UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

2298054513

ENVIRONMENTAL MANAGEMENT **0680/42**

Alternative to Coursework **May/June 2011**

1 hour 30 minutes

Candidates answer on the Question Paper.

Additional Materials: 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 a soft pencil for any diagrams, graphs or rough working.
Do not use staples, paper clips, highlighters, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
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.

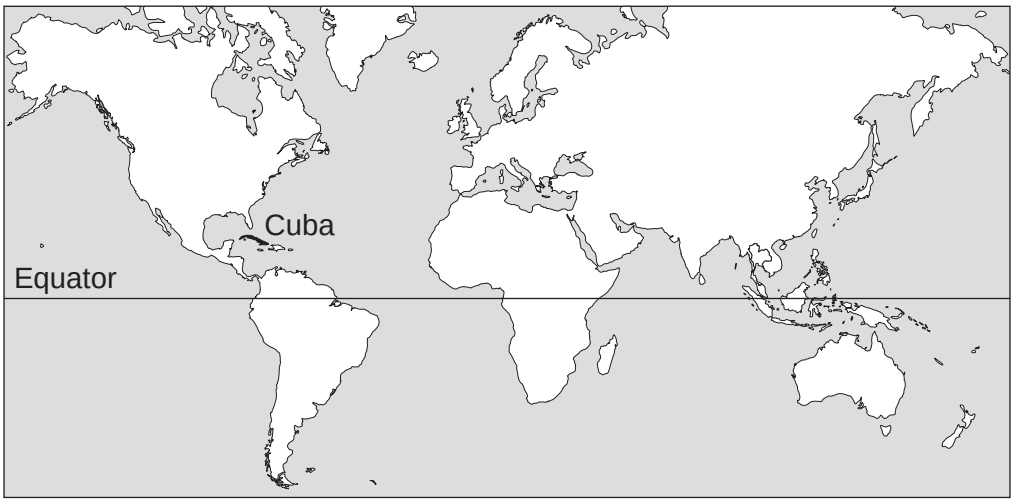
At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

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Total	

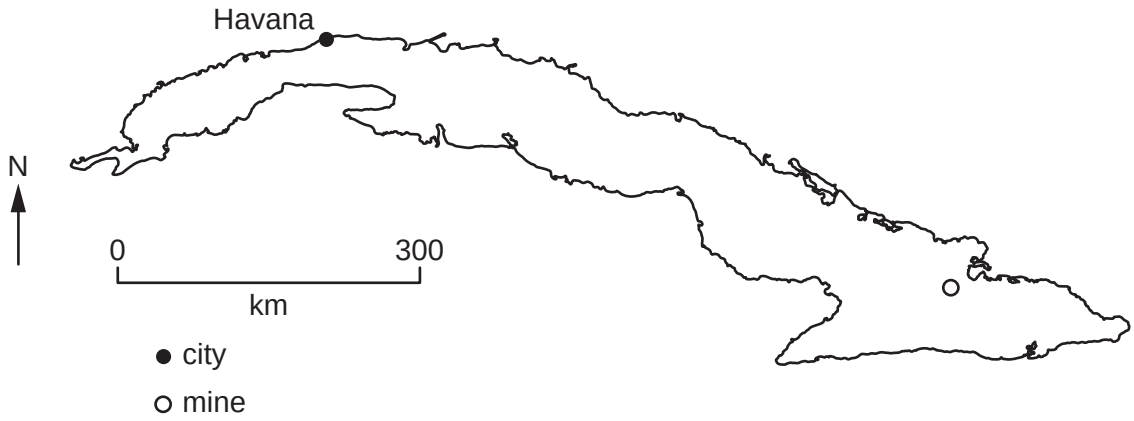
This document consists of **14** printed pages and **2** blank pages.

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Map of the World showing Cuba



Map of Cuba



Area of Cuba: 110 860 sq km
Population: 12 million
Children per woman: 1.61
Life expectancy at birth: 77 years
Currency: Cuban pesos (CUP 0.925 = 1 US $)
Languages: Spanish
Climate: tropical, with a dry and a wet season
Terrain: plains, with hills and mountains in the southeast
Main exports: sugar, nickel, tobacco, fish, medical products, citrus fruits, coffee

Cuba is the largest island in the Caribbean. It relies on Venezuela for supplies of oil and in return it supplies medical services to Venezuela. There are often shortages of food and goods and many Cubans emigrate. Sugar and nickel ore provide most of Cuba's export earnings.

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1 Cuba is the world's fourth largest producer of nickel. Variations in the world price of nickel are shown in the table.

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	average world price of nickel (US $ per tonne)						
year	2004	2005	2006	2007	2008	2009	2010
price	12 000	11 000	30 000	30 000	10 000	11 000	15 000

(a) (i) Suggest why the price dropped after 2007.

..... [1]

(ii) The mining company in Cuba limited its output between 2008 and 2011. Give two reasons why this was a good decision.

1. .....

2. ..... [2]

(b) The nickel ore is removed by opencast mining. When the ore is refined it only gives about 1% pure nickel.

(i) If 1500 tonnes of nickel ore are refined how much pure nickel can be extracted?

..... [1]

(ii) State **one** disadvantage of opencast mining.

.....

..... [1]

(c) Exposure to nickel for long periods of time has been linked to health problems such as skin rashes, asthma and lung cancer.

Suggest **two** ways mine workers can reduce the health risk while at work.

.....

..... [2]

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(d) A doctor wanted to find out how much ill-health was caused by mining nickel. The doctor selected a sample of males between 30–50 years old. Fifty men were miners and fifty did not work in mines. They were selected at random. None of them had health problems at the beginning of the study. They had a medical check-up once a year for ten years. The results are shown in the table.

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	number of miners	**number of non-miners**
skin rashes	15	3
asthma	7	3
lung cancer deaths	2	1
deaths from causes other than lung cancer	6	4

(i) Suggest why only males were selected for the study.

.....

..... [1]

(ii) Why was the study carried out over ten years?

.....

..... [1]

(iii) Suggest why it was important to record deaths from causes other than lung cancer.

.....

..... [1]

(iv) Suggest **two** ways in which the study could have been improved.

.....

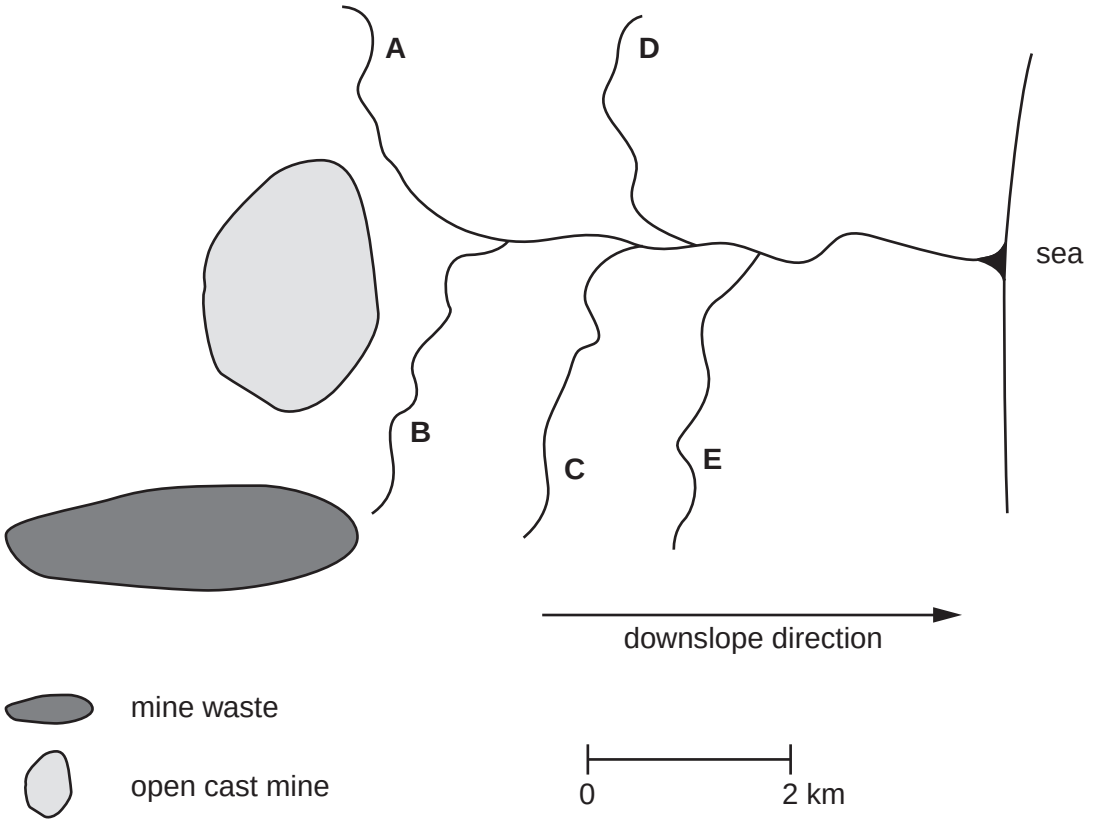
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(e) Nickel is a heavy metal that is toxic to plants and animals. The diagram shows streams flowing near an open cast nickel mine.

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(i) Which stream, **A**, **B**, **C**, **D** or **E**, is most likely to be polluted by nickel? Give a reason for your answer.

.....

..... [1]

(ii) The food chain found in these streams is shown below.

algae → invertebrates → small fish → large fish

Surveys of streams polluted with minerals found with nickel ore showed that

- the number of all animal types is lower than in unpolluted streams
- usually the number of large fish does not decrease more than the other animal types.

Suggest why large fish would normally be expected to decrease more than other animal types in streams polluted by heavy metals.

.....

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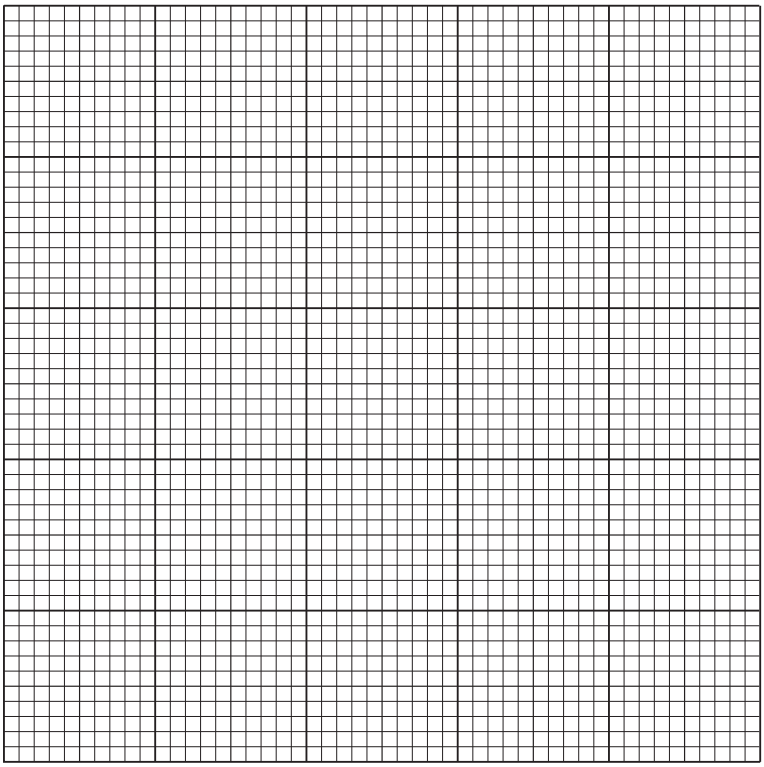
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(iii) The table shows the results of a survey of the streams shown in the previous diagram.

	number of invertebrates in sample from each stream				
	A	**B**	**C**	**D**	**E**
stone fly larvae	7	7	10	13	14
mayfly larvae	12	11	16	16	15
other invertebrates	6	6	7	5	8

Draw a graph of the data for mayfly larvae.



[4]

(iv) Describe what is shown for mayfly larvae.

.....

..... [2]

(f) Nickel can be mixed with iron ore to make alloys of steel which is used in a wide range of products. When the products come to the end of their life the nickel can be extracted from the scrap metal. Why is this a good alternative to mining nickel ore?

.....

..... [2]

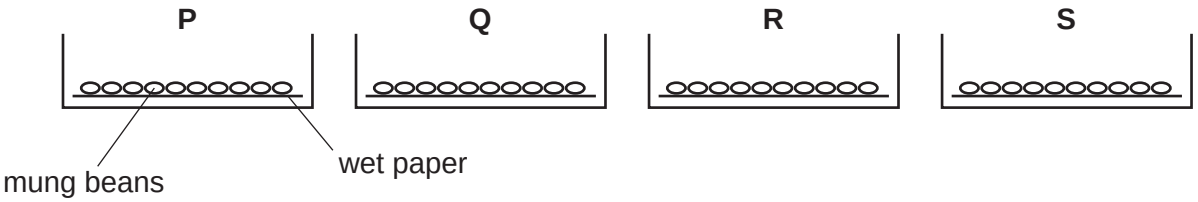
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(g) When a mining company is given a licence, it agrees to restore the land after opencast mining is completed. The soil that fills the mine can become contaminated with toxic chemicals so plant growth can be very slow in the first few years.

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Mung beans can be used in an experiment to show the degree of pollution in the soil.

A scientist measured the rate of growth of mung beans at intervals over 5 days. The mung beans were grown using water extracted from different soil samples, as shown in the diagram.



The soil was soaked with water for 24 hours and then drained off. This water was used to soak paper on which the mung beans were grown. Ten mung beans were placed on the wet paper in each dish. The dishes were all the same size.

The results are shown in the table.

	length of roots (mm)				
growth medium	**day 1**	**day 2**	**day 3**	**day 4**	**day 5**
P pure water	1	4	8	12	20
Q water from unpolluted soil	1	4	7	11	21
R water from soil covering the mine for one year	0	1	3	5	6
S water from soil covering the mine for ten years	0	3	5	9	15

(i) What does the information in the table show about the degree of pollution in the soil?

.....

.....

.....

..... [2]

(ii) Suggest one advantage and one disadvantage of trying to measure soil pollution using mung beans.

advantage.....

.....

disadvantage.....

..... [2]

(iii) Using information from the table, estimate how long a farmer should wait before planting crops on restored mine soil.

..... [1]

(h) A scientist working in another country has discovered a plant that absorbs nickel from the soil at extremely high rates. This is a Euphorbia plant that grows wild.

(i) How could you show that the Euphorbia plant reduces nickel toxicity in soil very quickly?

.....

.....

.....

..... [2]

(ii) Suggest **two** risks of introducing a wild plant from another country into Cuba.

.....

.....

.....

..... [2]

(iii) Are you in favour of, or against, continuing to mine nickel in Cuba in the future? Explain your view.

.....

.....

.....

..... [3]

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2 The eastern part of Cuba regularly suffers from water shortages. To help water storage and movement of water, Cuba has 200 dams and 2000 km of water channels. Look at the climate data for eastern Cuba shown in the table.

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Climate data table

month	average rainfall (mm)	lowest average temperature (°C)	highest average temperature (°C)
January	42	18	26
February	27	18	26
March	30	19	27
April	35	21	29
May	81	22	30
June	99	23	31
July	85	24	32
August	89	24	32
September	90	24	31
October	103	23	29
November	47	21	27
December	35	19	26

(a) (i) What are the wettest and driest months?

wettest month .....

driest month ..... [1]

(ii) Which months are the dry season?

..... [1]

(iii) A small dam can hold 5600 cubic metres of water and 50 cubic metres a day are used in the dry season. How many days of water supply will the dam provide?

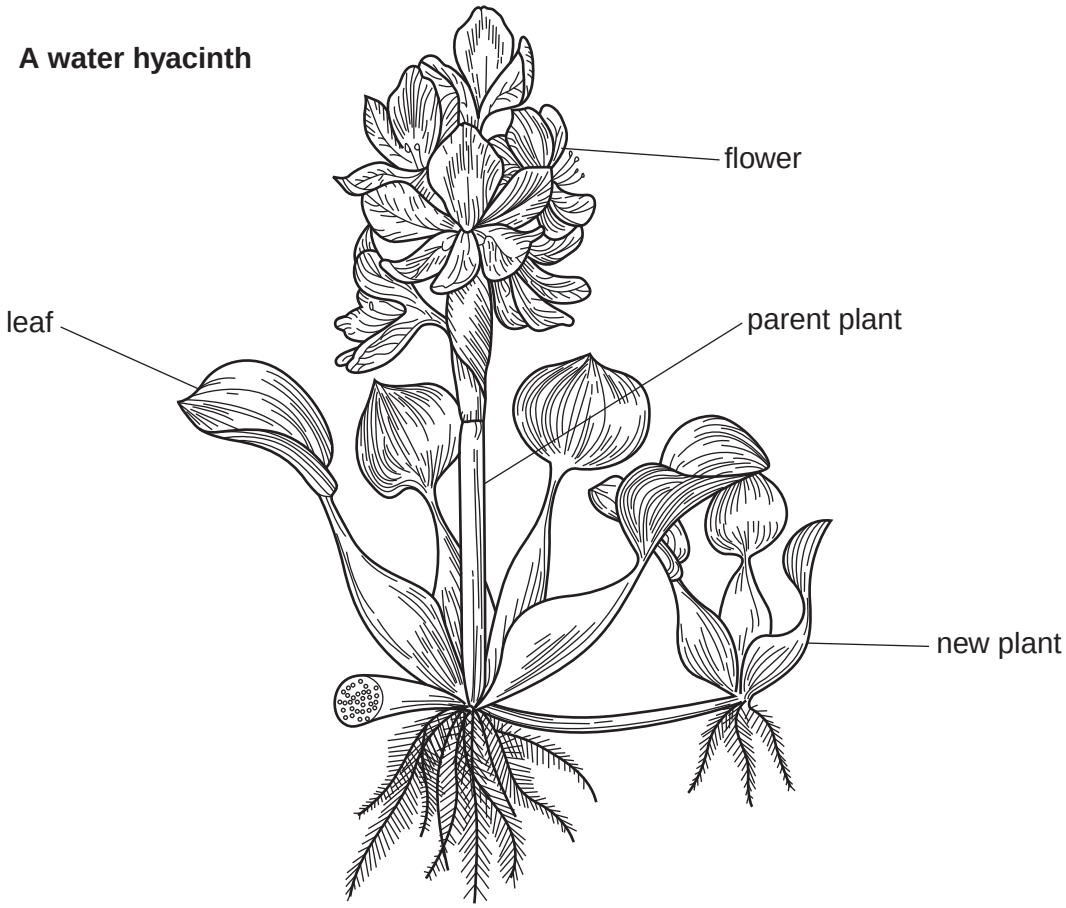
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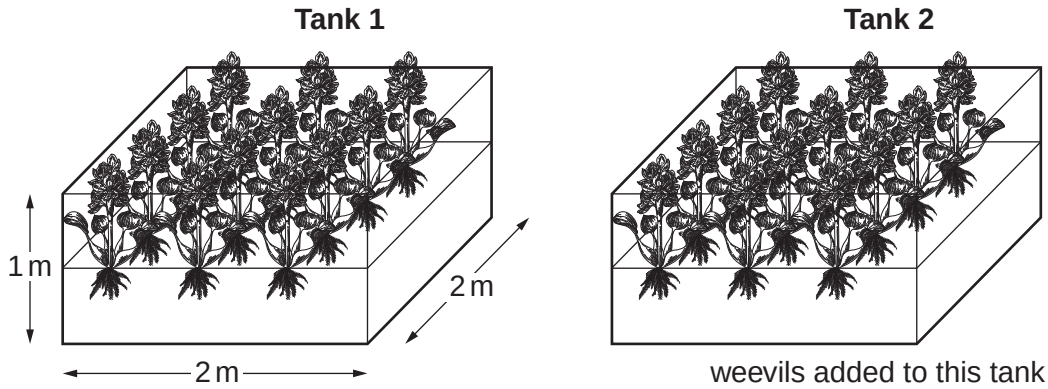
(b) Unfortunately, a plant called the water hyacinth grows on the surface of the water and can block dams and water channels. It has to be cleared by hand.

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A water hyacinth



A botanist discovered that a species of weevil feeds on water hyacinth and reduces its growth. To find out how effective the weevil could be the scientist carried out a trial as shown in the diagram.



The results for each tank are shown in the tables below.

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Tank 1 (no weevils)

	week 1	week 2	week 3	week 4	week 5	week 6
number of plants	10	10	12	15	19	24
number of leaves per plant	3	5	6	7	7	7
number of flowers per plant	0	1	2	3	3	3

Tank 2 (with weevils)

	week 1	week 2	week 3	week 4	week 5	week 6
number of plants	10	10	11	12	14	16
number of leaves per plant	3	4	5	5	5	6
number of flowers per plant	0	0	0	1	0	0

(i) Explain three pieces of evidence, from the tables, that the botanist could use to show that the weevils reduced the growth and development of water hyacinth.

evidence 1 .....

.....

evidence 2 .....

.....

evidence 3 .....

..... [4]

(ii) Which piece of evidence suggests that the plants have a slower rate of reproduction when infected with weevils?

..... [1]

(iii) State **one** piece of information the scientist needs to know before releasing weevils into a water channel as a trial.

..... [1]

(c) Over the last 40 years, Cuban farmers have cross bred Holstein and Zebu cattle to produce their own breed, Siboney cattle. These are kept on many Cuban farms.

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- **Holstein cattle**: high milk yield, fast growth rate, suffer from stress at high temperatures
- **Zebu cattle**: low milk yield, low growth rate, do not suffer stress at high temperatures, disease resistant
- **Siboney cattle**: have genes from Holstein cattle and Zebu cattle

(i) Explain why Siboney cattle are well suited for farming in tropical countries such as Cuba.

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..... [3]

(ii) The output from Siboney cattle is limited by a poor quality pasture during the dry season. A farmer tried feeding his cattle with water hyacinth and told local farmers that his animals survived and produced more milk than when they fed on pasture. The farmer decided to record milk yield every day during the dry season. Half his cattle were given water hyacinth as an additional food. The other half were fed on pasture only.

Draw a suitable table to record milk yield for one week.

[3]

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(d) Some farmers discussed how to get the best returns from their small farms. They proposed three different plans.

Plan A Sell all the cattle before the dry season. Replace the cattle with chickens. Continue growing sugar cane and cassava. Buy Holstein cattle at the beginning of the wet season.

Plan B Sell a small number of cattle throughout the year. Harvest water hyacinth and keep chickens. Continue growing sugar cane and cassava.

Plan C Sell a small number of cattle throughout the year. Harvest water hyacinth and dry some to store. Keep chickens. Continue growing sugar cane and cassava. Also grow tomatoes and beans.

(i) What are the disadvantages of plan **A** in the first year?

.....

.....

..... [2]

(ii) Explain **two** ways in which plan **B** is better than plan **A**.

.....

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..... [2]

(iii) Explain why plan **C** is better than plan **A** or plan **B**.

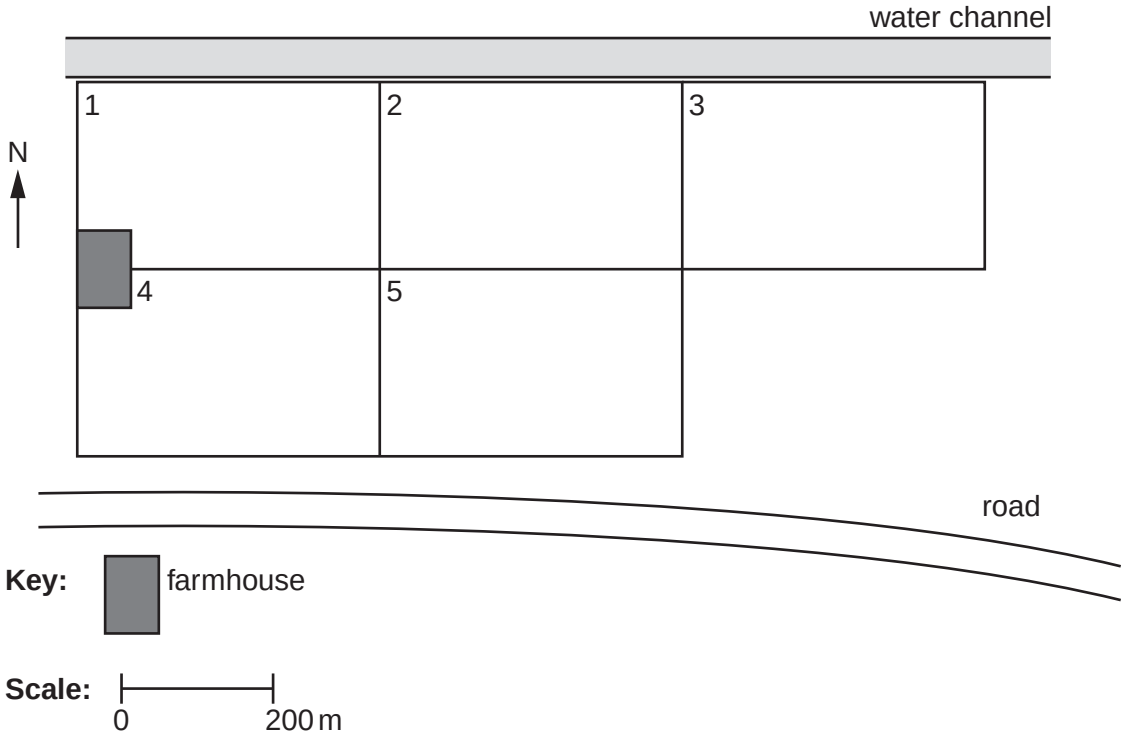
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(e) One farmer has five fields of about the same size. They are laid out as shown in the diagram.

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Describe how you would carry out plan **C** on this farm over the next three years.

Plan C Sell a small number of cattle throughout the year. Harvest water hyacinth and dry some to store. Keep chickens. Continue growing sugar cane and cassava. Also grow tomatoes and beans.

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..... [4]

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