Cambridge O Level

Cambridge International Examinations
Cambridge Ordinary Level

CANDIDATE NAME	

CENTRE NUMBER						CANDIDATE NUMBER					

5643660515

ENVIRONMENTAL MANAGEMENT **5014/21**

Alternative to Coursework **May/June 2015**

1 hour 30 minutes

Candidates answer on the Question Paper.

No Additional Materials are required.

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 an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.

Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.

Study the appropriate source materials before you start to write your answers.
Credit will be given for appropriate selection and use of data in your answers and for relevant interpretation of these data. Suggestions for data sources are given in some questions.
You may use the source data to draw diagrams and graphs or to do calculations to illustrate your answers.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

This document consists of **17** printed pages and **3** blank pages.

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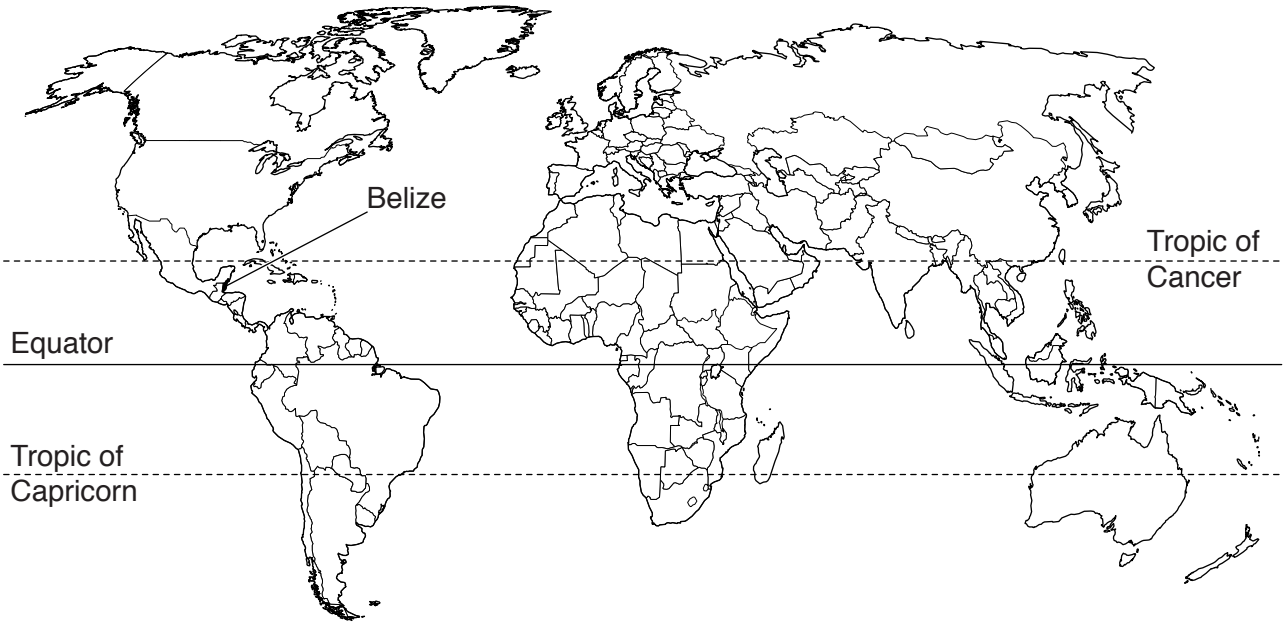
CAMBRIDGE International Examinations

map of the world



map of Belize

Key

★ capital

Area of Belize: 23 000 sq km

Population: 335 000

Children per woman: 3.08

Life expectancy: 68.4 years

Currency: Belizean dollar (2.0 BZD = 1 US$)

Languages: English, Kriol, Spanish

Climate: tropical, rainy season May to November

Terrain: coastal plain, mountains in the south

Main exports: sugar, fruits, clothing, fish products, molasses, wood and crude oil

Belize is a small, developing country that depends mainly on agriculture and tourism for employment. The country has a long coastline and is regularly hit by hurricanes (cyclones). Many people leave to work in other countries and send money back to their families.

1 **(a)** **(i)** Explain why hurricanes have a major impact on the economy of countries like Belize.

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(ii) Suggest an advantage to families living in Belize of having relatives working in other countries.

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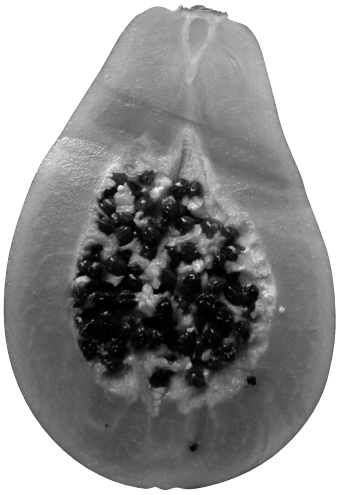
(b) Belize is the world's third largest exporter of papaya fruit. More than 30 000 tonnes are produced each year.

papaya trees

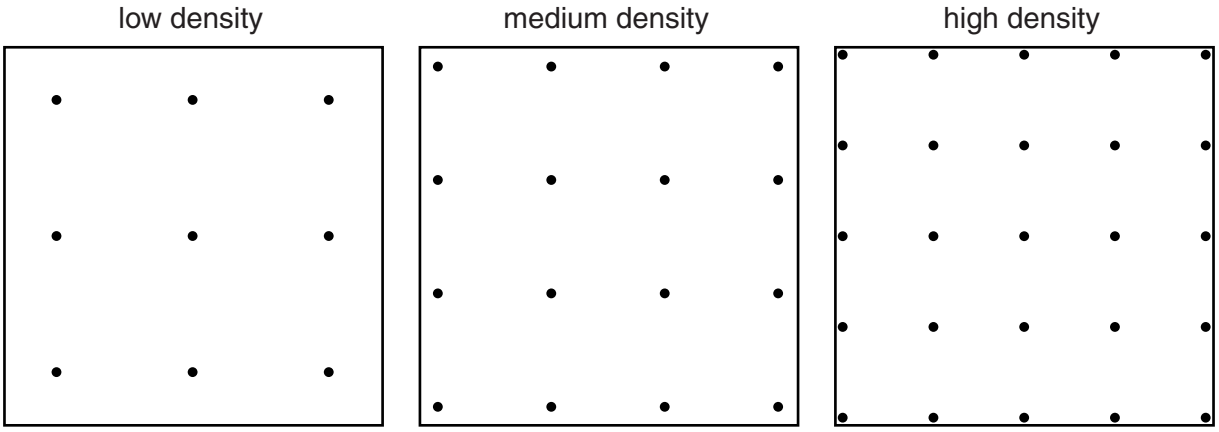
papaya fruit



Farmers growing papaya trees use the following method:

- dig holes 60 × 60 × 60 cm
- put 20 kg of manure in the bottom of each hole with 1 kg of bone meal
- fill each with topsoil
- plant papaya seedlings
- water the seedlings regularly
- add nitrogen fertiliser

Three different plant densities are used in this area when planting papaya seedlings.



Key

- papaya seedling

planting density	distance between seedlings / m
low	1.8
medium	1.5
high	1.2

(i) Explain why farmers put manure in the bottom of each hole.

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(ii) Some farmers plant papaya seedlings at high densities as they only have small fields. A student wanted to find out if high density planting gives a bigger yield of papaya fruit. The student selected a field on three neighbouring farms where these factors were the same:

- sample plots of 50 m^2
- age of trees
- quantity of nitrogen fertiliser added

The papaya fruits from each sample plot were collected and weighed.

planting density	distance between trees / m	number of trees	mass of fruit / kg
low	1.8	15	390
medium	1.5	22	440
high	1.2	35	500

What did the student find out about the effect of planting density on the yield of the papaya trees? Use data from the table to support your answer.

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(iii) The papaya trees produce fewer fruits after four harvests, so they are removed and the field is replanted. Suggest **three** reasons why a farmer would decide not to plant papaya trees at the highest density.

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(iv) The student talked to a farmer who said,

"I plant some crops, including legumes, between the rows of papaya trees."

Give the name of this method of farming.

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(v) Explain how planting legumes helps the farmer.

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(c) The student wanted to find out how much of the papaya fruit could be eaten. The seeds and skin cannot be eaten. The following method was used:

- weigh one papaya fruit
- weigh an empty bowl
- cut the fruit in half
- peel the skin from the fruit, place in the empty bowl
- remove the seeds and place in the bowl
- weigh the bowl, seeds and skin
- throw away the seeds and skin
- record all results in a table

	mass/g
whole fruit	385
empty bowl	10
bowl, seeds and skin	142
mass of edible fruit	.....

(i) Complete the table. [1]

(ii) Calculate the percentage of the papaya fruit that can be eaten.

Space for working.

.....% [1]

(iii) List the equipment the student used to carry out the method described.

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(iv) Suggest **one** safety instruction that should have been included in the method.

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(v) The people living on farms eat papaya every day. Suggest **two** ways the seeds and skin from the fruit could be used on a farm.

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(d) The major export market for papaya fruit prefers small-sized fruit. These trees are not native to Belize and need regular applications of insecticides and fertilisers. The native varieties of papaya are better adapted to local conditions, produce larger fruits and are more resistant to papaya ringspot virus. Insecticides are not usually used on native trees.

(i) Explain why the government encourages farmers to grow papaya for export.

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(ii) Explain why farmers think growing papaya for export is a risk.

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(iii) Describe how a new variety of papaya could be developed that is better adapted to local conditions and produces small fruits.

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(e) There is a demand for dried papaya flesh, which can be produced from any type of papaya tree. It is used to make processed foods. The flesh is oven-dried for 48 hours. The ovens are heated by butane gas. Only 1 kg of dried flesh is produced from 12 kg of fresh flesh. The dried flesh is packed and can last for 5 years.

(i) Suggest **three** advantages of exporting dried papaya flesh.

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(ii) Suggest **two** reasons why it is difficult to make drying papaya flesh profitable.

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(iii) Suggest how the government could encourage farmers to produce dried papaya flesh.

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(iv) Do you think producing dried papaya flesh is more sustainable than growing small fruits for export? Explain your point of view.

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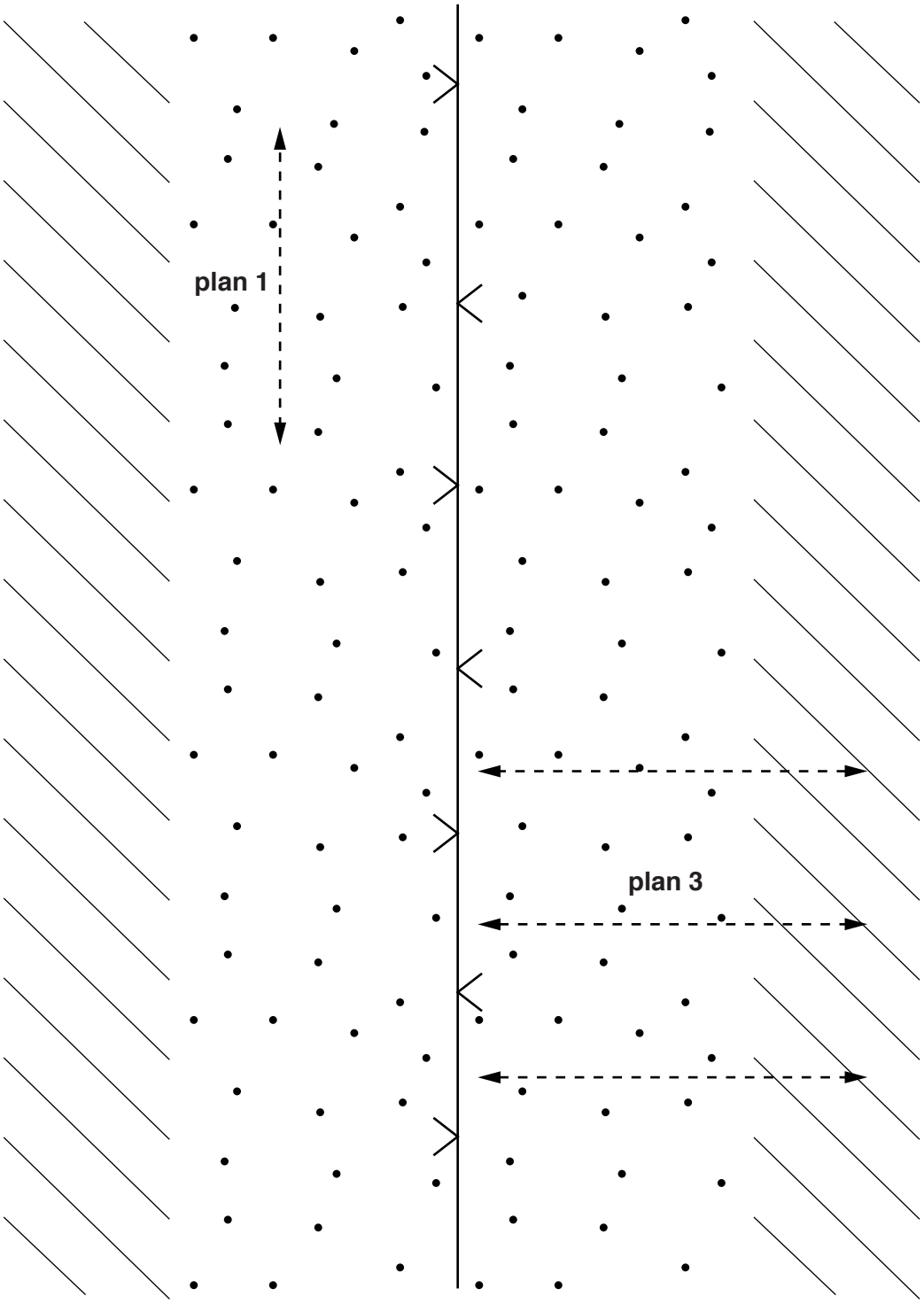
TURN OVER FOR QUESTION 2

2 **(a)** Much of the electricity used in Belize is generated in Mexico and transported on overhead power lines. The tropical forest under the power lines has to be cut down every few years.

The diagram shows an area of tropical rainforest in which an overhead power line is located.



(not to scale)

Key

A scientist wanted to investigate the impact of the power lines on biodiversity.

The scientist thought of three plans to carry out the survey.

plan one transect
Place a 100 m tape under the power line. Place a quadrat every 10 metres along the tape. Identify and record every different plant species found in the quadrat.

plan two transect
Place a 100 m tape across the path of the power line, so that there is 50 m on each side of the power line. Place a quadrat every 10 metres along the tape. Identify and record every different plant species found in the quadrat.

plan three transect
Place a 100 m tape from a central point under the power line, so it extends into the forest. Place a quadrat every 10 metres. Identify and record every different plant species found in the quadrat. Repeat this two more times.

(i) Draw the location of **plan two transect** on the diagram. [2]

(ii) Explain why the scientist carried out **plan three transect**, rather than plans **one** or **two**. Use the diagram to help support your answer.

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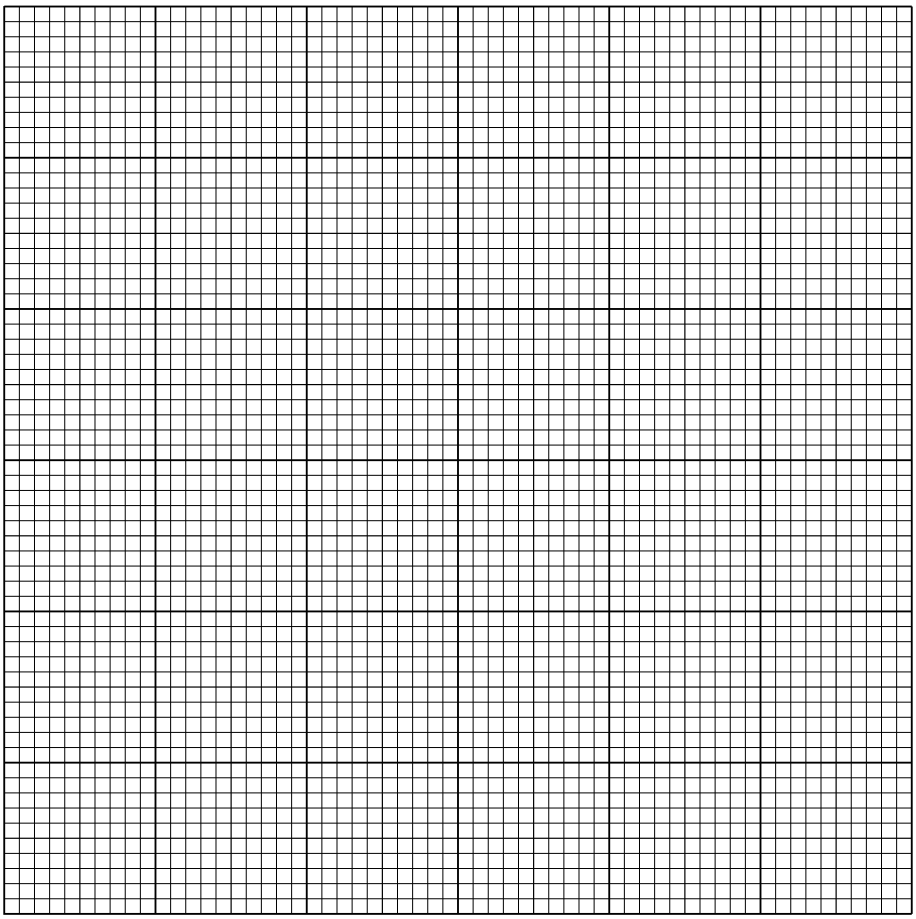
(iii) The results of **plan three** are shown in the table.

	distance from power line / m										
	0	10	20	30	40	50	60	70	80	90	100
average number of plant species	10	16	15	17	20	19	14	12	11	10	11

Plot the data as a graph on the grid below.



[4]

(iv) Describe the pattern shown by the data.

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Look at what two people said about biodiversity.

Person A said,

"Cutting down the forest under power lines is reducing the biodiversity and destroying animal habitats."

Person B said,

"Cutting down the forest does not reduce the biodiversity or destroy animal habitats."

(v) Which statement about biodiversity do you agree with? Support your answer using data from the table and graph.

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(vi) Suggest **three** ways in which the scientist could find out more about the biodiversity under power lines.

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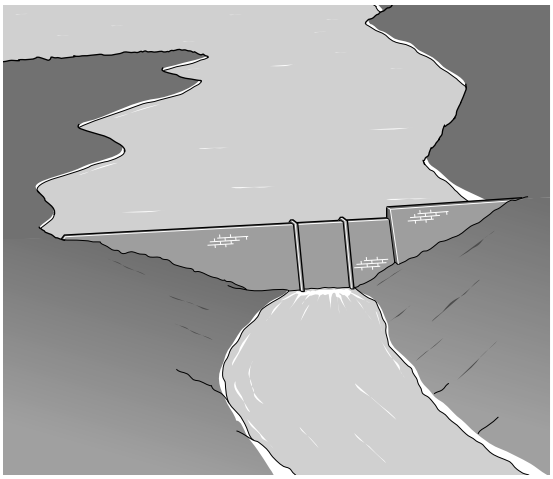
(b) The government proposed the Chalillo HEP (hydro-electric power) dam project to generate some of the electricity used in Belize. Although many people did not want the project to go ahead, it was completed in 2005.

Chalillo dam



(i) The government argued that the project is an example of sustainable development. Describe the arguments the government could have used to support this view.

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(ii) An objector to the dam project said,
"Now the dam is built, our electricity will cost more. Our national symbol, the scarlet macaw, is locally extinct and the Macal river is polluted."

Suggest why the electricity will cost more after the dam is built.

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(iii) Do you think the scarlet macaw should have been saved from local extinction rather than building the dam? Explain your point of view.

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(iv) Engineers predict that by 2045 the Chalillo dam will generate less electricity than its original output. Explain why this will happen.

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