

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

ENVIRONMENTAL SCIENCE **8290/02**

Paper 2 October/November 2004

Additional Materials: Answer Paper **1 hour 45 minutes**

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.

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.

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

Section A

Answer **all** the questions

Write your answers in the spaces provided.

- 1 Fig. 1.1 shows eight species of fruit-eating pigeon which live in the lowland rainforest in Papua New Guinea.

The size of each species, the range of branch size on which it perches and the size of the fruits eaten are shown.

Roman numeral (I–VIII) indicate species, numbers by each bird indicate average body weight / grammes.

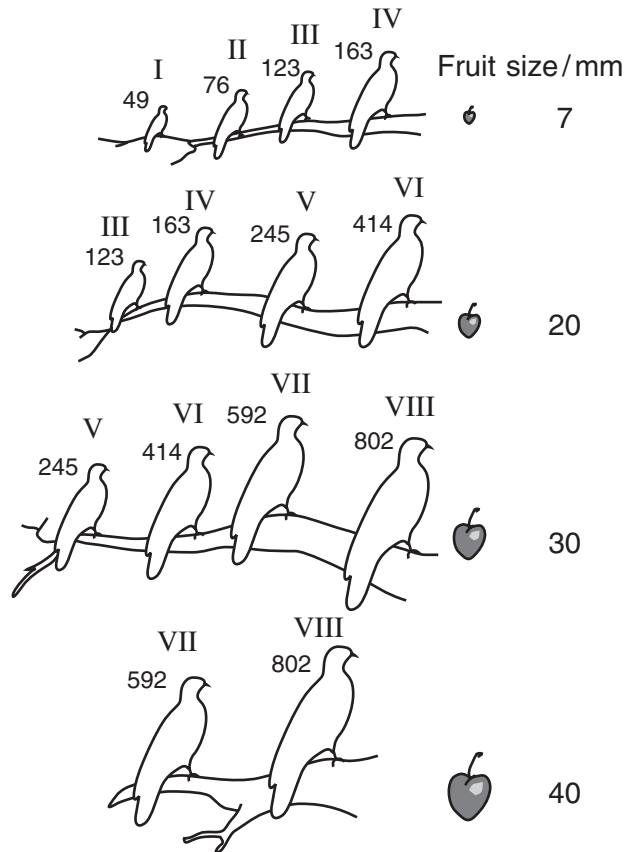


Fig. 1.1

- (a) (i) What is meant by the term *habitat*?

.....
 [1]

- (ii) What is the habitat of the pigeons?

..... [1]

(b) (i) What is meant by the term *niche*?

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

(ii) Explain how the pigeon species are able to co-exist.

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

2 Fig. 2.1 shows the angle of the Sun's rays striking the Earth's surface during winter and summer.

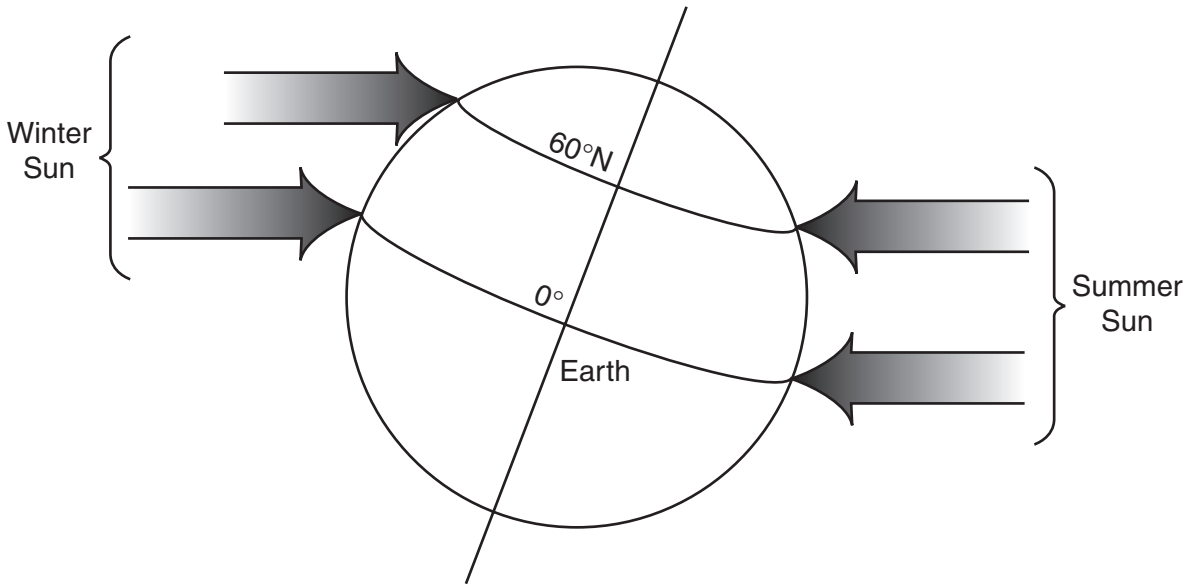


Fig. 2.1

(a) Describe and explain the pattern of summer and winter temperatures at

(i) 0° (equator),

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

(ii) $60^\circ N$

.....
.....
.....
.....
.....[6]

(b) State two reasons why two areas at the same latitude can have different temperatures for the same season.

1.

.....

2.

.....[2]

- 3 Fig. 3.1 shows what happens to solar energy reaching the Earth and some of the factors which may affect this.

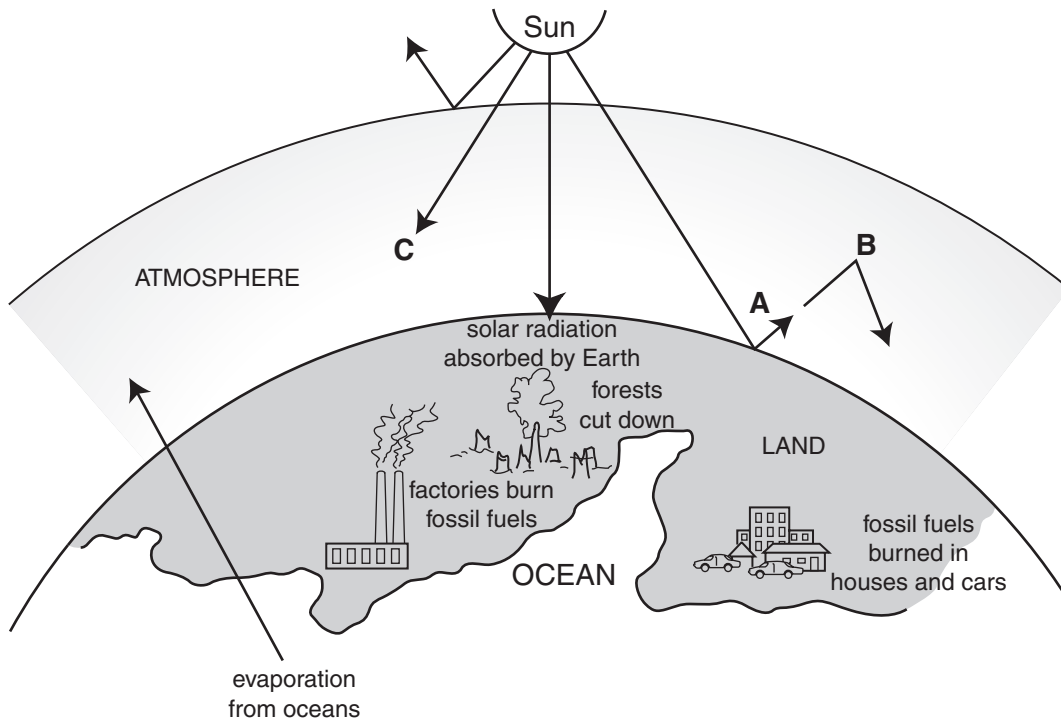


Fig. 3.1

(a) State what is happening at

(i) **A** and **B**,

.....
[2]

(ii) **C**.

.....[1]

(b) The process shown by **A** and **B** is called the “greenhouse effect”. What is the importance of this process to life on Earth?

.....
[2]

(c) Explain the likely change to the greenhouse effect from

(i) burning fossil fuels,

.....
.....

(ii) cutting down forests,

.....
.....

(iii) increased evaporation from oceans as they warm up.

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

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) When electricity is generated, energy is converted from one form to another.

State the two laws that apply to all energy conversions.

- 1.
.....
- 2.
.....[3]

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

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

(ii) How are kerogens converted to oil and gas?

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

(iii) Coal, gas and oil are fossil fuels.

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

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

(c) How does the burning of fossil fuels contribute to the production of acid rain?

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

5 The use of nuclear energy to generate electricity results in the production of radioactive waste.

(a) "Nuclear energy production results in very small amounts of waste so reduces pollution."

Explain why this statement is inaccurate.

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

(b) Outline two methods of disposing of nuclear waste.

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

(c) State two advantages of generating electricity from nuclear power.

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

6 (a) (i) Wind and waves can both be used to generate electricity.

What is the source of the energy that creates wind and waves?

.....[1]

(ii) State two problems associated with the use of waves as a source of energy.

1.

.....

2.

.....[2]

(b) Fig. 6.1 shows a wind turbine.

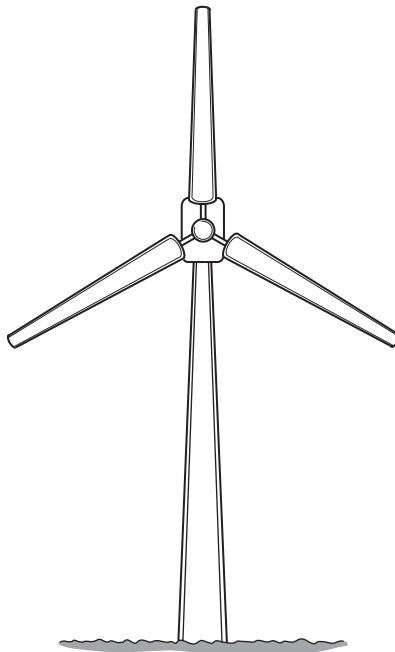


Fig. 6.1

Power generated by the turbine = P , wind speed = v , blade length = l

$$P = \text{constant} \times v^3 \times l^2$$

(i) By how much does power input increase when wind speed doubles?

..... [1]

(ii) State **one** factor that restricts the length of the turbine blades that can be used.

.....

.....

.....[1]

8 Geothermal energy is used in some parts of the world.

(a) What is the source of geothermal energy?

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

(b) Outline the way in which this energy source can be used to generate electricity.

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

(c) Why is geothermal energy not widely used throughout the world?

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

Answer this question on the separate answer paper provided.

- 9 (a) Describe the ways in which solar energy can be harnessed and used. [10]
- (b) Discuss the reasons why small, individual devices that trap solar energy for heat, light and cooking are particularly useful in developing countries and rural areas. [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 two satellite images of the Aral Sea, taken in 1964 and 1997.

The Aral Sea is one of the Earth's largest lakes, which once supported a thriving fishing industry.

The lake is shown by the black area in each image.



lake area
in 1964



lake area
in 1997

Fig. 10.1

(a) (i) Describe how the area of the lake has changed between 1964 and 1997?

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

(ii) What effect is this likely to have had on the salinity of the lake?

.....[1]

(iii) As the water level has changed, large areas of dry, dusty, salty soil have been exposed.

Suggest **one** way in which the arable land some distance from the Aral Sea could have become contaminated with salt.

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

(b) Fish stocks in the Aral Sea declined sharply between 1964 and 1997.

Suggest and explain reasons for this decline.

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

11 Explain how each of the following is used in the treatment of water for human consumption.

(i) coagulation
.....
.....
.....
.....[3]

(ii) sand filtration
.....
.....
.....
.....
.....
.....
.....
.....[5]

(iii) chlorination
.....
.....[1]

12 (a) Outline how minerals are formed by hydrothermal deposition.

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

(b) What is meant by the term *placer deposit*?

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

(c) Sand, gravel and limestone are referred to as bulk materials.

(i) What is meant by the term *bulk material*?

.....[1]

(ii) State **one** use for sand, gravel and limestone.(A different use should be given for each.)

sand

gravel

limestone[3]

(iii) State two environmental problems that may result from the extraction of bulk materials.

1.
.....

2.
.....[2]

13 Fig. 13.1 shows a pH meter being used to test the pH of a soil sample.

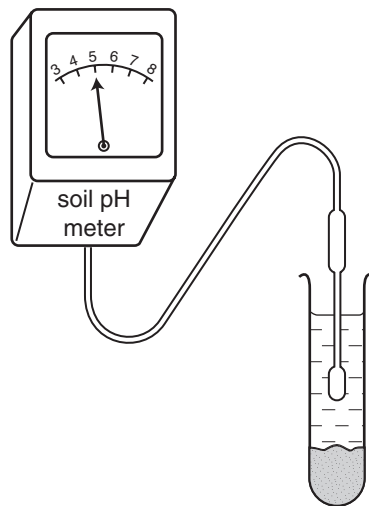


Fig. 13.1

(a) (i) Is the soil sample acidic, alkaline or neutral?

.....

[1]

(ii) What will be the effect on the pH of adding lime to the soil?

.....

.....[1]

(b) Fig. 13.2 shows the availability of nutrients in soil at different pH values.

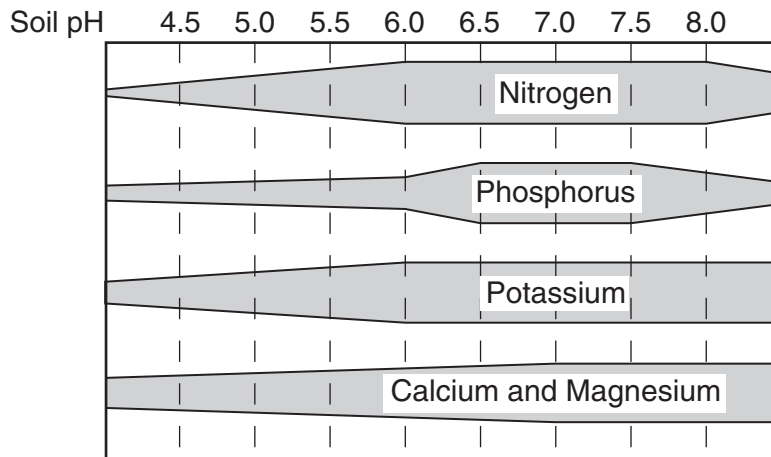


Fig. 13.2

How could the addition of lime to the soil improve crop production?

.....

.....

.....

.....

.....[3]

(c) *Acacia albida* is a leguminous tree which is sometimes planted in grassland to improve soil fertility. How does the tree produce this effect?

.....

.....

.....

.....[3]

14 Irrigation can make it possible to grow crops in areas that would otherwise be too dry.

(a) Continuous irrigation can result in soil salinisation.

(i) What is meant by the term *salinisation*?

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

(ii) Explain how irrigation brings about salinisation.

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

(iii) How does salinisation affect plant growth?

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

(b) Continuous irrigation can result in soil becoming waterlogged in previously dry areas.

Suggest why waterlogging of soil can occur.

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

Answer this question on the separate answer paper provided.

- 15 (a) Outline the problems associated with the long term storage of nuclear waste. [6]
- (b) Explain the advantages and disadvantages of recycling materials as a means of waste management. [9]

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 an example of genetic engineering.

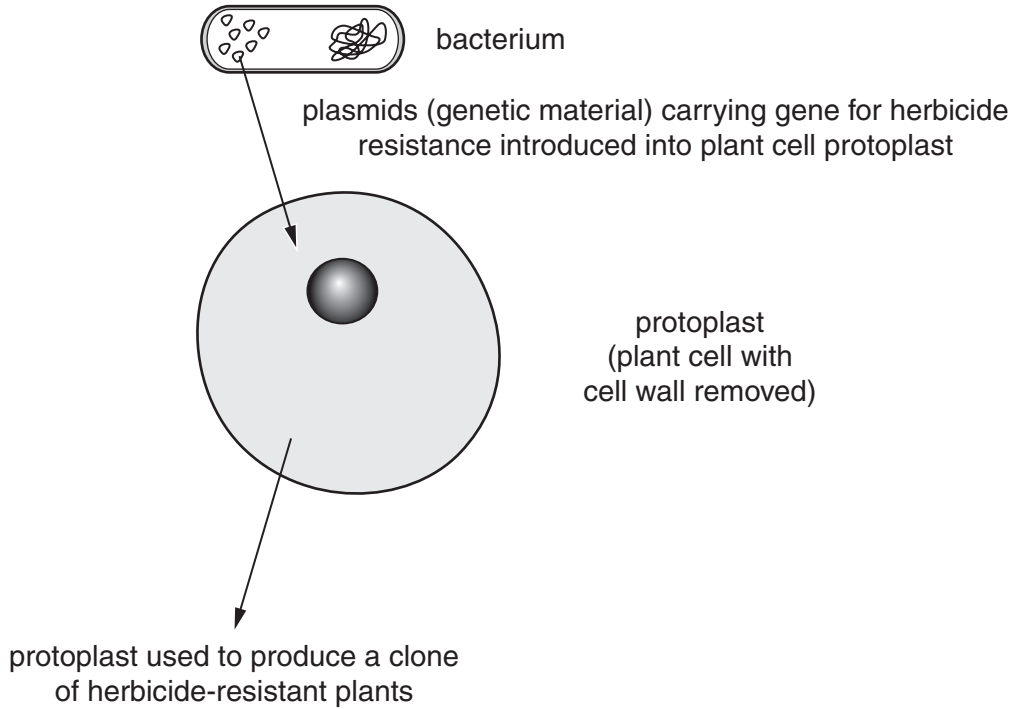


Fig. 16.1

(i) What is the material that is transferred from the bacterium to the plant cell?

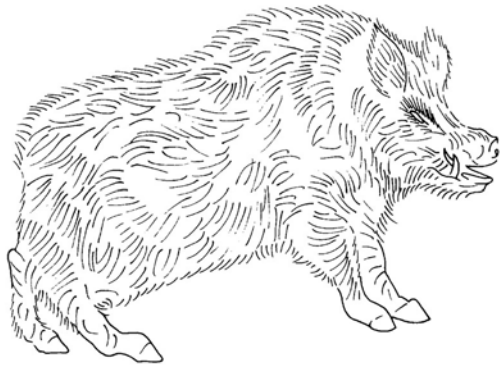
.....[1]

(ii) Suggest **one** advantage and **one** disadvantage of producing genetically engineered plants that are resistant to herbicide.

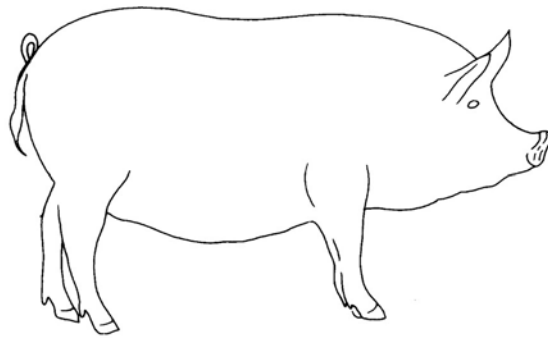
advantage

disadvantage

(b) Fig. 16.2 shows a wild boar and a domestic pig, which has been developed from it.



wild boar



domestic pig

Fig. 16.2

(i) Name the process that has been used to develop the domestic pig from wild types.

.....[1]

(ii) Explain how this process differs from the genetic engineering shown in (a).

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

17 (a) The traditional way of preparing soil before sowing crops involves ploughing to bury weeds and break up the soil. As fields have become bigger, larger, heavier machinery has been used. A new technique uses a machine to plant seeds without the need for ploughing. Growth of weeds is controlled by using herbicides.

Suggest **one** advantage and **one** disadvantage of the new technique, compared to ploughing.

advantage

.....

.....

disadvantage

.....

.....[2]

(b) Fig. 17.1 shows the fruit crop obtained from trees where herbicides have been used to different extents.

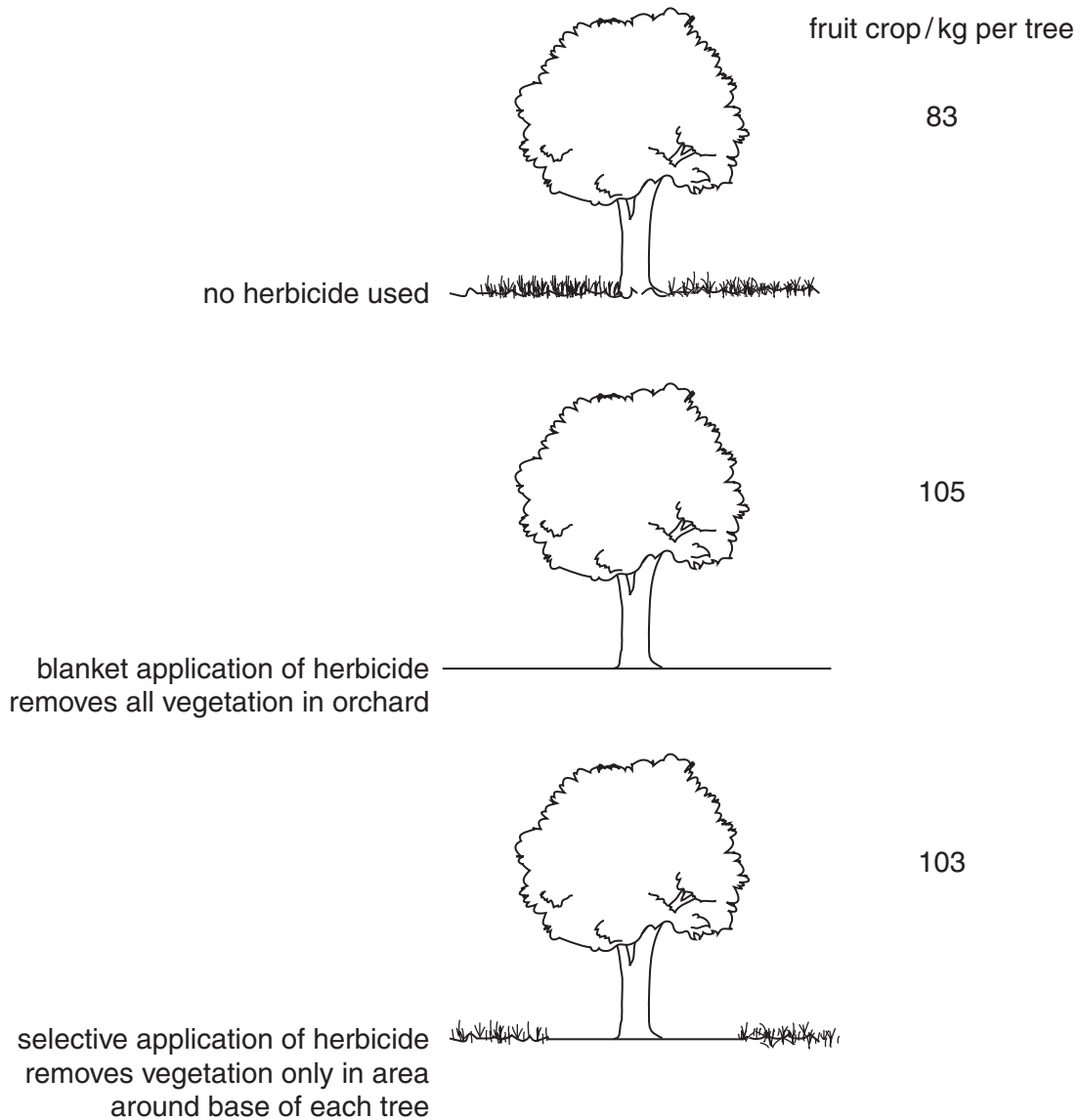


Fig. 17.1

(i) What is the effect on the crop of removing vegetation from around the tree?

.....[1]

(ii) What is the reason for this effect?

.....[1]

(iii) Suggest why a farmer might apply a selective application of herbicide rather than a blanket application.

.....

[3]

18 As stocks of fossil fuels decrease, crops grown for fuel are becoming more important. These include wood grown for fuel and oil seed crops which can be used to produce fuel oil.

(a) (i) State **one** advantage of fuel wood and oil seed crops over fossil fuels.

.....[1]

(ii) Suggest **one** environmental problem that may arise from production of wood and oil-seed crops for fuel.

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

(b) In developing countries, wood collected from local forests is an important fuel source. As the population increases more wood is needed.

Describe the environmental consequences of this increased demand.

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

(c) In some areas, cattle dung may be used as a substitute for firewood, as supplies of readily available fuel wood become scarcer.

Explain how this could

(i) lower soil fertility,

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

(ii) increase soil erosion.

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

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19 (a) Milk, meat, leather, wool, horn and bone are all products obtained from domestic grazing animals.

Which of these products would not be readily available by hunting wild animals?

.....[1]

(b) Apart from the greater range of products obtained, what are the other advantages of keeping domestic grazing animals, rather than hunting?

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

- (c) Table 19.1 shows the stocking rates and carrying capacities of different areas of grazing land in an African country.

Table 19.1

district	stocking rate/ hectares per animal	carrying capacity/ hectares per animal
Central	9.4	16
North East	2.0	24
North West	24.1	9
Chobe	89.3	9
Ghanzi	64.4	21
Kgalagadi	77.0	26
Kweneng	11.5	12
Kgatlung	3.1	12
South East	0.2	12
Ngwaketse	7.4	16

- (i) Which regions are
over-stocked,
-
- under-stocked?
-[4]

- (ii) What are the consequences of over-stocking grazing land?
-
-
-
-[2]

20 Fig. 20.1 shows the relationship between yield and fishing effort.

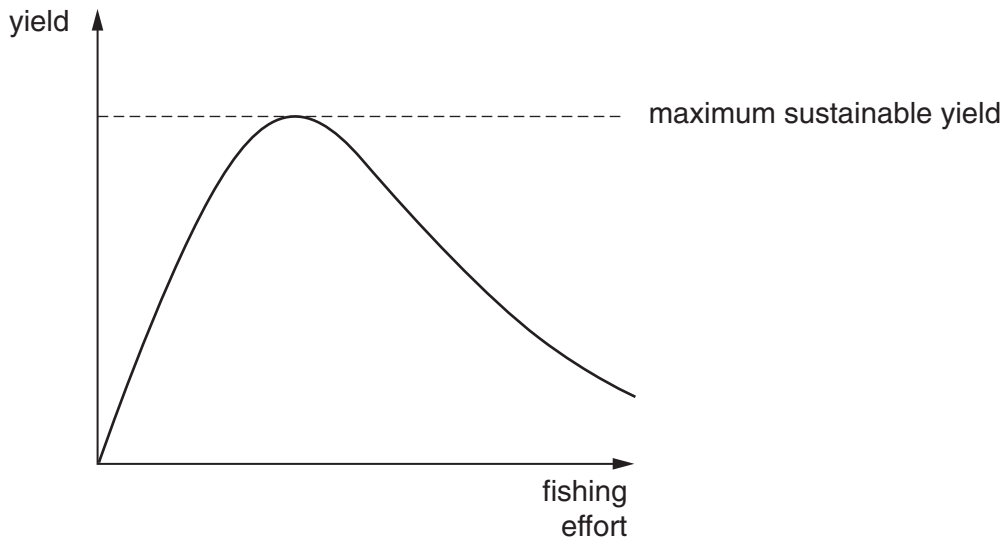


Fig. 20.1

(a) (i) What is meant by the term *maximum sustainable yield*?

.....[1]

(ii) Describe the trend shown by the graph.

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

(b) State **one** measure that can be taken to maintain maximum sustainable yield.

.....[1]

(c) Fig. 20.2 shows the proportion of fish obtained from various sources.

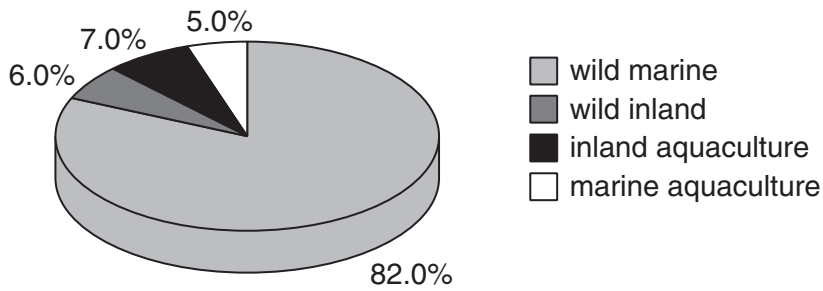


Fig. 20.2

As wild fish stocks have decreased, more importance has been given to aquaculture (fish farming). So far, however, the proportion of fish obtained this way is relatively small.

- (i) Why is aquaculture considered to be important?
.....[1]
- (ii) State two environmental problems that can arise from aquaculture.
 - 1.
 - 2.[2]

Answer this question on the separate answer paper provided.

- 21 (a) Discuss the factors that can endanger the survival of a species. [7]
- (b) Describe the actions that can be taken to conserve an endangered species. [8]

Copyright Acknowledgements:

Question 1	Fig. 1.1 © Data Sheet <i>Tropical Rain Forest</i> , August 1989, WWF-UK Data Support Service.
Question 3	Fig. 3.1 © Data Bulletin <i>Energy and Climate Changes</i> , WWF-UK Data Support Service.
Question 10	Fig. 10.1 http://edcwww.cr.usgs.gov/earthshots/slow/aral/aral .
Question 17	Fig. 17.1 © Clegg and Mackean <i>Advanced Biology</i> , John Murray Ltd.
Question 19	Fig. 19.1 © <i>Agriculture for Botswana</i> (1983) MacMillan and Ministry of Education, Botswana.
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