Cambridge
O Level

Cambridge International Examinations
Cambridge Ordinary Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

8697682708

ENVIRONMENTAL MANAGEMENT **5014/22**

Alternative to Coursework **October/November 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.

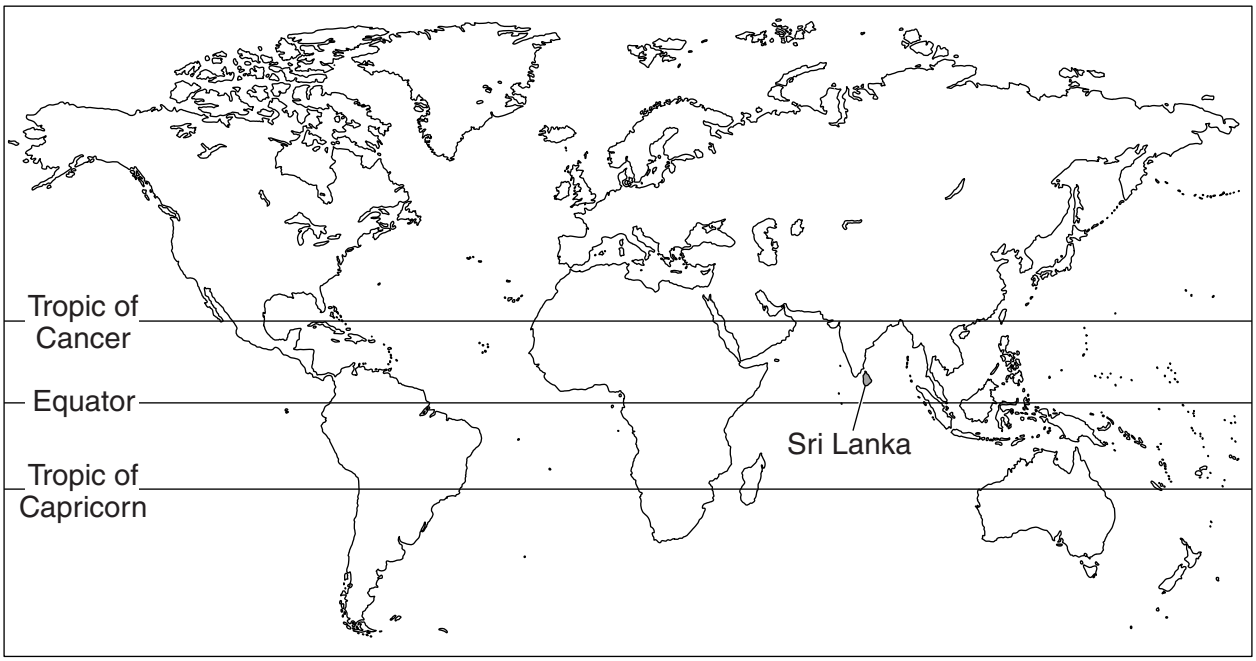
Study the appropriate source materials before you start to write your answers.
Credit will be given for appropriate selection and use of data in your answers and for relevant interpretation of these data. Suggestions for data sources are given in some questions.
You may use the source data to draw diagrams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

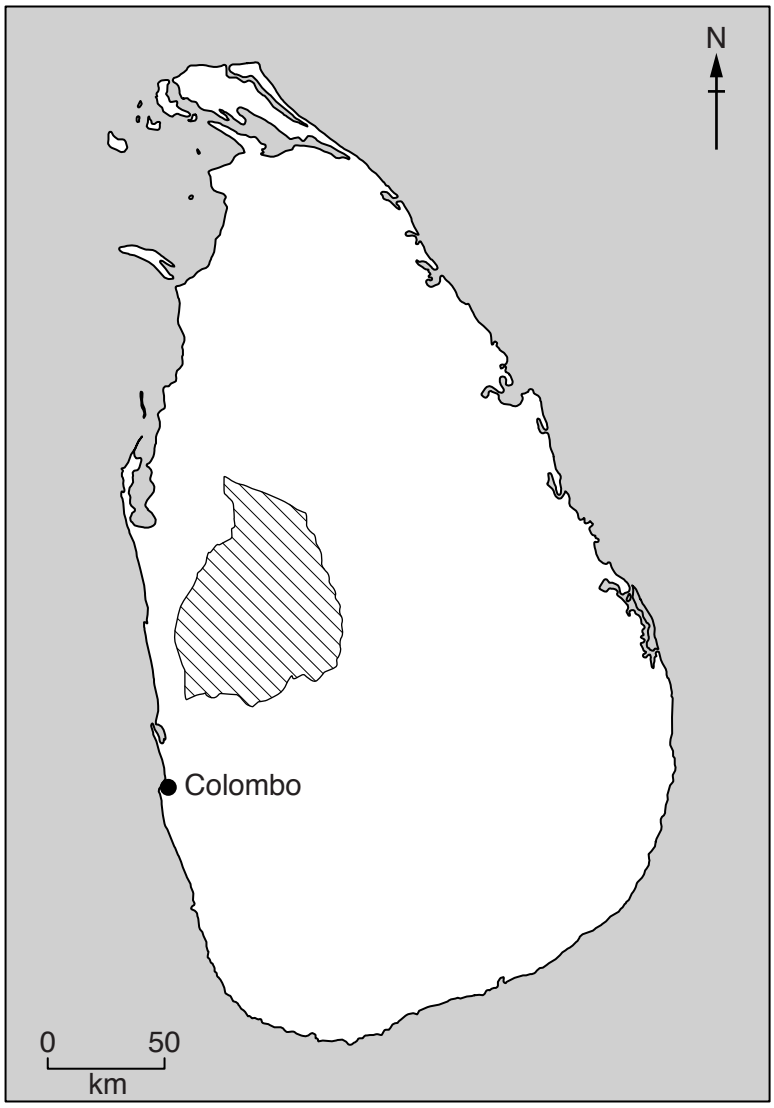
This document consists of **15** printed pages and **1** blank page.

CAMBRIDGE International Examinations

map of the world



map of Sri Lanka



Key

main district of intensive chicken farming

Area of Sri Lanka: 65 600 sq km

Population: 22 million

Children per woman: 2.15

Life expectancy: 76 years

Currency: Rupee (130 LKR = 1 US$)

Languages: Sinhala, Tamil

Climate: tropical

Terrain: low flat plains with mountains in the south central interior

Main exports: textiles, clothing, tea, spices, rubber, precious stones, coconut products and fish

[Turn over

1 Sri Lanka has developed manufacturing and service industries. However, more than 30 percent of the population are involved in agricultural production. The island is divided into a dry and a wet zone. Different farming methods are used to grow crops and raise livestock in each zone. The government wants to encourage farmers to increase production of eggs and chicken meat to improve the health and nutrition of the population.

(a) (i) Suggest how eating eggs can improve the health and nutrition of the population.

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..... [2]

A study of children up to four years old was carried out in five villages. The findings are shown in the table below.

health problem	percentage of children
low birth weight	17
underweight	29
respiratory infections	14
diarrhoea	5

(ii) Suggest a reason why respiratory infections and diarrhoea are serious conditions in young children.

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(iii) Suggest **two** causes of low birth weight.

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..... [2]

(iv) Suggest **one** cause of children being underweight.

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..... [1]

The study also measured the height and mass of adult women. Their body mass index (BMI) was calculated using the formula below.

$$\text{BMI} = \frac{\text{mass}}{\text{height}^2}$$

The results for three of the women in this study are shown in Table 1.1.

Table 1.1

adult woman	mass/kg	height/m	height^2/m^2	BMI	category
A	55	1.60	2.56	21.48	normal
B	50	1.58	.....	.....	.....
C	49	1.65	.....	.....	.....

Table 1.2

BMI	percentage of adult women	category
Below 18.5	20	underweight
18.5–24.9	58	normal
25.0–29.9	17	overweight
30.0 and above	5	obese

(v) Complete the column for height^2/m^2 **and** BMI and use information from Table 1.2 to complete the category column in Table 1.1. [3]

(vi) To what extent does the study support the government belief that nutrition needs to be improved?

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(b) An agricultural researcher wanted to carry out a survey of the chickens kept in the five villages to find out about the production of eggs for food. The researcher proposed three plans.

plan one
Visit one family from each village, record how many chickens they keep and how many eggs they collect in one week.

plan two
Visit five families from each village, record how many chickens they keep and how many eggs they collect in one week.

plan three
Visit five families from each village, record how many chickens they keep. Weigh every egg collected by each family in one week.

(i) Suggest why the researcher decided **not** to carry out **plan one**.

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..... [1]

(ii) Explain why **plan three** is better than **plan two**.

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..... [1]

The researcher carried out **plan three**. The results for one village are shown below.

	family **P**	family **Q**	family **R**	family **S**	family **T**
number of chickens	3	2	4	5	3
number of eggs collected in a week	11	9	15	20	10
mass of each egg/g	52, 50, 51, 46, 48, 45, 53, 51, 48, 49, 50	47, 52, 50, 49, 49, 54, 53, 51, 51	58, 49, 56, 57, 52, 47, 48, 51, 60, 45, 44, 53, 51, 50, 50	57, 46, 49, 49, 53, 52, 51, 44, 43, 57, 59, 53, 54, 47, 48, 48, 45, 41, 40, 54	55, 46, 48, 47, 49, 53, 49, 51, 46, 45
total mass of eggs/g	543	456	771	990	.....
average mass of one egg/g	49.4	50.7	51.4	49.5	.....

(iii) Complete the table for family **T**. [2]

(iv) Suggest how the researcher selected the five families to be a representative sample of this village.

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(v) Suggest how this study could be improved to provide more information on egg production in villages.

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(c) The researcher also found that 70 percent of the chicken food came from household waste. The chickens found the rest of their food themselves. Suggest whether keeping these chickens is a sustainable activity. Give reasons for your answer.

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(d) A government scheme distributed 900 000 young chicks to hundreds of villages to try to increase the number of eggs produced. The researcher visited some of these villages and found that 65 percent of the young chicks did not survive long enough to lay eggs.

(i) Calculate how many of the chicks survived to lay eggs.

Space for working.

..... [2]

(ii) Suggest why this scheme is likely to increase the number of eggs produced for only two years.

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(e) Look at the factsheet that gives information about the cockerel exchange programme (CEP).

FACTSHEET

- The cockerel exchange programme (CEP) gives villagers improved cockerels (male chickens) in exchange for local male birds.
- The improved cockerel can breed freely with the local female chickens.

village hen (female chicken)

improved cockerel (male chicken)

• lay 50 eggs a year	• cockerels carry genes for hens to lay 150 eggs a year
• hens take good care of young chicks	• improved hens take little care of young chicks
• some chicks are eaten by predators	• many chicks are eaten by predators

(i) Explain how the CEP can lead to an increase in the number of eggs produced each year.

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..... [2]

(ii) Suggest why villagers find it difficult to stop predators taking eggs and birds.

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..... [1]

(iii) Suggest why selective breeding programmes, such as the CEP, may cause problems in the future.

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2 **(a)** To supply towns and cities with eggs, some farmers keep large flocks of chickens in enclosures and feed them maize. More maize is needed every year to meet demand. The government has placed a new tax on imported maize to encourage Sri Lankan farmers to increase production, which has now risen to more than 120 million tonnes a year.

Explain how the new tax caused an increase in maize production.

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(b) The maize weevil is a serious insect pest, as it destroys the maize grains both in the field and during storage.
A scientist observed that two wild plants had no insect pests. To find out if these wild plants had a natural pesticide, the following method was used.

- dry the leaves of the wild plants
- grind the dry leaves into a powder
- apply 10 g of dried leaf powder to a maize cob infected with weevils
- count the number of living and dead weevils after 24 hours

The results of using the powder from two different species of wild plant on two infected maize cobs, are shown in the table.

number of maize weevils	powder from wild plant **A**	powder from wild plant **B**
living	84	94
dead	6	0
total on each cob	90	94

(i) Calculate the percentage of dead weevils for the maize cob treated with powder from plants **A** and **B**.

Space for working.

plant **A** .....%

plant **B** .....% [2]

(ii) Suggest **two** factors the scientist should have controlled in this experiment.

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..... [2]

(c) The scientist investigated the effects of the leaf powder from wild plant **A**. Each maize cob had a different amount of leaf powder added to it. The results are shown below.
The percentage of weevils that were dead every six hours was recorded.

leaf powder amount / g	hours			
	6	12	18	24
	percentage of dead weevils			
0.0	0	0	4	4
3.0	31	60	71	78
5.0	48	75	81	84
7.5	55	80	88	90

(i) Suggest why the scientist used 0.0 g leaf powder on one maize cob.

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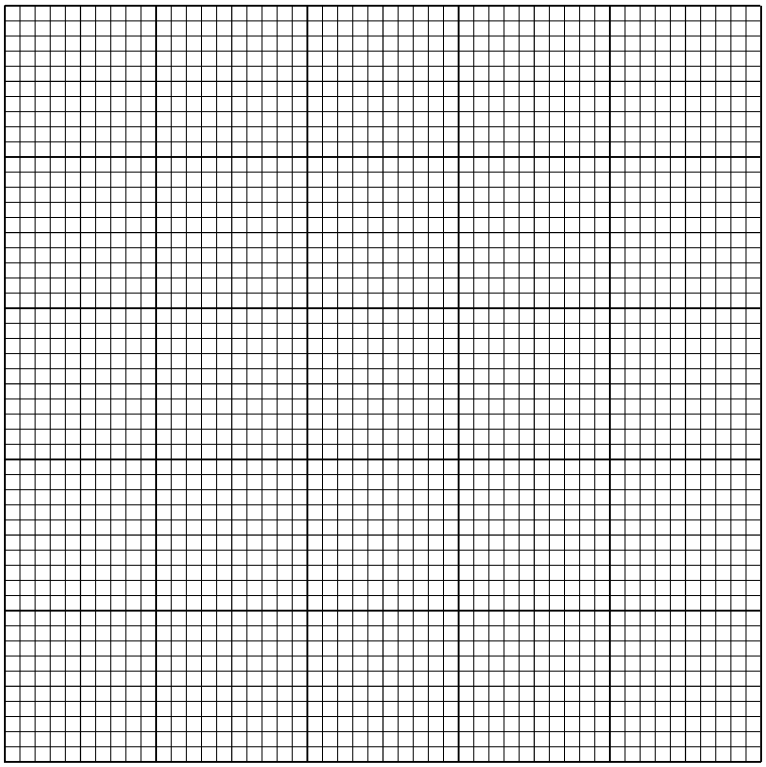
..... [1]

(ii) Plot the results for the 3.0 g treatment over 24 hours as a graph on the grid below. [4]



(iii) Describe the pattern shown on the graph.

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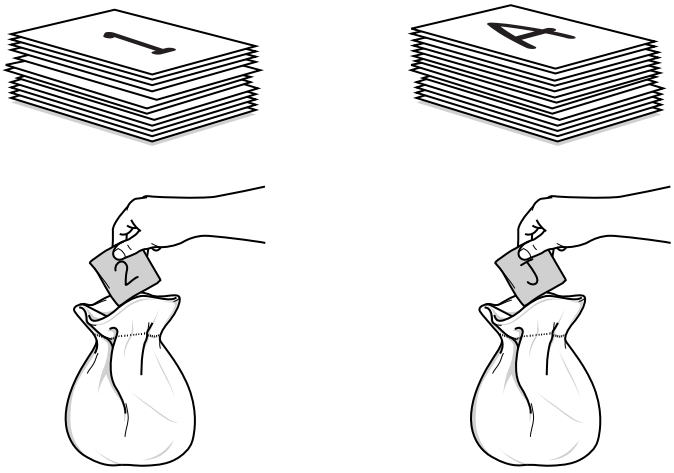
..... [2]

(iv) Draw a line on the graph to show the likely effect of using 10.0 g of leaf powder. [1]

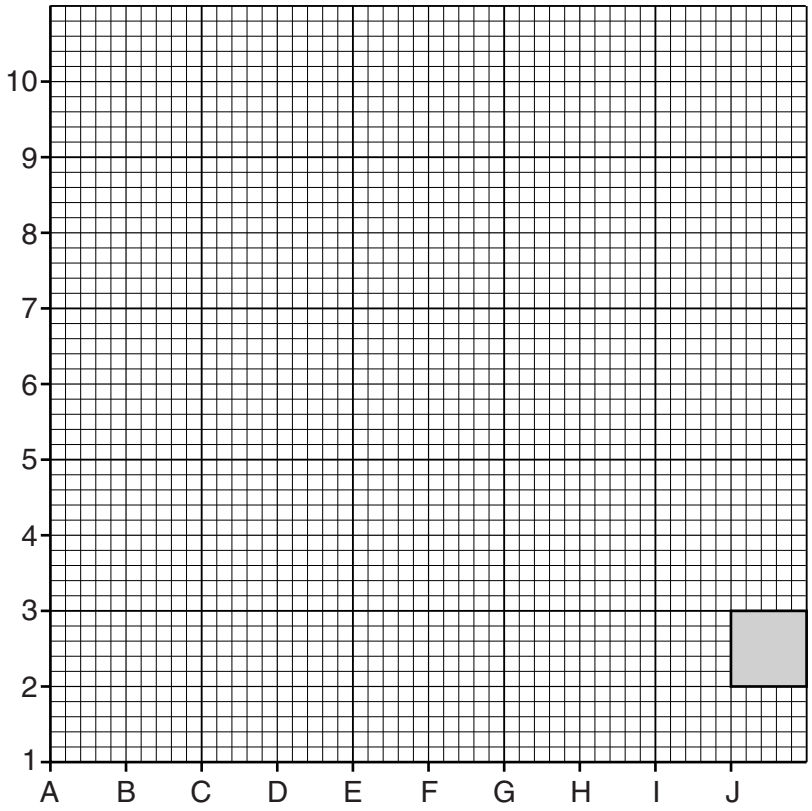
(d) The scientist wanted to find out about weevils on maize growing in a one hectare field. The scientist used the following method.

- Lay four tapes in the field to make a 10 m × 10 m square.
- Take ten pieces of paper. Number the pieces of paper one to ten.
- Repeat this for another ten pieces of paper but label these A to J.
- Place numbered papers into a bag. Place the lettered papers into another bag.
- Remove one piece of paper from each bag.
- Write the letter and number down.
- Repeat this four more times.
- Use the letters and numbers as coordinates for identifying sampling locations inside the 10 m × 10 m square.



sample location

letter	number
J	2
D	4
B	7
G	6
H	9



(i) Draw the position of the remaining sample locations on the plan shown above. The first one has been done for you. [2]

(ii) State the type of sampling method the scientist has used.

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..... [1]

(iii) The scientist removed four maize cobs from each sampling location and counted the live weevils on each cob. All maize cobs were then treated with 7.5 g of leaf powder and placed in sealed bags. After 24 hours the remaining live weevils on each cob were counted.

	at the start	after 24 hours
average number of live weevils	48	31

Calculate the percentage of **dead** weevils after 24 hours.

Space for working.

.....% [2]

(iv) Fewer weevils are killed by leaf powder used in a maize field compared with a laboratory experiment where the same amount of powder is used directly on the weevils in dishes. Suggest why.

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(v) Suggest other reasons why the scientist decided the leaf powder could **not** be used as a natural pesticide in the field.

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..... [2]

(e) Maize can be stored for several months in dry conditions before being used. The weevils continue destroying the grains of stored maize. You have been given all the equipment listed below.

plastic box with secure lid ×10
maize cobs with weevils in plastic bags ×10
leaf powder 75 g
small plastic 100 ml beakers ×10
weighing scale ×1
notebook and pen ×1

(i) Describe an experiment you could carry out over six weeks to find out if the leaf powder could reduce wastage of stored maize.

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(ii) In the space below draw a suitable table to record all the results of your experiment. [3]

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