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Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER | | | | | |

CANDIDATE NUMBER | | | | |

0002567307

ENVIRONMENTAL MANAGEMENT **0680/43**

Paper 4 **October/November 2017**

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.

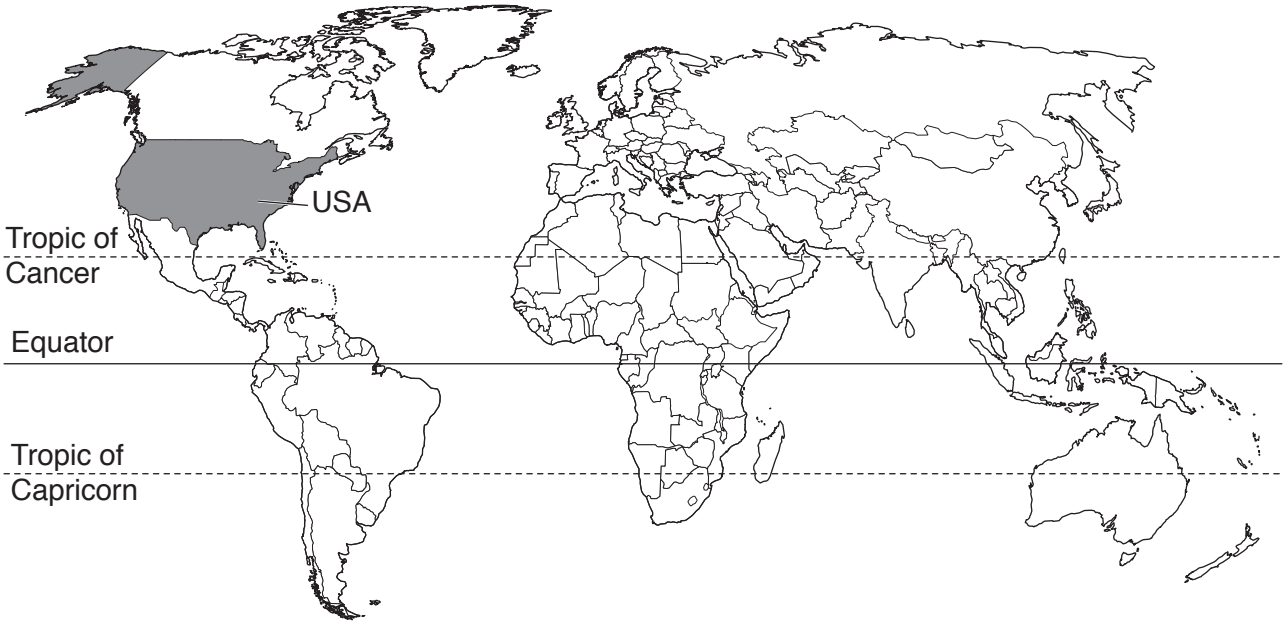
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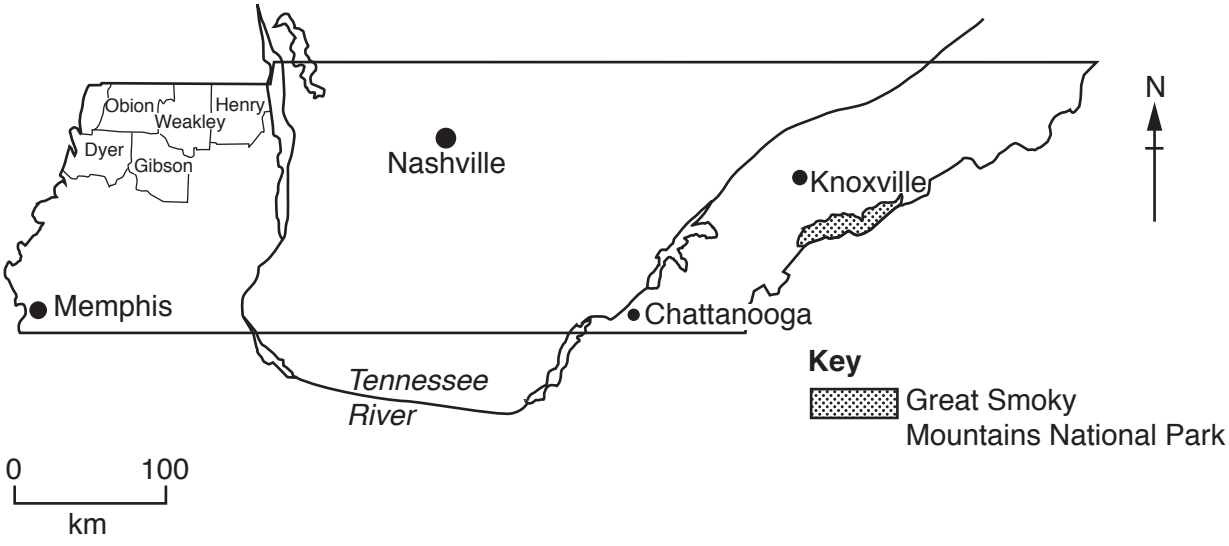
map of the world



map of USA



map of Tennessee



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area of Tennessee: 109 152 km^2

population: 6.5 million (in 2016)

children per woman: 2.1

life expectancy: 76 years

currency: USD

languages: English

main economic activities: agricultural production, electrical power generation, mining, music, tourism and vehicle manufacture

1 The state of Tennessee has large areas of fertile land. The Tennessee River is used to generate electricity. Coal and zinc mining take place in the east of the state. Many tourists visit the Great Smoky Mountains National Park and the state capital, Nashville.

(a) Soybeans are an important crop grown in many western counties of Tennessee. The population of five counties in west Tennessee that grow soybeans are shown in the table.

county	population
Dyer	38 000
Gibson	50 000
Henry	32 000
Obion	31 000
Weakley	34 000
total	.....

(i) Complete the table. [1]

(ii) Calculate the percentage of the total population of Tennessee that live in these five counties.

Show your working.

.....% [2]

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(iii) Present the population data in rank order from highest to lowest by completing the table.

highest

county	population

lowest

[2]



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(b) Only a small proportion of the population of Tennessee work on farms. Soybeans are leguminous plants. They can be grown successfully without adding fertiliser. Many farmers do not plough their fields before planting soybeans. This reduces the loss of topsoil.

(i) Explain why soybeans can be grown successfully without adding fertilisers.

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..... [3]

(ii) Explain how planting soybeans without ploughing reduces the loss of topsoil.

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..... [2]

(iii) Suggest **one** other advantage of planting a crop without ploughing.

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..... [1]

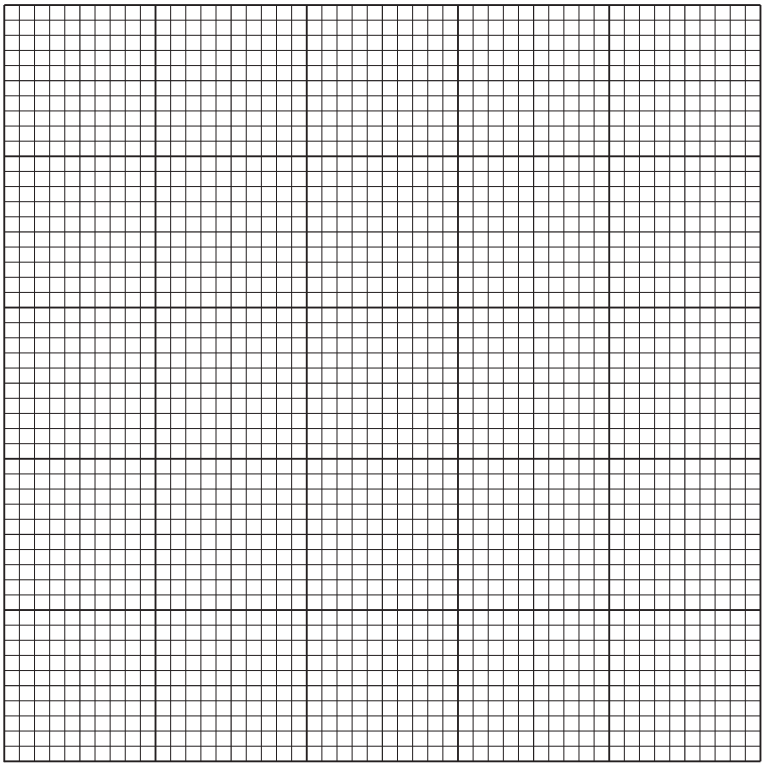
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(c) The price paid for soybeans to farmers in west Tennessee over an 8-year period is shown in the table.

	year							
	2008	2009	2010	2011	2012	2013	2014	2015
price /USD	470	410	380	500	620	500	440	350



(i) Plot the data as a bar graph on the grid. [4]

(ii) Describe the trend between:

2008 and 2012 .....

2012 and 2015. .....

[2]

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(d) Soybeans can be planted at different densities. The table shows the expected results of planting at two different densities.

planting density	average number of seeds planted per metre	average number of young plants growing per metre	average yield /tonnes per hectare
A (rows 0.5 m apart)	33	23	2.01
B (rows 0.25 m apart)	27	20	2.65

(i) Suggest reasons for the difference between the number of seeds per metre and the number of young plants per metre.

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..... [2]

(ii) The table shows the expected results of harvesting soybean plants at the two densities.

planting density	maximum number of plants that can be harvested per hectare	estimated actual number of plants harvested per hectare	difference between maximum and actual number of plants	percentage difference between maximum and actual number of plants
A	448 109	444 444	3 665	0.82
B	779 320	641 975	137 345	.....

Calculate the percentage difference between the maximum and actual number of plants harvested per hectare for planting density **B**.

Show your working.

Complete the table.

[2]

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(iii) Suggest reasons why many farmers only plant soybeans at planting density **A**.

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..... [3]

(e) One farmer said

> I check the number of plants per hectare by placing a 1.0 m^2 quadrat over a row of soybeans at the edge of one field. I count the number of plants in one quadrat and multiply this by 10 000. This gives me the number of plants per hectare.

(i) Explain why this farmer is not using a reliable method of finding the number of plants per hectare.

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..... [2]

(ii) A student decided to check the number of plants per hectare in the field.

The student said

> I used a calculator to generate six pairs of random numbers. I selected one corner of the field and used the random numbers to place the 1.0 m^2 quadrat over the plants. I counted the plants in each quadrat.

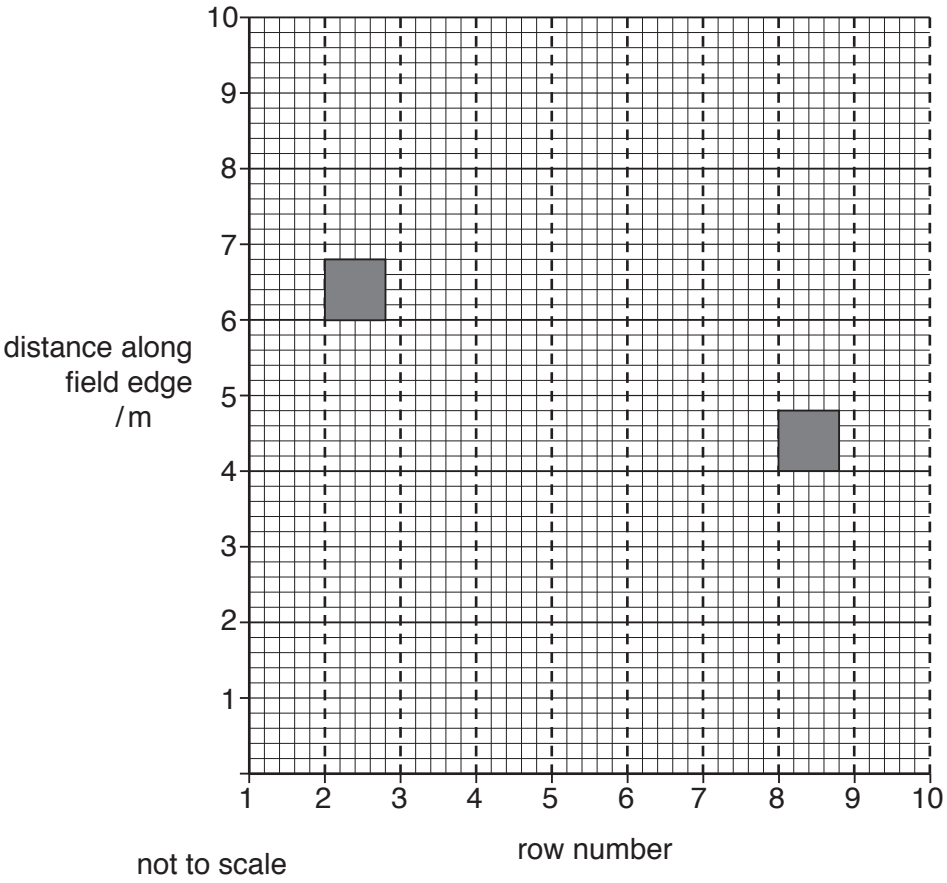
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The table shows the pairs of random numbers used.

	distance along field edge / m	row number
1st pair	6 ,	2
2nd pair	4 ,	8
3rd pair	5 ,	5
4th pair	2 ,	9
5th pair	7 ,	7
6th pair	1 ,	4

Complete the diagram to show the positions of the remaining four quadrats. The position of the first two quadrats have been done for you.

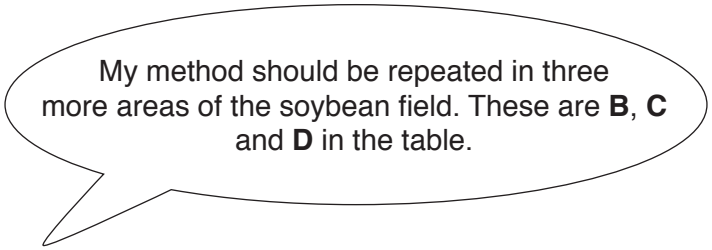


not to scale

[2]

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(iii) The student said



All of the results are shown in the table.

	number of soybean plants			
quadrat number	area **A**	area **B**	area **C**	area **D**
1	18	16	18	20
2	17	15	15	19
3	19	18	9	18
4	20	17	18	17
5	15	17	20	19
6	17	20	19	19
average	17.7	17.2	16.5	.....
range	5	5	11	.....

Complete the table.

Space for working.

[2]

(iv) The student identified one anomalous result in the table.

The anomalous result was in field area ..... , quadrat number ..... . [1]

(v) Suggest one possible cause of this anomaly.

.....

..... [1]

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(f) Soybean plants only grow well when weeds are not allowed to grow between plants.

The factsheet shows more information about soybean farming. Soybean plants have been genetically engineered. Soybeans grown from genetically modified, GM, seeds are not killed when a specific herbicide is used to kill the weeds.

soybean factsheet

GM	Non-GM
• soybean plants are only resistant to a specific herbicide • seeds cost 70 USD a bag • seeds cannot be saved to grow next year • soybeans are sold to make biodiesel and animal feed	• wide range of herbicides can be used • seeds cost 35 USD a bag • seeds can be saved to grow next year • this harvest is in demand for chicken feed • non-GM soybeans are sold at a higher price than GM soybeans

(i) Use information from the factsheet to suggest reasons why many farmers have changed from growing GM soybeans to non-GM soybeans.

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..... [4]

(ii) Suggest why some scientists are worried about herbicide resistance developing in weeds.

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..... [2]

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(g) Oil can be extracted from soybeans to make biodiesel. The use of biodiesel is encouraged in Tennessee. Diesel engines can burn diesel or biodiesel.

(i) Suggest **two** problems with burning diesel in vehicles.

1 .....

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2 .....

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[2]

(ii) Explain why burning biodiesel is thought to be less harmful to the environment than burning diesel.

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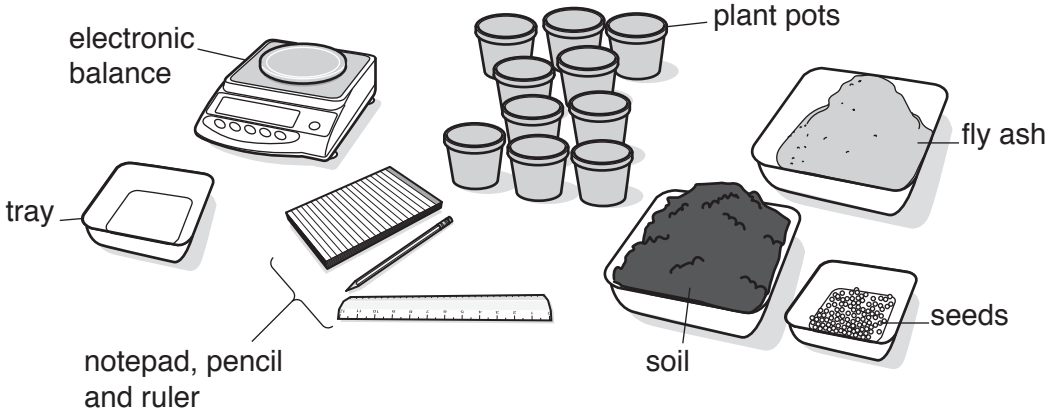
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2 About half the electricity used in Tennessee comes from coal-fired power stations. This forms large amounts of waste called fly ash. Fly ash is not classified as a hazardous substance by law in Tennessee. Fly ash is known to contain toxic metals. Some fly ash is used on farms to improve the soil.

A student wanted to investigate the effect of fly ash on the growth of soybean plants. The student had the following equipment.



(a) Describe an investigation the student could carry out to find out how fly ash affects the growth of soybean plants.

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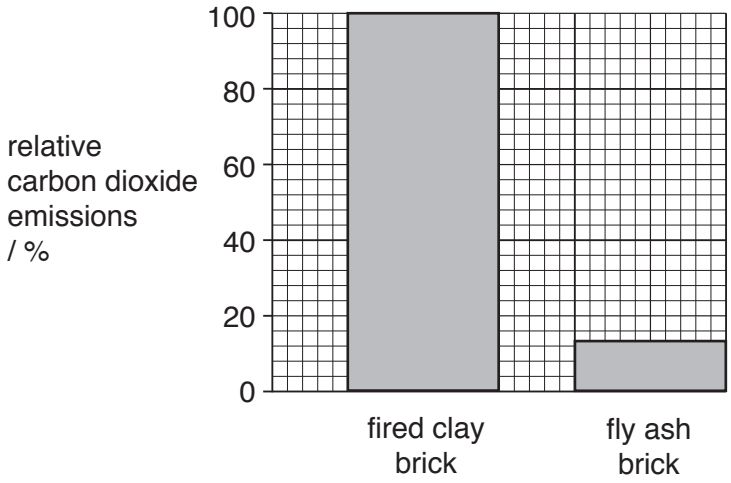
..... [6]

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(b) Most fly ash is stored near coal-fired power stations in large ponds. There have been major pollution events when these ponds leak. A new process has been developed to make bricks from fly ash. Traditionally, bricks are made from clay.

Fly ash bricks are heated at 110 °C by steam for 2 days. Clay bricks are heated to 2000 °C for 4 days.

The graph shows the relative carbon dioxide emissions associated with bricks produced from clay and fly ash.



(i) Explain the advantages of using fly ash for making bricks.

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..... [4]

(ii) Suggest why some scientists think there may be a risk to human health from using fly ash bricks for building houses.

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..... [2]

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(c) The Tennessee Valley Authority are investing in new methods of generating electricity and are closing down old coal-fired power stations.
Describe the effects of this strategy on the people and environment.

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..... [6]

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