



Cambridge International Examinations
Cambridge Ordinary Level

CANDIDATE
NAME

CENTRE
NUMBER

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ENVIRONMENTAL MANAGEMENT

5014/22

Alternative to Coursework

October/November 2014

1 hour 30 minutes

Candidates answer on the Question Paper.

Additional Materials: Calculator
 Ruler

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.

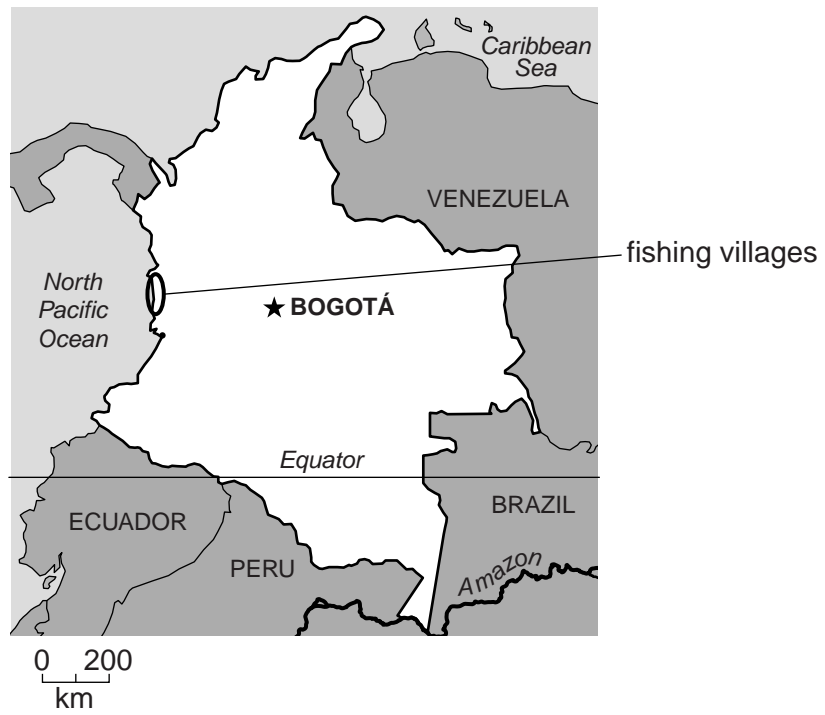
The number of marks is given in brackets [] at the end of each question or part question.

This document consists of **14** printed pages and **2** blank pages.

map of the world



map of Colombia



Area of Colombia: 1.14 million sq km

Population: about 46 million

Children per woman: 2.12

Life expectancy: 74 years

Currency: Pesos (2.0 COP =1US\$)

Languages: Spanish

Climate: tropical along the coast and in the east, cooler in the Andes mountains

Terrain: coastal lowlands, high Andes mountains and lowland river basins in the east

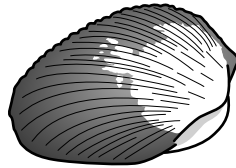
Main exports: petroleum products, coal, nickel, emeralds, coffee, cut flowers, bananas and clothes

Colombia depends on exporting oil. Development is held back by poor transport routes. Unemployment remains high; severe flooding in 2010 and 2011 caused widespread damage. Recently Colombia has negotiated free trade agreements with several other countries.

1 (a) Suggest how free trade agreements could benefit the population of Colombia.

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.....[2]

(b) Piangua are an important food source for thousands of people living along the Pacific coast.



Piangua are collected from the mud in mangrove swamps. The harvest has increased from 100 tonnes per year forty years ago, to 3000 tonnes per year now.

(i) Calculate the percentage (%) increase in the piangua harvest over forty years.
Show your working.

..... % [2]

(ii) Suggest reasons why there has been such a large increase in the piangua harvest.

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.....[2]

- (c) Two village communities are now finding it hard to collect enough piangua in a day. The communities discussed the problem and proposed three different methods of making the piangua harvest more sustainable.

method one

Harvest plots only once a week.

method two

Harvest plots in rotation every two weeks.

method three

Only harvest plots once every eight weeks.

Each village marked out a fixed 10×10m sampling plot in the mangrove swamp for each of the three methods. Each sample plot was harvested by two villagers for 45 minutes. Only piangua 5 cm or more in length were collected.

- (i) Suggest why the same sampling method was used for every plot.

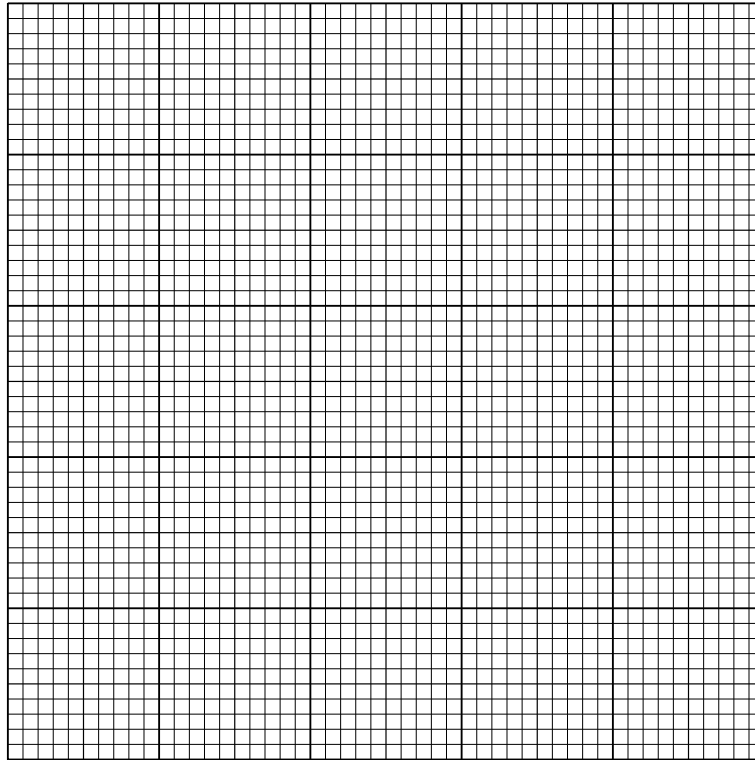
.....
.....[1]

(ii) Some of the results for method one are shown below.

numbers of Piangua 5 cm or more in length collected in 45 minutes once a week

| week | village A | village B |
|------|-----------|-----------|
| 1 | 100 | 300 |
| 6 | 85 | 220 |
| 11 | 70 | 170 |
| 16 | 56 | 110 |
| 21 | 40 | 70 |
| 26 | 30 | 40 |

Plot the data as a graph on the grid below.



[4]

(iii) Describe the trends shown in the graph.

.....

 [2]

- (iv) When piangua are collected by sampling method two a drop in numbers was recorded by week 26.

Using method three, an increase in numbers was recorded after eight weeks but there was no further increase at 16 or 24 weeks.

Suggest what you think the communities decided after discussing these results.

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.....[2]

- (v) Colombian law bans collecting piangua less than 5 cm in length. In neighbouring Ecuador they must not be less than 4.5 cm in length. Scientists have reported that piangua can reproduce at 3.5 cm in length.

Describe how the village communities could carry out a survey to find out if collecting piangua at least 4.5 cm long would have an effect on their populations.

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.....[4]

- (vi) The village communities are determined to develop a plan to allow them to harvest piangua sustainably. Suggest a suitable plan for the village communities.

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.....[3]

(d) Recently, the human population along the Colombian coast has increased. The only work people can find is to collect piangua. Ecuador is now importing piangua in large quantities.

One collector said, 'It is hard to support my family, I only get paid a few pesos for a bag full of piangua.'

Another collector said, 'It is quite dangerous work as many of us are bitten by insects and become sick. I cannot afford any medicines.'

(i) Suggest reasons why the collectors are only paid a few pesos for a bag of piangua.

.....

[2]

(ii) Explain how being bitten by insects could make the collectors sick.

.....

[2]

(e) A scientist wanted to measure the sizes of the piangua being collected. The scientist bought some bags of piangua from the collectors and measured all the piangua. The piangua were then returned to the mangrove swamp.

The results for one bag of piangua are shown in the table below.

| class size length/cm | number | total in class |
|----------------------|--------|----------------|
| 4.7 or shorter | | 5 |
| 4.8 – 4.9 | III | 8 |
| 5.0 – 5.1 | I | 26 |
| 5.2 – 5.3 | II | 32 |
| 5.4 – 5.5 | I | |
| 5.6 or longer | II | |
| | total | |

|||| = five individuals

(i) Complete the table.

[1]

(ii) Suggest reasons why the scientist found some of the piangua in the collectors' bags were less than 5 cm in length.

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.....[2]

(iii) Explain why the scientist should have measured the piangua from more than one bag.

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

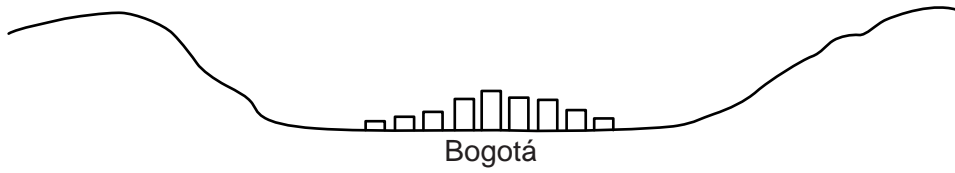
(iv) Only large piangua are bought by dealers because people will not buy small piangua at markets. Explain how this may help piangua remain a sustainable source of food.

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.....[2]

[Total: 32]

- 2 (a) Bogotá is the capital city in Colombia with a population of 7 million people. It is 2600 metres above sea level.

The location of Bogotá is shown in the sketch below.



- (i) The average temperature in this part of the world at sea level is 25.0°C . The temperature decreases by 0.6°C for every increase in height of 100m. Calculate the average temperature in Bogotá.

Show your working.

..... $^{\circ}\text{C}$ [2]

- (ii) Smog often occurs in Bogotá during the day. Explain how this could happen.

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.....[3]

(iii) A student living in Bogotá was concerned about the air pollution in the city. The air pollution is often blamed on the 80 000 buses in the city.

A newspaper reported, 'All the bus drivers are going on strike for one day next week. No buses are expected to be moving.'

The student decided to carry out an experiment before the bus strike, using the following method:

- cover six small boards with clear sticky tape facing towards the air
- hang the boards at regular intervals along a bus route
- collect the boards and count the particles on the sticky tape using a microscope
- record the results in a table

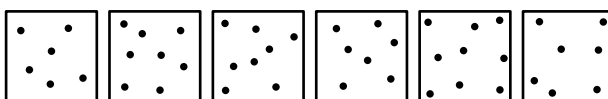
The student repeated this method on the day of the bus strike.

Suggest one factor the student should keep the same for all of the samples.

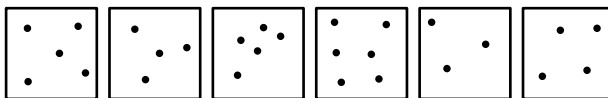
.....
[1]

(iv) The results are shown below.

before the bus strike



on the day of the bus strike



Draw a table to record these results in the space below. Fill in the number of particles from the sticky tapes.

- (v) Calculate the average number of particles before and on the day of the bus strike.
Space for working.

before the bus strike

on the day of the bus strike[1]

- (vi) Calculate the % decrease in particles on the day of the strike.
Space for working.

.....[1]

- (vii) Suggest ways of reducing air pollution in Bogotá in the future.

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.....[3]

(b) The air quality and rainfall data in Bogotá have been measured for one year. The results are shown in the tables below.

air quality

| pollutant | January – March | April – June | July – September | October – December |
|----------------------------------|-----------------|--------------|------------------|--------------------|
| particles /mg per m ³ | 0.13 | 0.11 | 0.10 | 0.10 |
| nitrogen oxide /ppb | 45.0 | 34.0 | 32.0 | 30.0 |

rainfall

| month | J | F | M | A | M | J | J | A | S | O | N | D |
|-------------------------------------|-------|---|----|-------|----|----|-------|----|----|-------|----|----|
| rainfall /mm | 6 | 7 | 13 | 20 | 17 | 16 | 18 | 16 | 15 | 20 | 16 | 15 |
| total rainfall for three months /mm | | | | | | | | | | | | |

(i) Complete the table for rainfall. [1]

(ii) Describe the relationship between air quality and rainfall.

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.....[2]

(iii) In which three month period would you expect hospitals in Bogotá to have the highest and lowest hospital admissions for severe breathing problems?

highest admissions

lowest admissions

[1]

(iv) Use the information given and your own knowledge to suggest reasons for possible differences in the hospital admissions for severe breathing problems.

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.....[3]

(c) A public health worker decided to use a questionnaire to find out how frequent and how severe breathing problems are in the population of Bogotá.

1. your age: 11–20 21–30 31–40 41+

2. male: female:

3.
.....
4.
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5.
.....

(i) Complete the questionnaire with three more questions. [4]

(ii) Suggest how the public health worker could use such questionnaires to monitor changes in the air quality of Bogotá in the future.

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.....[2]

[Total: 28]

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