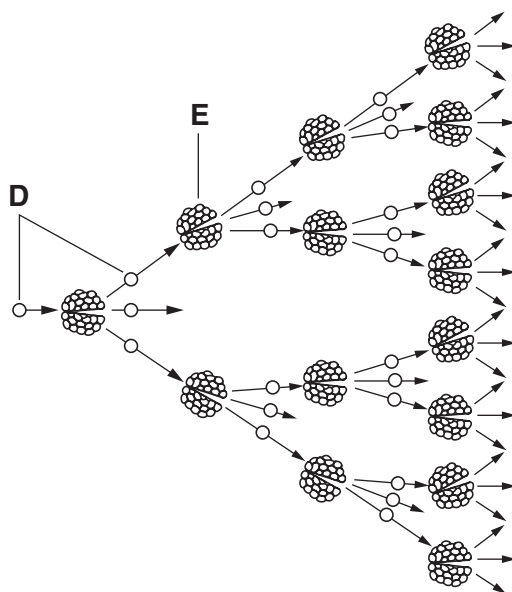


Fig. 7.1

(i) Name particle D.

.....

(ii) Name particle E.

.....

[2]

(c) The reaction shown in Fig. 7.1 is a chain reaction. Explain what is meant by *chain reaction*.

.....

[2]

- (d) Outline the way in which energy, released in a nuclear reactor, is used to generate electricity.

.....

[3]

- (e) There is very little investment in new nuclear power plants. This is in contrast to the growth in use of other energy sources. Suggest **one** reason for this.

.....
[1]

8 Complete Table 8.1 to show

- (a) **two** sources of renewable energy,
 (b) **one** advantage of **each** source,
 (c) **one** disadvantage of **each** source.

Table 8.1

source of renewable energy	advantage	disadvantage
1		
2		

[6]

Answer this question on the separate answer paper provided.

- 9 (a) Describe the ways in which moving water can be used to generate electricity. [8]
 (b) Explain the advantages and disadvantages of these methods of generating electricity. [7]

OPTION 2 - THE MANAGEMENT OF NON-BIOLOGICAL RESOURCES

Answer questions 10, 11, 12, 13 and 14 in the spaces provided.

- 10** Fig. 10.1 shows the fate of rainwater (precipitation) before and after the development of housing and other buildings (urbanisation).

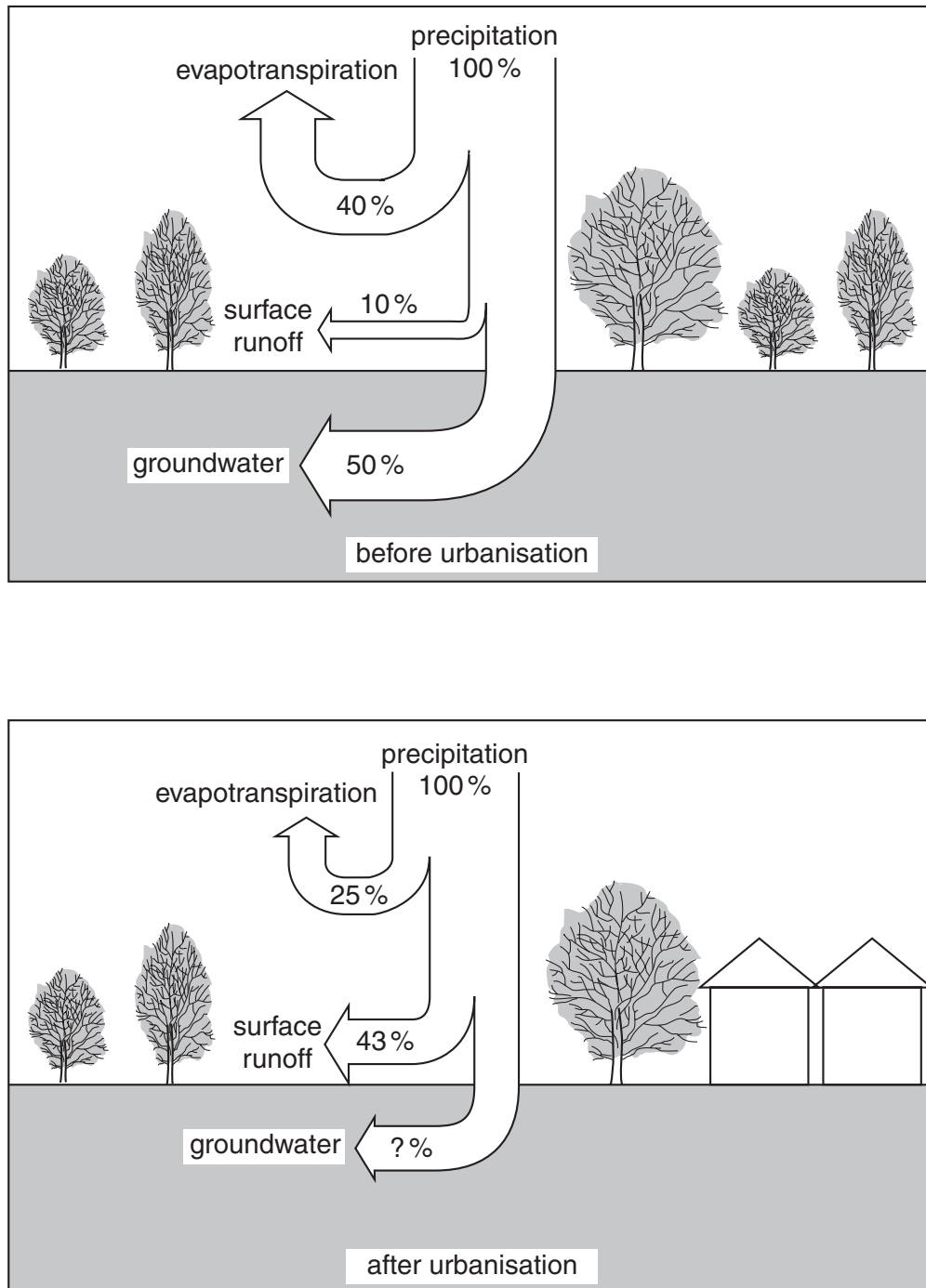


Fig. 10.1

- (a) Calculate the % (percentage) of precipitation that forms groundwater after urbanisation. (Show your working.)

.....[2]

- (b) Explain the difference in the % (percentage) of precipitation, before and after urbanisation, forming

- (i) evapotranspiration,
- (ii) surface runoff,
- (iii) groundwater.

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

11 Large numbers of dead fish appeared in a river below an outfall pipe that drains into the river from farmland. Oxygen levels and levels of organic matter were investigated in this part of the river. Fig. 11.1 shows the findings from these investigations.

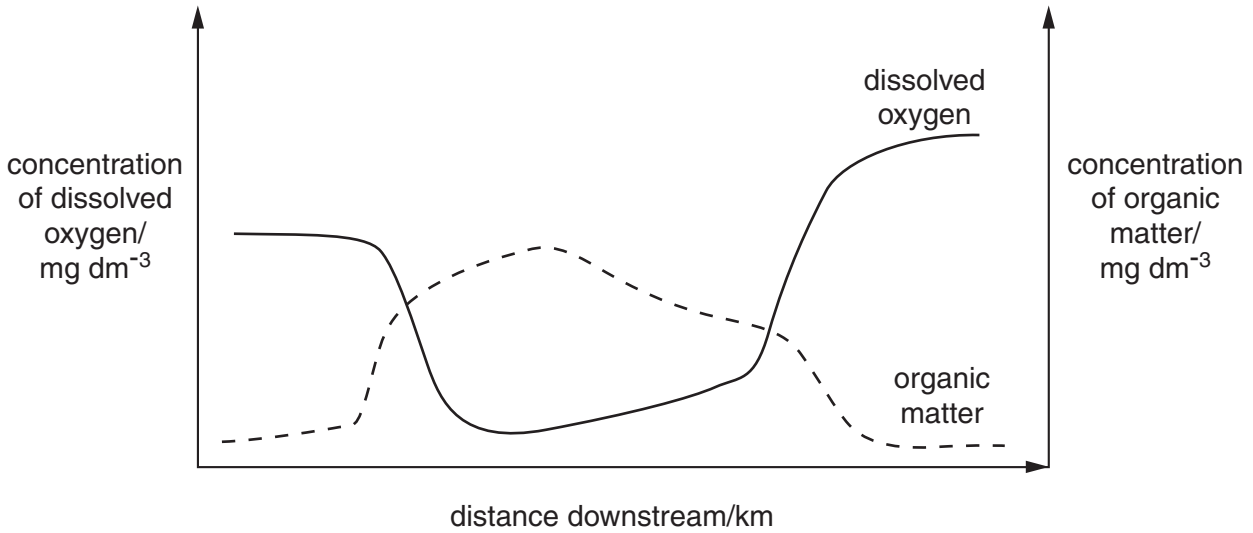


Fig. 11.1

(a) (i) On the diagram, mark with an **A** the point at which the outfall flows into the river. [1]

(ii) On the diagram, mark with a **B** the area where the dead fish were first likely to be seen. [1]

(b) What is the name of the process that has occurred in this part of the river, resulting in the death of fish?

.....[1]

(c) Explain how this process results in the death of the fish.

.....

[4]

(d) Suggest what could have produced this effect below the outfall.

.....[1]

12 A farmer grows a grass crop to provide fodder for animals. The growth of the grass is poor. The soil is tested in several ways to find out why.

(a) Fig. 12.1 shows a sample of the soil being put through a soil sieve and the results of analysing the proportions of different particle sizes.

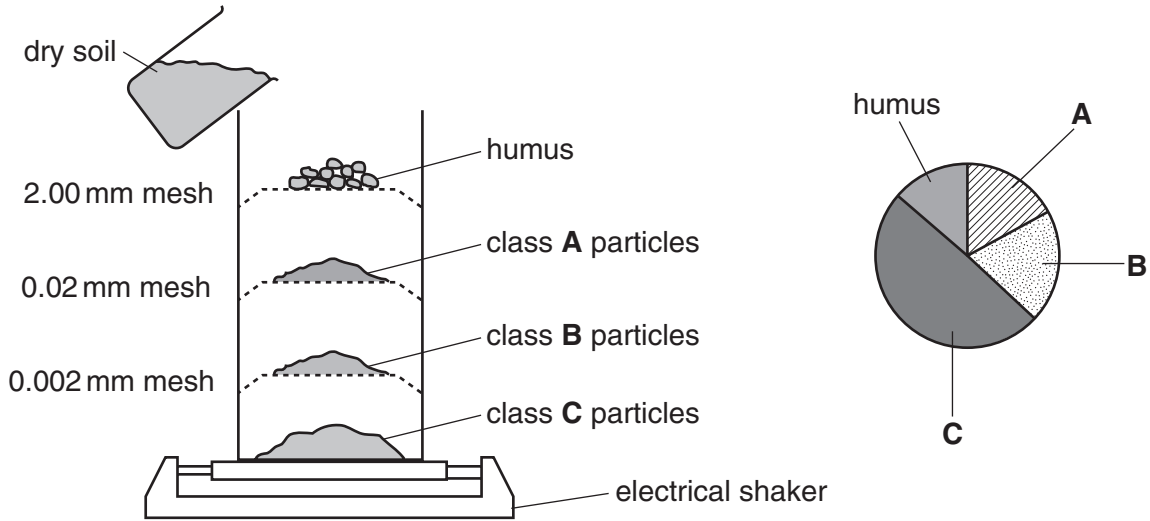


Fig. 12.1

What are the particles **A**, **B** and **C**?

- A
- B
- C

[1]

(b) Fig. 12.2 shows the results of testing the pH of the soil.

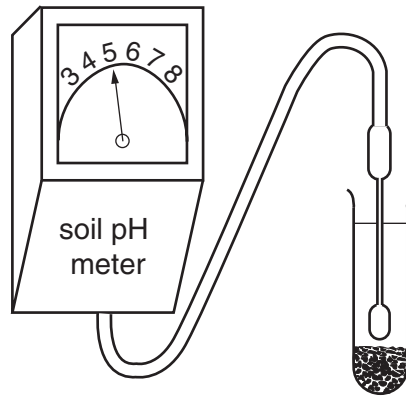


Fig. 12.2

State **one** effect of adding lime to this soil.

.....
[1]

(c) The grass crop shows poor, yellowed leaf growth.

(i) Which major nutrient is likely to be deficient?

.....[1]

(ii) This nutrient could be added by manuring the land or spreading a synthetic fertiliser.

State **one** advantage of

adding manure,

.....

spreading synthetic fertiliser.

.....[2]

(iii) Explain why sowing legumes with the grass could help to prevent the nutrient deficiency.

.....

.....

.....

.....[3]

- 13 Table 13.1 shows the changing proportions of different types of household waste in a developed country between 1950 and 1990.

Table 13.1

type of waste / % of volume per year	year				
	1950	1960	1970	1980	1990
plastic	5	7	14	16	18
wood	2	3	1	4	3
metal	3	2	2	4	4
glass	0	2	4	8	6
paper	20	30	41	63	66
coal and wood ash	70	56	38	5	3

- (a) Describe the changes seen, between 1950 and 1990, in the % of volume of

(i) plastic waste,

.....

(ii) paper waste,

.....

(iii) coal and wood ash.

.....

[3]

- (b) For **one** of the types of waste listed in (a), suggest a reason for the change seen in % of volume between 1950 and 1990.

type of waste

.....

.....[1]

(c) (i) For **one** of the types of waste shown in Table 13.1, suggest one way in which the volume of waste produced could be reduced.

type of waste
.....
.....[1]

(ii) State two reasons why reducing the amount of waste produced would be an advantage.

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

14 (a) (i) What is a *bulk material*?

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

(ii) Table 14.1 shows the origins of the bulk materials granite, limestone and sand. Complete the table, identifying each material and stating a use for it.

Table 14.1

bulk material	origin	use
	sedimentary rock found as placer deposits	
	igneous rock	
	rock from the remains of marine organisms	

[6]

(b) Fig. 14.1 shows a section through a limestone quarry close to the coast. When extraction of limestone reached sea-level, the quarry was abandoned.

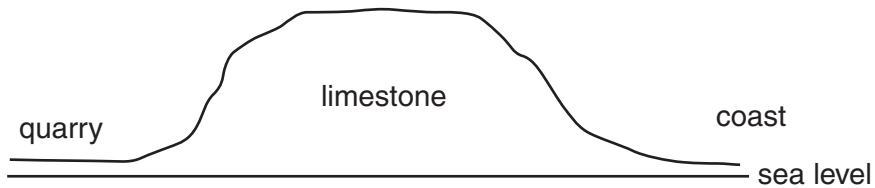


Fig 14.1

(i) Suggest why the quarry was abandoned at this point.

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

(ii) Suggest two ways in which disused quarries could be used.

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

Answer this question on the separate answer paper provided.

15 (a) Outline the ways in which drinking water can be produced from sea water. [7]

(b) Describe the advantages and disadvantages of the artificial fluoridation of drinking water. [8]

OPTION 3 - THE CONSERVATION OF BIOLOGICAL RESOURCES

Answer questions 16, 17, 18, 19 and 20 in the spaces provided.

- 16 (a)** Fig. 16.1 shows a process that takes place within cells and is essential for the use of genetic information within a living organism.

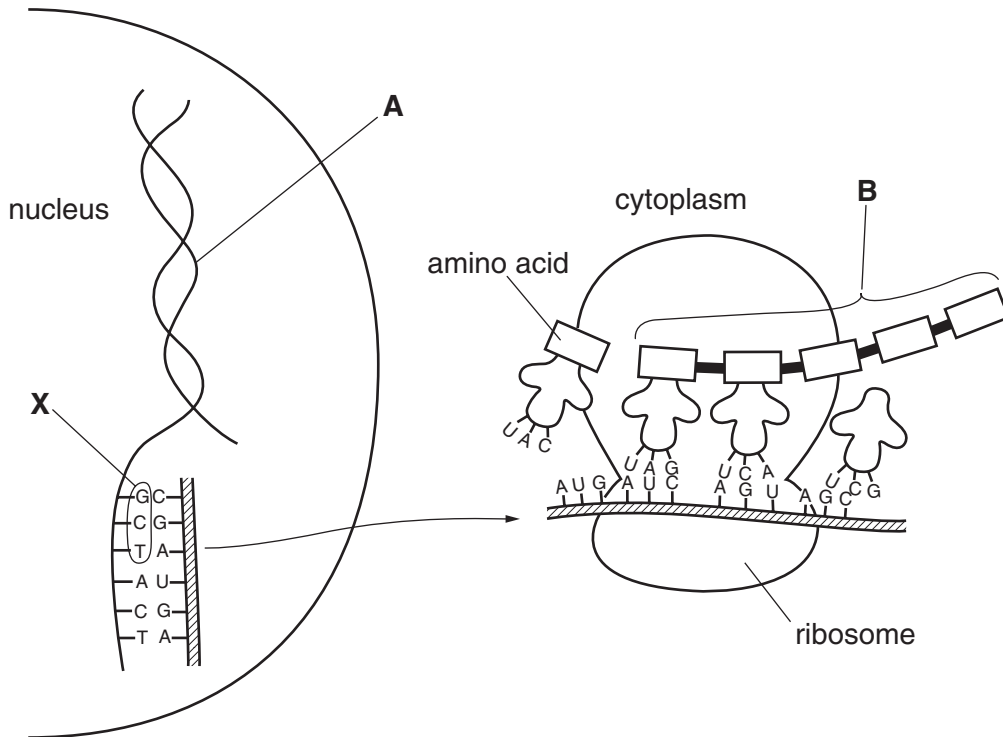


Fig. 16.1

- (i)** State what **A** and **B** represent.

A

B

[2]

- (ii)** Explain the importance of regions such as **X** in this process.

.....

[3]

(b) A plant (*Arabidopsis thaliana*) has been genetically modified so that it can synthesise a biodegradable plastic.

(i) Explain what is meant by *genetic modification*.

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

(ii) Outline a way in which genetic modification could have been brought about in the plant.

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

(iii) Suggest **one** advantage and **one** disadvantage of this genetic modification to produce biodegradable plastic.

advantage

.....

disadvantage

.....[2]

17 Cultivated land, producing crops, is at much greater risk of erosion than land covered with natural vegetation.

(a) Suggest two reasons for the greater risk of erosion on cultivated land.

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

(b) State two methods that farmers can use to prevent soil erosion.

- 1.
- 2.[2]

(c) For each of the two methods that you have stated in (b), describe the way in which erosion is prevented.

- method 1.
.....
.....
- method 2.
.....
.....[4]

- 18 Table 18.1 gives information about the populations of two fish species, in an enclosed sea, over one year.

Table 18.1

	species A	species B
mass at the beginning of the year / tonnes	100 000	60 000
increase in mass by birth of young fish / tonnes	1 000	300
increase in mass by growth of fish / tonnes	10 000	8 000
mass removed by fishing / tonnes	20 000	4 000
mass removed by natural mortality / tonnes	12 000	5 000
mass at the end of the year / tonnes	79 000	

- (a) Calculate the mass at the end of the year for species B. (Show your working.)

mass at the end of the year for species B[2]

- (b) (i) Which species is most at risk from overfishing?

.....[1]

- (ii) Explain why this species is most at risk.

.....

[1]

(c) Describe two controls that could help to maintain sustainable yields of fish species.

- 1.
.....
.....
- 2.
.....
.....[4]

19 (a) In both developed and developing countries, the number of grazing livestock has increased significantly. This has led to the degradation of grazing land in many areas.

Explain how increased numbers of livestock can bring this about.

.....

.....

.....

.....

.....[3]

(b) Wood is still widely used as fuel in some developing countries. As more people migrate from rural areas to towns, in search of work, wood is collected by people in the surrounding rural areas and brought to town for sale. Wood collected is usually fallen wood but increased demand has led to the felling of trees.

Outline the problems that are likely to arise from this situation.

.....

.....

.....

.....

.....[3]

20 State **one** advantage and **one** disadvantage of

(a) irrigation,

advantage

.....

disadvantage

.....[2]

(b) using synthetic fertiliser,

advantage

.....

disadvantage[2]

.....

(c) selective breeding,

advantage

.....

disadvantage[2]

.....

(d) using pesticides.

advantage

.....

disadvantage[2]

.....

Answer this question on the separate answer paper provided.

21 (a) Explain the ways in which wild species of plants and animals can become endangered. [8]

(b) Describe the measures that can be taken to conserve endangered species. [7]

