CANDIDATE
NAME

CENTRE
NUMBER

CANDIDATE
NUMBER

ENVIRONMENTAL MANAGEMENT

Alternative to Coursework

0680/43

May/June 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.

[Turn over

map of the world

Colombia
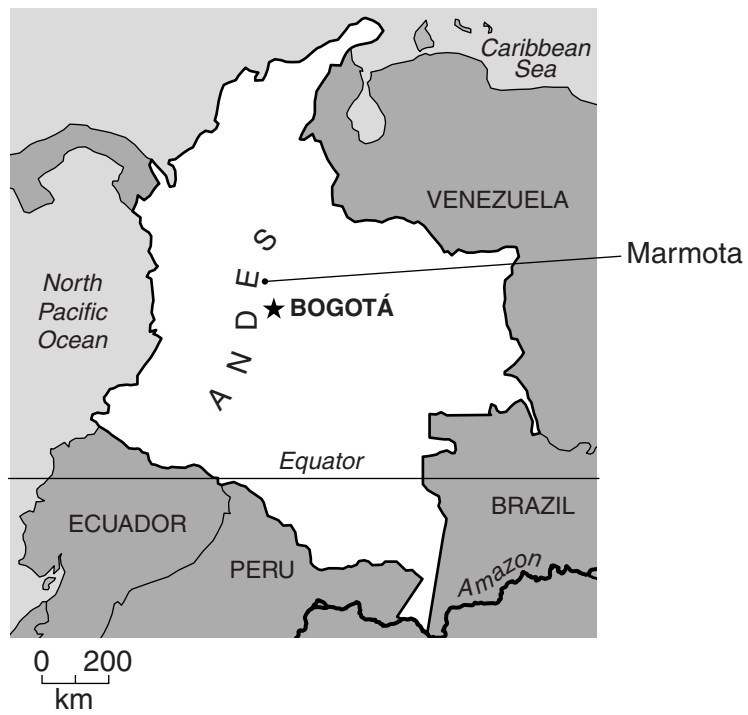
map of Colombia

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 trade agreements with several other countries.

1 (a) Suggest why severe flooding causes long term problems for people.

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....[2]

(b) Much of the world's supply of Arabica coffee is grown in Colombia. Up to half a million people are involved in coffee production in Colombia. Coffee bushes are grown on small family farms at high altitude.

One farmer said:

'My coffee harvest has gone down from 200 kg in 2011 to 125 kg in 2013. I may have to give up coffee farming in the future.'

Another farmer said:

'I think it is warmer and there is now 25% more rainfall. When it rains too much, the coffee bushes do not flower normally and fungal diseases are more common.'

(i) Calculate the percentage (%) decrease in the first farmer's coffee harvest in 2013 compared with 2011.

Show your working.

.... % [2]

(ii) The coffee dealers paid the first farmer 3 US$ for one kg of coffee in 2011 and 5 US$ for one kg of coffee in 2013.

Calculate the value of this farmer's harvest in 2011 and 2013.

Show your working.

2011 ....

2013 ....[2]

(iii) Explain why it is important that the coffee bushes flower normally.

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....[1]

(iv) Suggest possible reasons for the increase in temperature and rainfall that the second farmer has described.

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....[3]

(v) The main flowering season for Arabica coffee bushes is during December and January. A farmer decided to use a rain gauge to measure the rainfall during the flowering season.
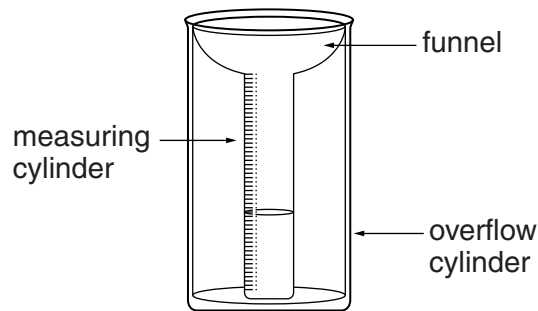
Describe how the farmer should use this rain gauge.

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....[2]

(vi) In the space below, draw a table to allow the farmer to record the daily rainfall for one week on the farm.

[3]

(c) The farmer devised three different plans to improve income on the farm in the future.

plan one

Continue growing Arabica coffee bushes. Apply more fertiliser to help the bushes grow faster. Apply more pesticides to prevent the fungal diseases of coffee bushes.

plan two

Continue growing Arabica coffee bushes. Grow avocado and banana plants between the coffee bushes.

plan three

Dig up the Arabica coffee bushes and replace them with Robusta coffee bushes that are resistant to fungal diseases. Grow avocado and banana plants between the bushes.

(i) Explain why plan one is **not** likely to lead to sustainable farming.

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....[2]

(ii) Suggest what the advantages of plan two for the farmer would be compared with plan three.

....

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....[2]

(iii) An agricultural advisor said the farmer should carry out plan three. Suggest reasons for this advice.

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....

....[3]

(d) The agricultural advisor carried out a survey to find out how many farmers in different districts were worried about continuing to grow Arabica coffee. A representative sample of farmers was interviewed using a questionnaire.

(i) Explain how the agricultural advisor could select a representative sample of farmers.

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....[2]

(ii) Suggest **one** reason why the agricultural advisor used a questionnaire.

....

....[1]

(iii) The results of the survey from two districts are shown below.

	district **A**	district **B**
	percentage (%) yes	percentage (%) yes
Do you grow Arabica coffee?	80	65
Do you grow any other variety of coffee?	0	25
Do you grow any other crops?	20	40
Have your harvests in the last three years been getting worse?	90	70
Are your profits less than three years ago?	80	50

Suggest **one** other question the agricultural advisor could have asked the farmers.

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....[1]

(iv) Which district, **A** or **B**, is more likely to continue farming if poor harvests of Arabica coffee continue in the future? Explain your reasons using the information from the questionnaire and your own knowledge.

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....[4]

[Total: 30]

2 **(a)** Colombia has widespread gold deposits in the mountains. Gold has been mined for hundreds of years in Colombia. The world price of gold has been rising in recent years.
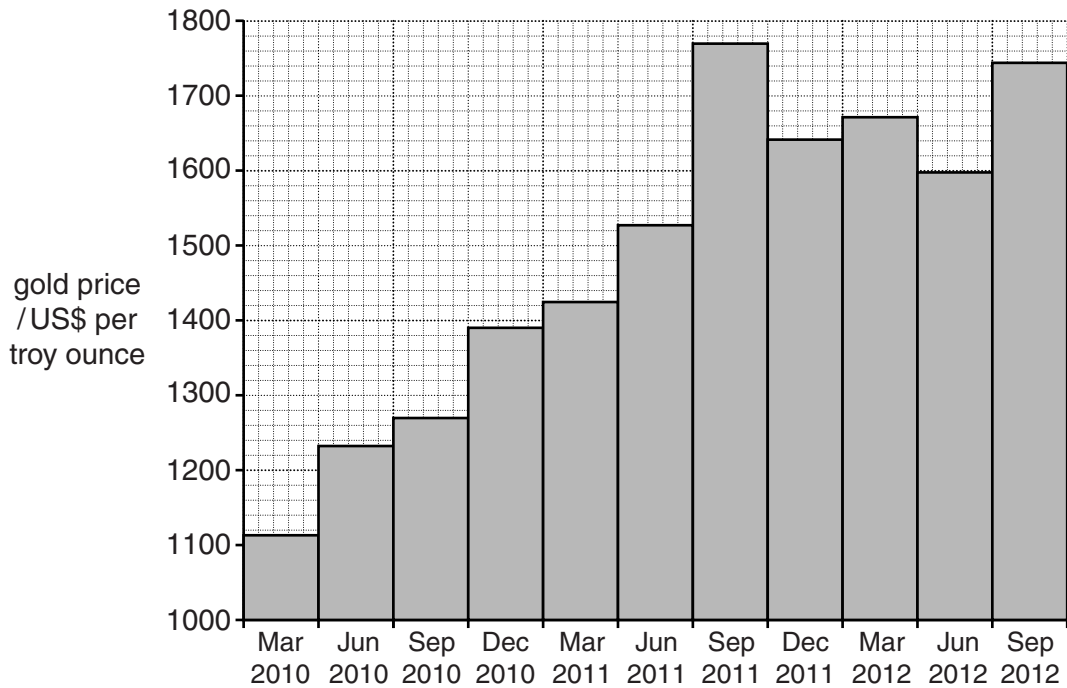
(i) Deduce the lowest and highest price of gold.

lowest ....

highest ....

[1]

(ii) Calculate the percentage (%) increase in the price of gold between September 2010 and September 2012.

Show your working.

.... % [2]

(b) Marmato is a town in the Andes mountains that depends on many small scale mines. Most of the miners belong to a co-operative. They extract enough gold to keep their families and maintain Marmato's economy.

The government has given many new mining licences. One foreign mining company wants to extract all the remaining gold in the next twenty years. The mining company plans to remove the town and operate an open cast mine on the site. A new town will be built at the bottom of the mountain.

(i) Suggest why the government are giving many new mining licences.

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....[2]

(ii) The amount of gold recovered from each tonne of rock is very small. However, the mining company thinks that they will make a profit from this open cast mine.

Describe the process of open cast mining.

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....[2]

(iii) Describe the environmental damage that can be caused by open cast mining.

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....[2]

(iv) Suggest the advantages of open cast mining compared with other methods of extraction.

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....[2]

(c) The people of Marmato and the small scale miners do not want to move. They are very worried about the destruction of their town and their future. They want the government to cancel the mining licence that was given to this company.

   (i) Suggest some problems the people will face if the town is moved to the bottom of the mountain and small scale mining stops.

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   (ii) The government wants all small scale miners in Colombia to obey the same laws as the large mining companies. Suggest how this might affect small scale mining in the future.

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   ....[2]

(d) The government asked an environmental scientist to investigate the impact of small scale mining around Marmato. To recover as much gold as possible from crushed rock, the small scale miners use the following process involving the heavy metal mercury.

   • liquid mercury is added to crushed rock, containing gold

   • the gold and mercury combine

   • this liquid mixture is collected

   • the mixture is heated and mercury vapour is lost

   • the gold is left behind

   (i) Some small scale miners suffer from ill health and as a result, have a short life expectancy. Suggest possible reasons for this.

   ....

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   ....

   ....[2]

(ii) A health worker took some blood samples from nine small scale miners and measured the concentration of mercury in their blood. The results are shown below.

miner	concentration of mercury in blood / arbitrary units
1	95
2	110
3	400
4	350
5	210
6	105
7	450
8	500
9	320

Medical studies suggest that the concentration of mercury in blood can be up to 110 arbitrary units without having any effects on health.

State how many of the nine miners have put their health at risk.

....[1]

(iii) The health worker decided to collect blood samples from a larger sample of small scale miners of different ages.

age / years	18–23	24–29	30–35	36–41	42–47
average mercury concentration in blood / arbitrary units	95	175	270	325	320

Plot the data as a graph on the grid below.
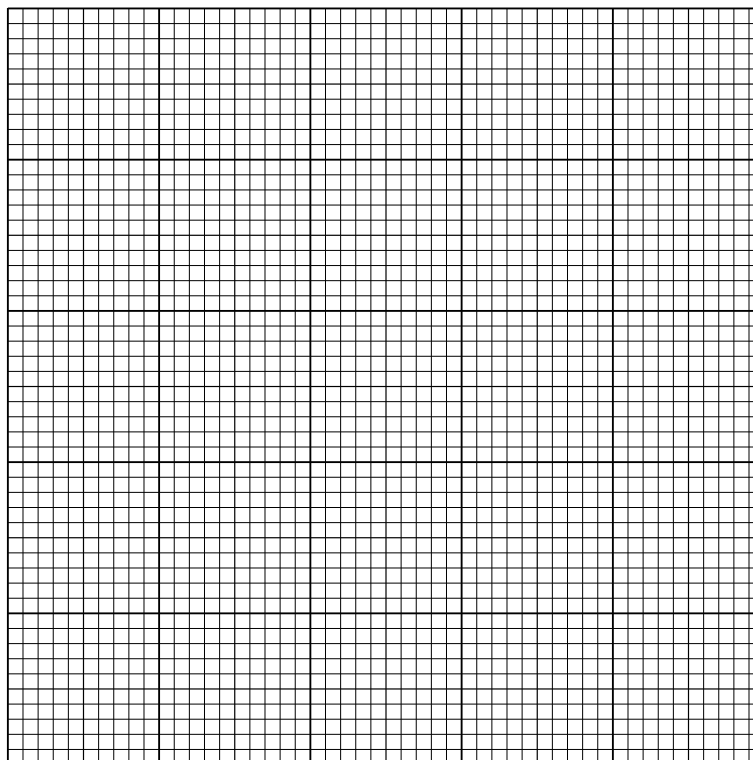
[4]

(iv) Describe the pattern shown by the graph.

....

....[1]

(v) Explain why the health worker wanted to collect more samples.

....

....[1]

(e) A scientist visited Marmato and noticed that the vegetation did not grow near places used to recover gold using the method described in **(d)**. The diagram shows the gold extraction site and the vegetation area around it. The scientist used the following method to find out more about the vegetation around the sites.

uphill

gold extraction area

downhill

not to scale
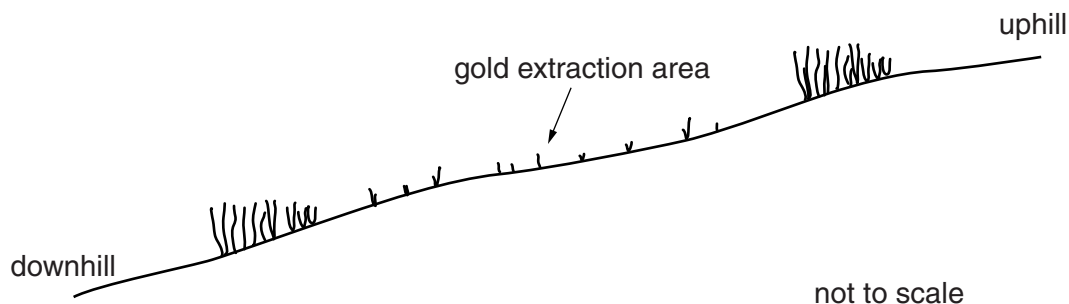
- starting at the lower edge of the gold extraction site, lay out a 30 m tape down the hill

- place a 1 m² quadrat at 2 m intervals

- count the number of different plant species

- count the total number of plants

distance down the hill / m	0	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30
total number of plants	0	3	3	6	10	12	18	25	24	27	25	26	22	27	24	25
number of species	0	1	1	1	2	2	3	3	4	5	4	6	4	4	4	4

(i) Describe the trend for:

total number of plants ....

number of species ....
[2]

(ii) Suggest what conclusions the scientist came to.

....

....[1]

The scientist decided to repeat the method 30 m up the hill above the extraction site.

(iii) Suggest how the results from up the hill might have been different from results down the hill.

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....[1]

(iv) Suggest how the scientist could extend the sampling around this gold extraction site.

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....[1]

[Total: 30]

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