Centre Number	Candidate Number

Candidate Name _____

General Certificate of Education Advanced Subsidiary Level
CAMBRIDGE INTERNATIONAL EXAMINATIONS

ENVIRONMENTAL SCIENCE 8290/2

PAPER 2

MAY/JUNE 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 22 printed pages and 2 blank pages.

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Local Examinations Syndicate

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For Examiner's Use

Section A

Answer **all** the questions

Write your answers in the spaces provided

1 **(a)** Fig. 1.1 shows a cross-section of the Earth's atmosphere.

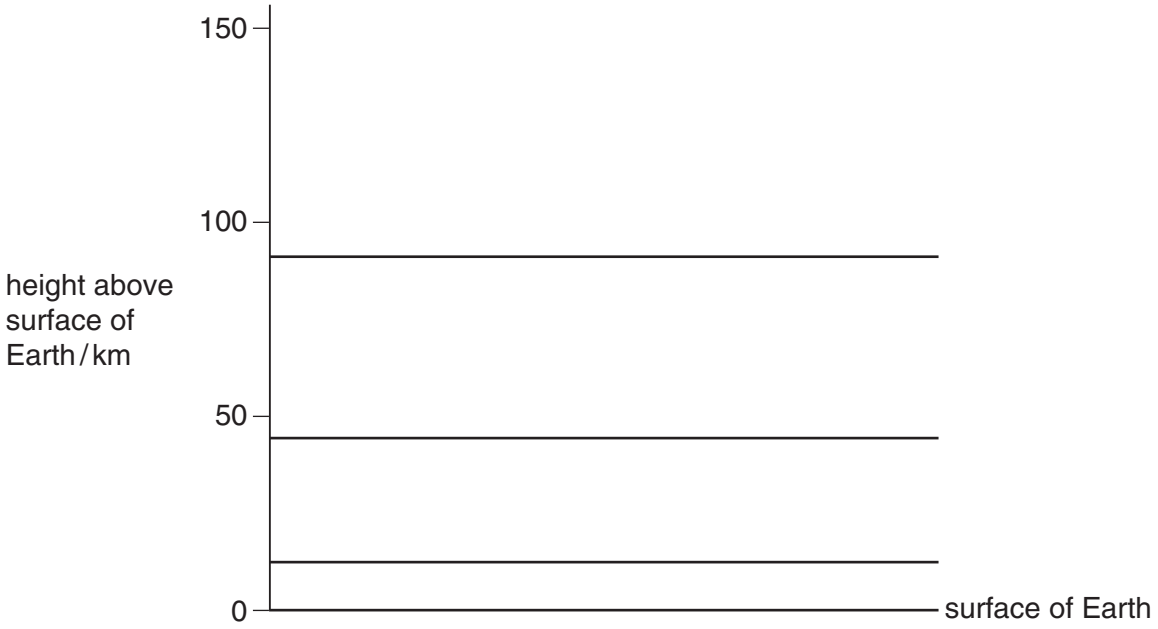

Fig. 1.1

On Fig. 1.1,

(i) label the layers;

(ii) indicate the position of the ozone layer.

[3]

(b) **(i)** How do the atmospheres of Mars and Venus differ from the Earth's atmosphere?

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.....[6]

(ii) The average surface temperatures of the planets are shown in Fig. 1.2.

Earth	Mars	Venus
22°C	–23°C	480°C

Fig. 1.2

Suggest how the different atmospheres could account for these temperature differences.

.....

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.....[2]

[Turn over

2 The collared dove appeared in the United Kingdom (U.K.) in the 1950s and is now widespread there. Fig. 2.1 shows the growth in the U.K. collared dove population.

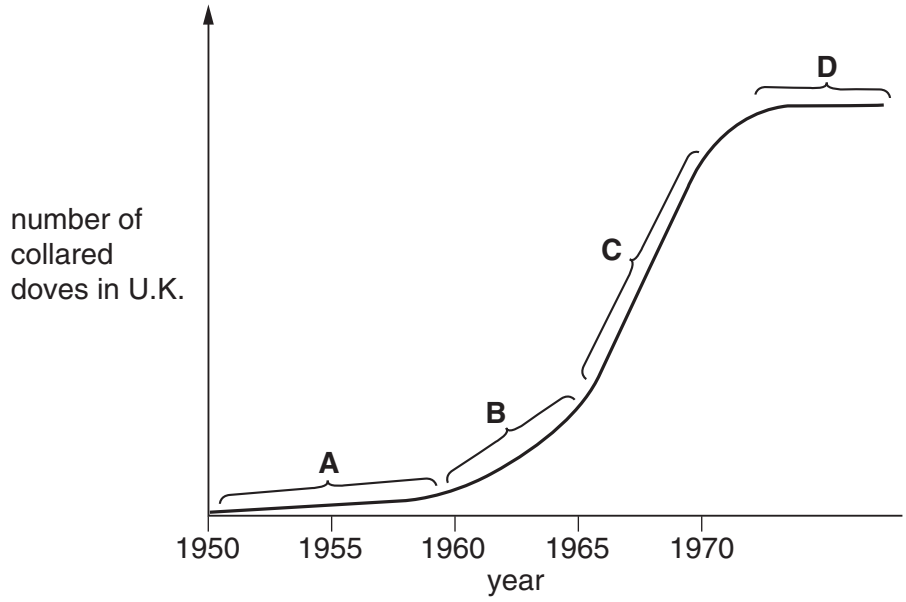

Fig. 2.1

(a) Name the phases **A**, **B**, **C**, and **D** shown on the graph.

A .....

B .....

C .....

D .....[2]

(b) Suggest **two** factors that will limit the population growth of collared doves.

.....

.....

.....[2]

(c) Suggest how the arrival of the collared dove could have affected the populations of other bird species in the U.K..

.....

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.....[2]

3 Fig. 3.1 shows the distribution of earthquakes over a six-year period. Each black dot represents one earthquake.

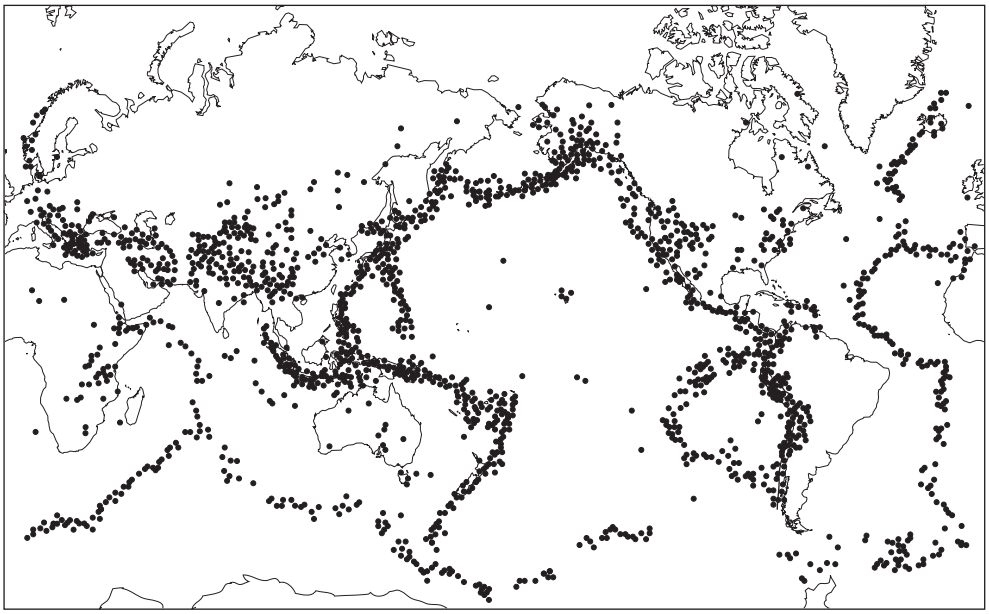

Fig. 3.1

Explain the reasons for the distribution of earthquakes shown on the map.

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.....[8]

Section B

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

OPTION 1 – THE EXPLOITATION OF NATURAL ENERGY RESOURCES

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

4 **(a)** The Sun provides 99% of the energy entering the Earth's ecosystems.

State **one** source of energy on Earth that has **not** originated from solar energy.

.....[1]

Fig. 4.1 shows the generation of electrical energy by the action of falling water.

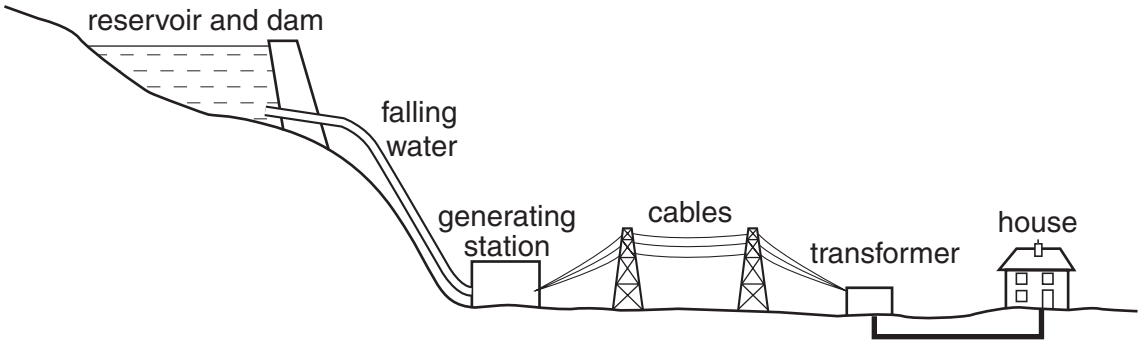

Fig. 4.1

(b) Name **one** labelled area on Fig. 4.1 where

(i) *gravitational potential energy* is converted to *kinetic energy*,

.....[1]

(ii) electrical energy can be converted to light energy.

.....[1]

(c) The First Law of Thermodynamics states that energy is neither created nor destroyed. Why is the quantity of energy generated as electricity less than the gravitational potential energy of the water in the reservoir?

.....

.....

.....[2]

5 **(a)** A European government is proposing a tax on cars which is based on their carbon dioxide emissions. Drivers of vehicles with low carbon dioxide emission levels will pay less tax.

(i) State **one** way in which motor manufacturers can reduce levels of carbon dioxide emitted from cars.

.....[1]

(ii) Outline possible consequences of a continued rise in levels of atmospheric carbon dioxide.

.....

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.....

.....[4]

(b) Stratospheric ozone performs a vital role for life on Earth but tropospheric ozone is a danger. A car manufacturer claims to have designed a car radiator that converts ground-level (tropospheric) ozone to oxygen.

(i) How is ground-level (tropospheric) ozone formed?

.....

.....

.....[2]

(ii) How do emissions from cars contribute to the production of ground-level ozone?

.....

.....[1]

(iii) Explain why tropospheric ozone is dangerous.

.....

.....

.....

.....[3]

6 **(a)** Coal, gas and oil are fossil fuels.

Why are fossil fuels described as non-renewable sources of energy?

.....

.....

.....[2]

(b) Kerogens are part of the process of oil and gas formation.

(i) What are *kerogens*? .....

.....[1]

(ii) How are kerogens formed? .....

.....[1]

(iii) How are kerogens converted to oil and gas? .....

.....

.....[2]

(c) Fig. 6.1 shows an oil trap.

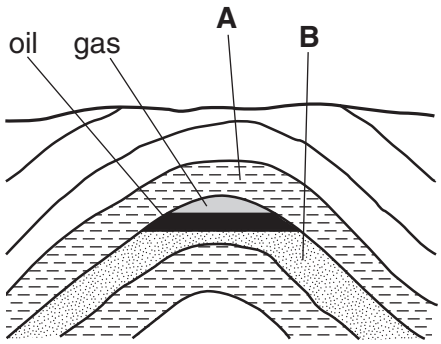

Fig. 6.1

State one essential property of rock **A** and one essential property of rock **B**.

rock **A** .....

rock **B** .....[1]

7 **(a)** Nuclear energy is released by the breakdown of heavy nuclei such as that of the isotope ^{235}U.

(i) What is this process called? .....[1]

(ii) Which element is represented by U? .....[1]

(b) Energy is also released from nuclear fusion. State **two** ways in which nuclear fusion differs from the process in **(a)(i)**.

.....

.....

.....[2]

(c) Many countries have stopped building nuclear power plants.

Suggest reasons for this.

.....

.....

.....

.....

.....

.....

.....[6]

8 **(a)** Both winds and waves are renewable sources of energy.

State two problems associated with the use of each of these.

Winds

1 .....

2 .....

Waves

1 .....

2 .....[4]

(b) Fig. 8.1 shows a solar panel used to trap solar energy.

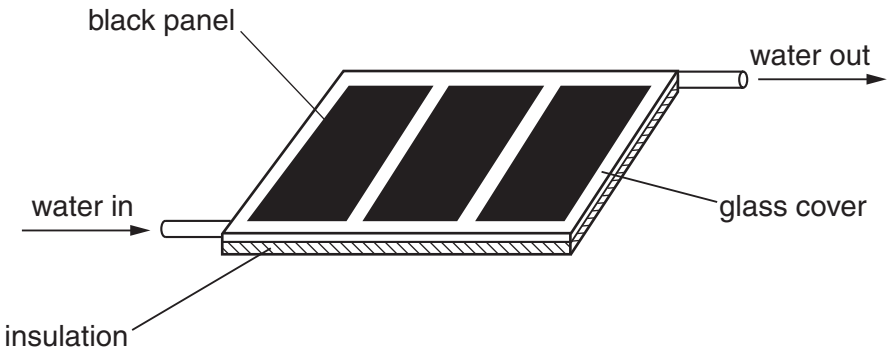

Fig. 8.1

(i) Why are the panels painted black?

.....

.....

(ii) What is the function of the glass cover?

.....

.....

(iii) Why is there insulation underneath the solar panel?

.....

.....[3]

Answer this question on the separate answer paper provided.

9 **(a)** Explain how acid rain is produced and outline the problems it causes. [10]

(b) Outline ways in which acid rain and its problems could be reduced. [5]

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 a cross-section of two aquifers.

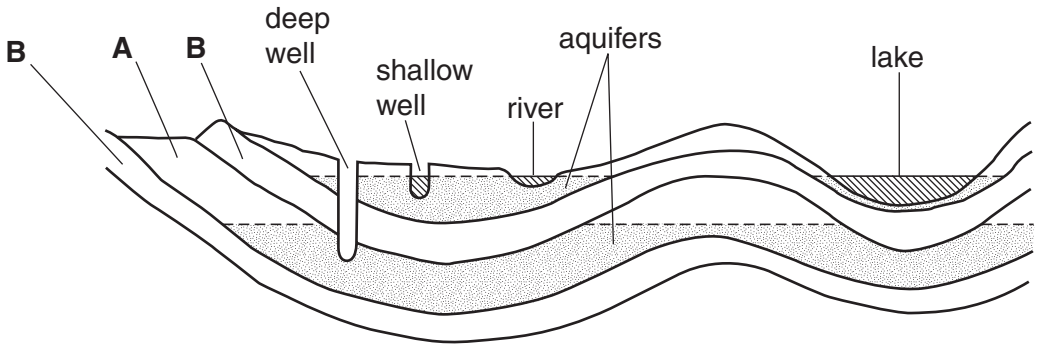

Fig. 10.1

(a) What are the essential characteristics of rocks **A** and **B**?

rock **A** .....

rock **B** .....[1]

(b) On Fig. 10.1, mark the level of water in the deep well. [1]

(c) What will happen to the levels of the water tables during a period of drought?

.....[1]

(d) Water in a lake can become polluted with phosphates and nitrates.

(i) State **two** ways in which these pollutants can enter the lake.

.....

.....[2]

(ii) Suggest **one** source of,

nitrate pollution, ...

phosphate pollution. .....[2]

11 Fig. 11.1 shows the stages of the purification of water from various sources to provide a piped supply.

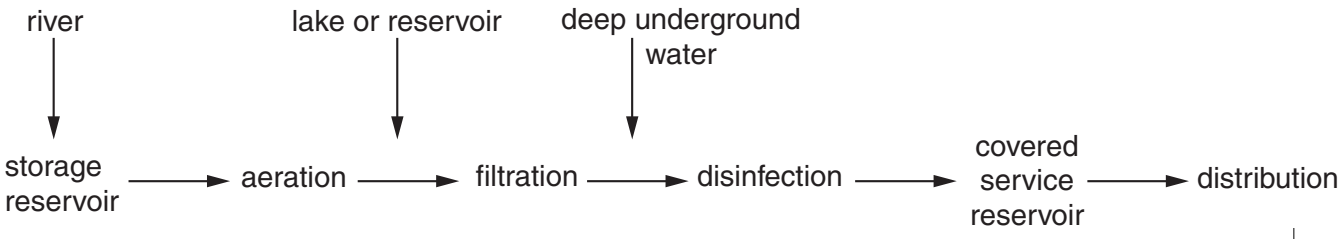

Fig. 11.1

(a) Outline the processes of

(i) filtration,

.....

.....

.....

(ii) disinfection.

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[4]

(b) Suggest reasons why water from deep, underground sources may need less treatment than river water.

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.....[4]

12 The pie chart in Fig. 12.1 shows the average composition of domestic waste from an inner city in a developed country.

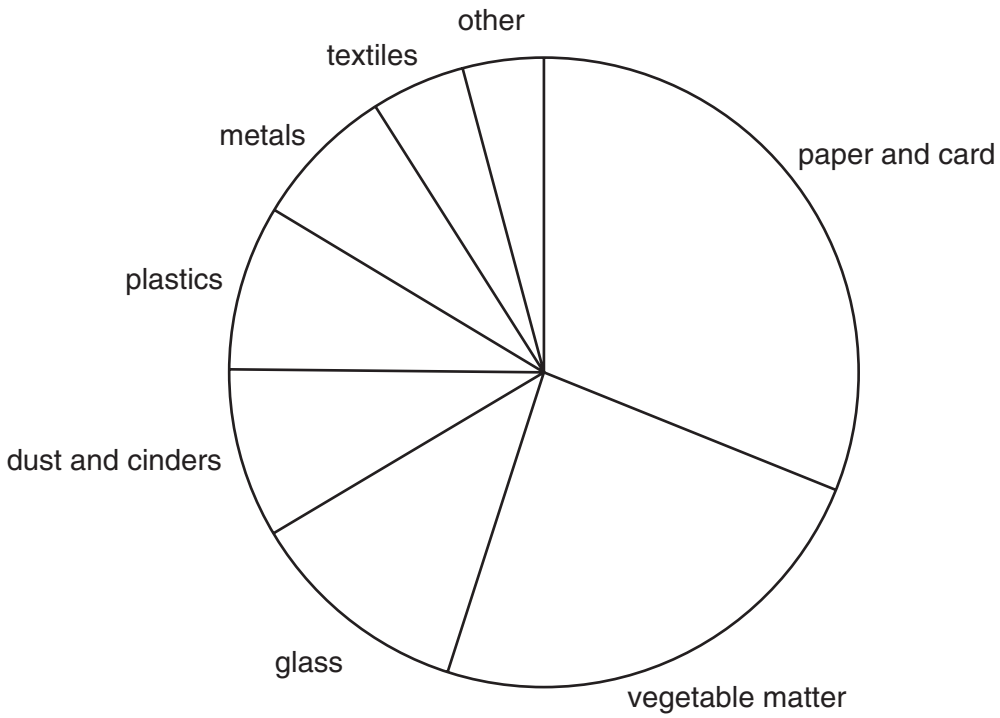

Fig. 12.1

(a) List three of the materials shown that can be recycled.

1 .....

2 .....

3 .....[2]

(b) For one of the materials that you have named, state one advantage and one problem associated with its recycling.

advantage .....

.....

problem .....

.....[2]

(c) Large amounts of waste are not recycled but are buried in landfill sites.

Describe two problems associated with burial in landfill sites.

1 .....

.....

.....

2 .....

.....

.....[4]

13 (a) What is meant by *eutrophication*?

.....

.....

.....[2]

(b) Fig. 13.1 shows how the level of dissolved oxygen changes in a river downstream of a sewage discharge.

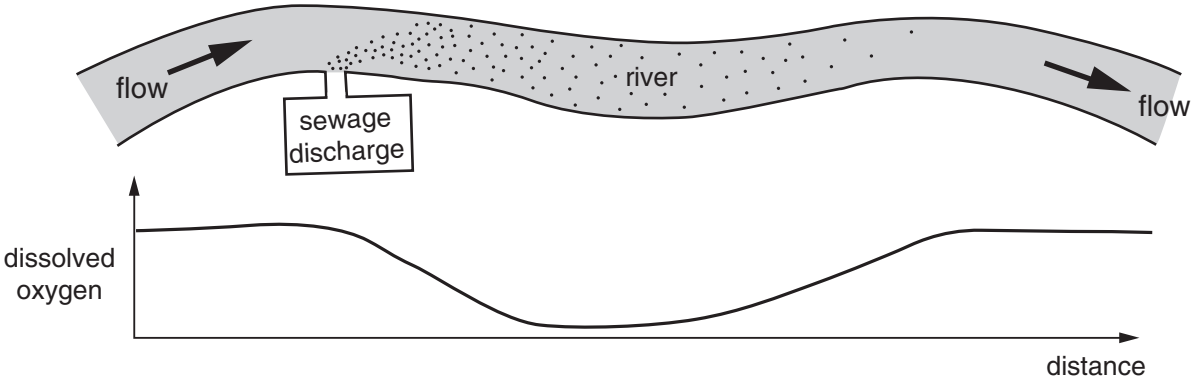

Fig. 13.1

Explain the changes in the level of dissolved oxygen.

.....

.....

.....

.....[4]

(c) Raw sewage has a biological oxygen demand (BOD) of 600 units while treated sewage effluent has a BOD of 30 units.

(i) What is *BOD*?

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.....[1]

(ii) Outline the treatment of sewage that results in this reduced BOD.

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.....[5]

[Turn over

14 Fig. 14.1 shows the soil horizon of a podsol.

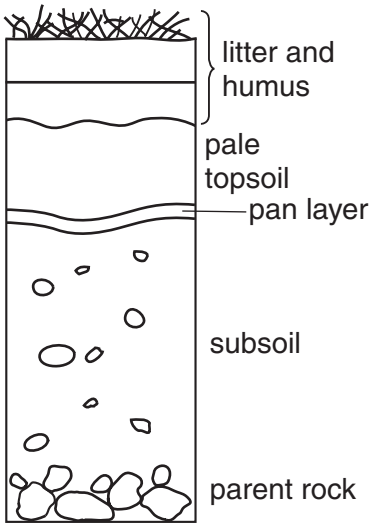

Fig. 14.1

(a) What are the conditions in which a podsol is likely to be found?

.....

.....[2]

(b) Explain how the pan layer forms.

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.....[3]

Answer this question on the separate answer paper provided.

15 **(a)** Discuss the environmental problems associated with mining, quarrying and dredging. [10]

(b) Outline the ways in which the environmental impact of mineral extraction can be reduced. [5]

OPTION 3 – THE CONSERVATION OF BIOLOGICAL RESOURCES

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

16 (a) Two species of duck exist side by side in the wild but do not interbreed.
However, in captivity they mate and produce fertile offspring. Many species of toad interbreed in nature but their offspring are infertile.
In each case, explain why the animals can be considered to be of different species.

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.....[4]

(b) (i) What is meant by *genetic variation*?

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.....[2]

(ii) Use an example to outline how genetic variation may give rise to natural selection.

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.....[4]

[Turn over

17 Fig. 17.1 shows a mountain region where melting snows feed into streams and a settlement has been built on the river floodplain.

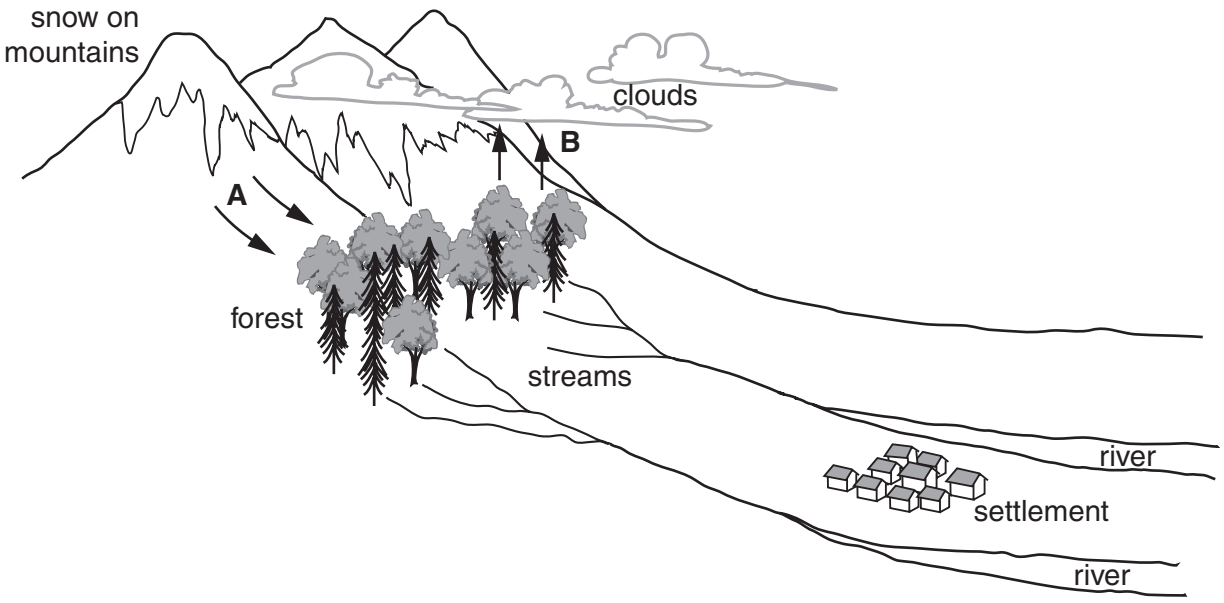

Fig. 17.1

(a) (i) Describe the processes that are occurring at **A** and **B**.

A .....

.....

B .....

.....[4]

(ii) Explain why risks to the settlement are increased if the forest is removed.

.....

.....

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.....[3]

18 **(a)** Outline how sugar cane can be used to produce fuel.

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.....[5]

(b) Many plants store energy as starch rather than as sugars. Genetic engineering has led to the development of yeasts that produce enzymes which convert starch to sugars.

How could this increase the quantity of fuel produced from plant material?

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.....

.....[2]

[Turn over

19 International agreements have been implemented to limit the catch of some fish species. One indicator that a species is being over-fished is that the average size of the fish that are caught gradually decreases.

Fig. 19.1 shows the total allowable catch and the actual catch for a deep sea fish species from 1983 to 1990.

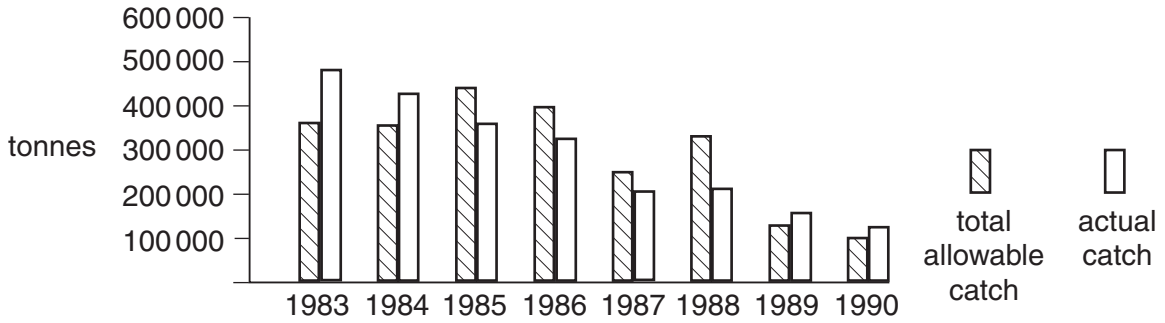

Fig. 19.1

(a) Suggest reasons for the overall decline between 1983 and 1990 in

(i) actual catch,

.....

.....

.....

(ii) total allowable catch.

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[4]

(b) State **one** way in which fishing for one species can damage populations of other aquatic species.

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.....[1]

20 **(a)** Outline the factors that can influence the choice of crops grown in different regions of the world.

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.....[5]

(b) The carrying capacity of an area of land used for ranching is 1 livestock unit (a mature animal) to 12 hectares of land. The land is stocked at a rate of 1 livestock unit per 3 hectares.

What will be the results of this?

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.....[3]

(c) Fig. 20.1 shows the expected pattern of rainfall distribution and grass quality throughout the year in the Sahel.

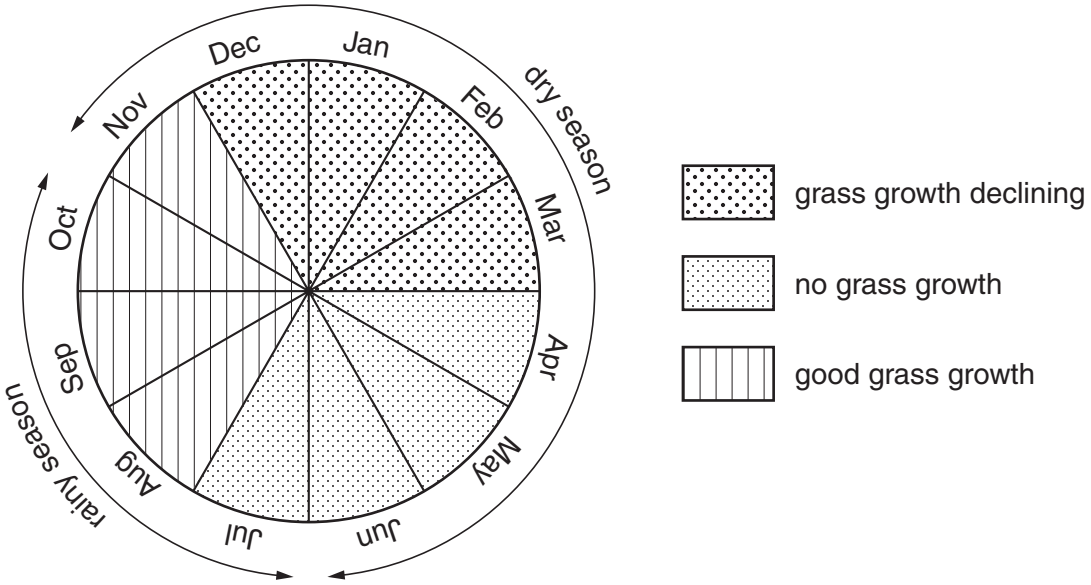

Fig. 20.1

(i) Suggest why most breeding of cattle and goats takes place in the early part of the rainy season in the Sahel.

.....

.....

.....[1]

(ii) Suggest the likely effects if the rains fail after several good years.

.....

.....

.....[2]

Answer this question on the separate answer paper provided.

21 **(a)** Discuss the roles of zoos and botanic gardens in conservation and education. [10]

(b) Outline the importance of maintaining genetic diversity in plant and animal populations. [5]

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