Cambridge
O Level

Cambridge International Examinations
Cambridge Ordinary Level

CANDIDATE NAME	
CENTRE NUMBER	
CANDIDATE NUMBER	

5323986261

ENVIRONMENTAL MANAGEMENT **5014/21**

Paper 2 **May/June 2016**

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.

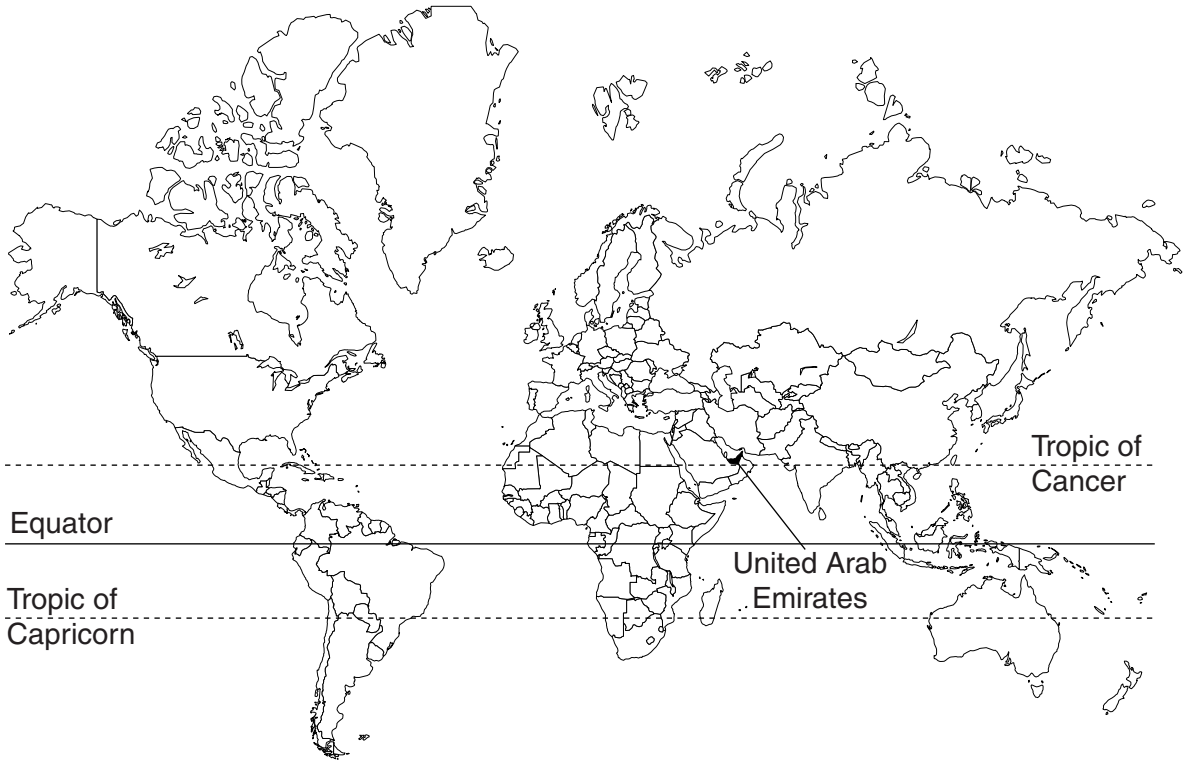
Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.

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.

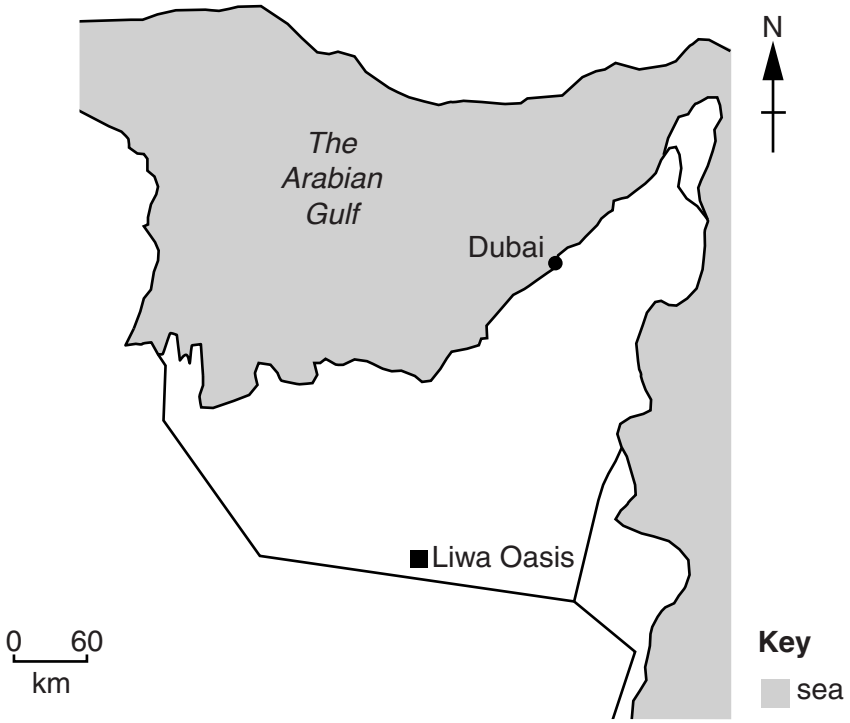
At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

This document consists of **18** printed pages and **2** blank pages.

map of the world



map of the United Arab Emirates (UAE)



area of the United Arab Emirates: 83 600 km^2

population: 9.5 million

children per woman: 2.36

life expectancy: 77 years

currency: Emirati Dirham (3.7 AED = 1 USD)

languages: Arabic, Persian, English, Hindi, Urdu

climate: hot and arid, cooler in the eastern mountains

terrain: flat coastal plain merging into mountains in the east

main exports: crude oil, aluminium, natural gas, dried fish, dates

[Turn over

1 Seven states joined together to form the United Arab Emirates (UAE) in 1971. The economy developed because of oil exports. Dubai now has one of the largest international airports in the world.

Industries now include oil refining, production of aluminium, cement and fertilisers, as well as ship repairs and textiles. Energy consumption per person is high. There are large areas of the UAE that have not been damaged by human activity and some areas (habitats) are protected to conserve plants and animals.

(a) The table shows the area of different habitats in the UAE, some of which are protected.

habitat	area / ha	area protected / ha	percentage of area protected
saltmarsh	542 381	37 879	7.0
sea-grass	44 911	12 007	26.7
coral reef	29 850	3 055	.....
mangrove	53 466	18 178	.....

Complete the table. [2]

Space for working.

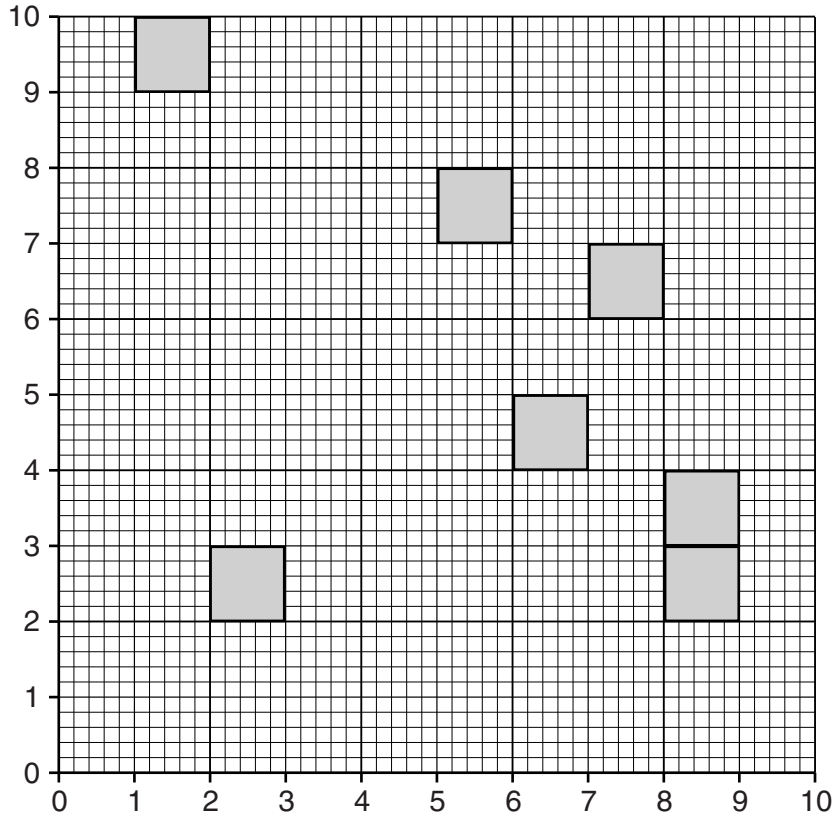
(b) Coastal parks have been set up to protect areas of saltmarsh. These areas are an important habitat for plants that can grow in saline conditions and birds.

A student wanted to carry out a survey to find out how much plant biomass was present in an unprotected saltmarsh. The following method was used.

1. select one area of unprotected saltmarsh
2. lay out four 10 m tapes to form a square
3. use a random number table to select 10 pairs of numbers
4. use the first pair of numbers as co-ordinates to locate the position of the first quadrat
5. place the first 1 m^2 quadrat at these co-ordinates
6. cut down all the plants in the quadrat
7. place the plants in a labelled bag
8. repeat this process using the remaining nine pairs of numbers as co-ordinates

quadrat	paired numbers
1	1, 9
2	5, 7
3	2, 2
4	6, 4
5	8, 3
6	7, 6
7	8, 2
8	1, 7
9	5, 3
10	3, 7

(i) Complete the sampling grid below by drawing in the positions of the last three quadrats. [3]



[Turn over

The plants taken from each quadrat were placed on a tray. The trays were placed in an oven at 60 °C for 24 hours. The dried plants were then weighed.

Look at the table below, which shows the results.

quadrat	dry mass of plants / g
1	845
2	980
3	770
4	1050
5	1100
6	1115
7	940
8	675
9	890
10	855

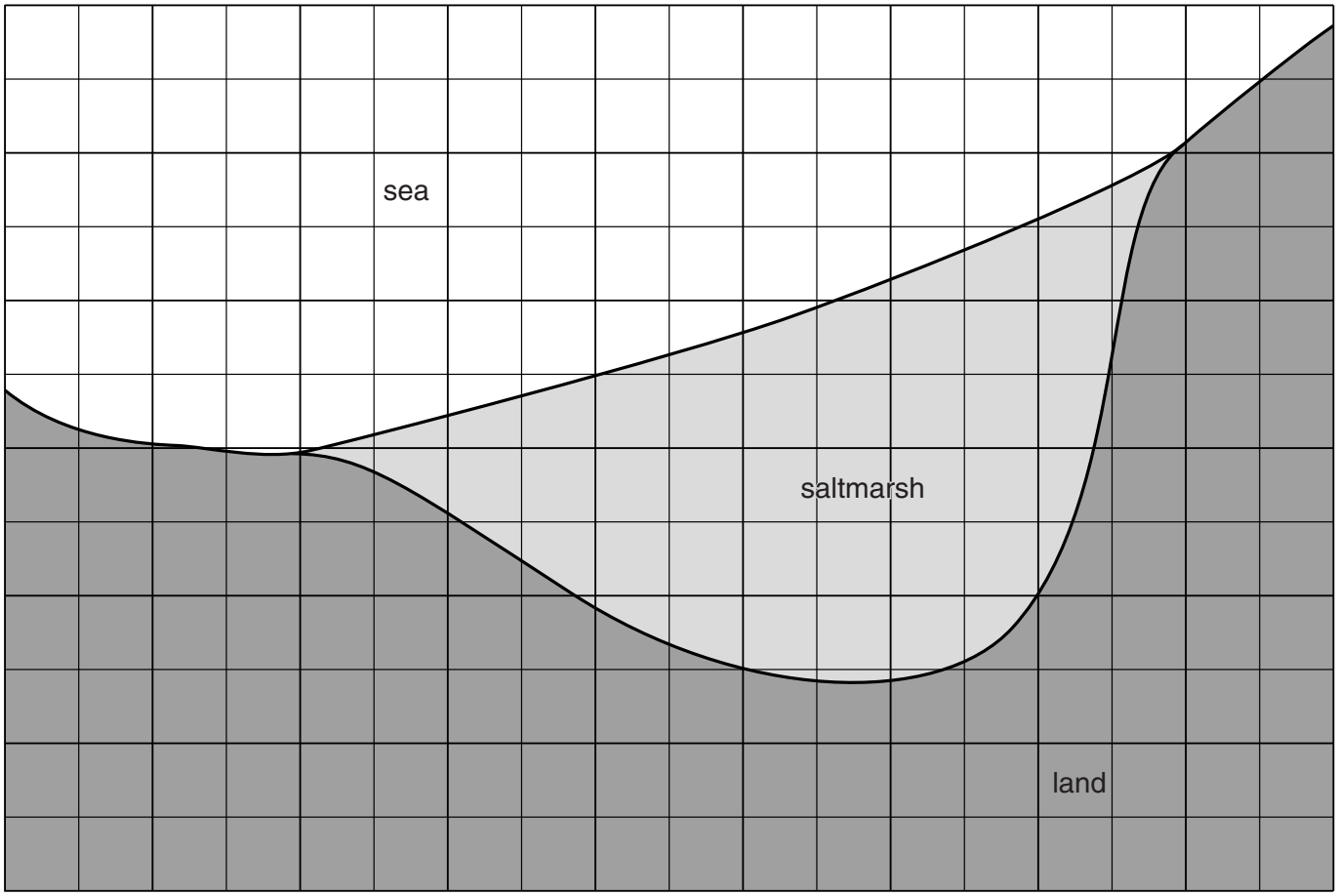
(ii) State the range of the dry mass of plants.

.....[1]

(iii) Look at the map opposite. Use the key to estimate the total area of this saltmarsh.

Space for working.

..... m^2 [1]



Key

sea

land

saltmarsh

10 m^2

(iv) The average dry mass of plants was 922 g per m^2. Using this information and your answer from part **(iii)**, estimate the total dry mass of plants on this saltmarsh.

Space for working.

..... g [1]

(v) The student decided that not all the plant biomass of this saltmarsh had been included in this survey. Explain why.

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.....[2]

(vi) Suggest how this survey could have been made more reliable.

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.....[1]

(c) The student marked the centre of each quadrat with a pole. The student returned one year later and cut down all the plants in three of these quadrats. The plants were dried and weighed using the same method as the first survey. Another three of the quadrats were sampled in the same way, two and three years after the first survey. The results are shown below.

time after first survey	one year	two years	three years
average dry mass of plants / g	210	405	640

(i) What can the student conclude from the information in the table?

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.....[2]

(ii) Suggest how the information can be used to develop a conservation plan for a saltmarsh.

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.....[1]

(d) Another student thought that biodiversity could be measured using the same quadrat locations.

(i) Suggest how this could have been done.

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.....[3]

(ii) Draw a suitable table in the space below to record biodiversity in the 10 quadrats. [3]

(e) To reduce the use of fossil fuels some saltmarsh plants are being used as a source of biomass fuel.

The process being used is:

1. collect organic waste from fish farms

2. add the organic waste to a saltmarsh

3. harvest the saltmarsh plants regularly

4. extract oils from the saltmarsh plants to make biomass fuel

(i) Explain how adding organic waste from fish farms affects the growth of saltmarsh plants.

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.....[2]

(ii) Describe **two** possible risks of adding organic waste from fish farms to a saltmarsh.

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.....[2]

(f) (i) Suggest why some people living in hot and arid environments, such as the UAE, use large amounts of fuel.

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.....[2]

The UAE have started a carbon capture initiative. The aim is to maintain and increase coastal habitats so large amounts of carbon dioxide from the atmosphere can be captured.

(ii) State the name of the process that plants use to capture carbon dioxide.

.....[1]

(iii) Suggest **three** possible advantages of the carbon capture initiative.

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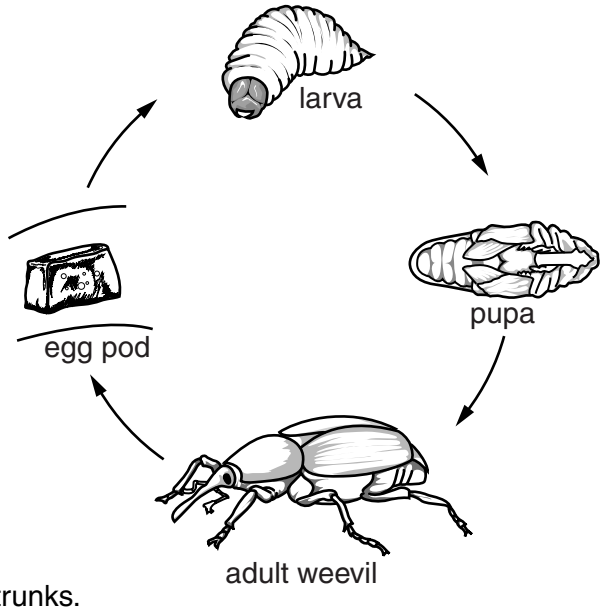
.....[3]

2 The UAE is a large producer of dates. Many varieties are grown and the best quality are the most expensive.

Many date palm trees are grown in walled gardens in the Liwa Oasis, as shown in the photograph. The red palm weevil feeds off date palm trees and was first reported in 1985 in the UAE. It has now spread to all parts of the country.

RED PALM WEEVIL FACTSHEET

red palm weevil



Adult females lay 200 to 300 eggs in date palm tree trunks.

The eggs hatch into larvae in 2 to 5 days.

The larvae feed on soft tissues in the date palm tree trunk for up to 90 days.

The fully grown larvae take 20 days to change into flying adults.

The life cycle is completed in 120 days.

(a) Using information from the factsheet and your own knowledge, explain why the red palm weevil has become a severe pest of date palm trees in the UAE.

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.....[4]

(b) A scientist wanted to find a chemical that would kill red palm weevils. In a laboratory experiment different chemicals were applied to 20 red palm weevil larvae that were two days old. The results of the experiment are shown below.

	number of larvae 20 days after chemical applied		percentage killed
chemical	living	dead	
carbosulfan	0	20	100
dimethoate	0	20	100
water	20	0	0

(i) Apart from the number and age of larvae, suggest **two** other factors the scientist kept the same during this experiment.

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.....[2]

(ii) Explain why the scientist used water as one of the chemicals.

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.....[2]

(iii) The experiment was repeated using 40 larvae that were 30 days old. The results are shown in the table below.

	number of larvae 7 days after chemical applied		percentage killed
chemical	living	dead	
carbosulfan	4	36	90
dimethoate	8	32	80
water	38	2	.....

The scientist also repeated the experiment using 10 pupae. The results are shown in the table below.

	number of pupae 3 days after chemical applied		percentage killed
chemical	living	dead	
carbosulfan	3	7	.....
dimethoate	6	4	.....
water	10	0	0

Complete **both** the tables. [2]

Space for working.

(iv) The scientist wanted to make sure the chemicals could kill adult red palm weevils. The results of a trial are shown below.

time after chemical applied

chemical	sex	2 days			5 days		
		living	living but unable to move	dead	living	living but unable to move	dead
carbosulfan	M	0	4	1	0	1	4
	F	0	2	3	0	0	5
dimethoate	M	0	5	0	0	1	4
	F	0	1	4	0	0	5
water	M	5	0	0	5	0	0
	F	5	0	0	5	0	0

Describe **three** differences shown by the results in the table.

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.....[3]

(v) The scientist wanted to use one chemical in a date palm tree garden to find out if it could be used as a pesticide by farmers. Suggest which chemical the scientist used.

Give **three** reasons for your answer.

chemical .....

reasons .....

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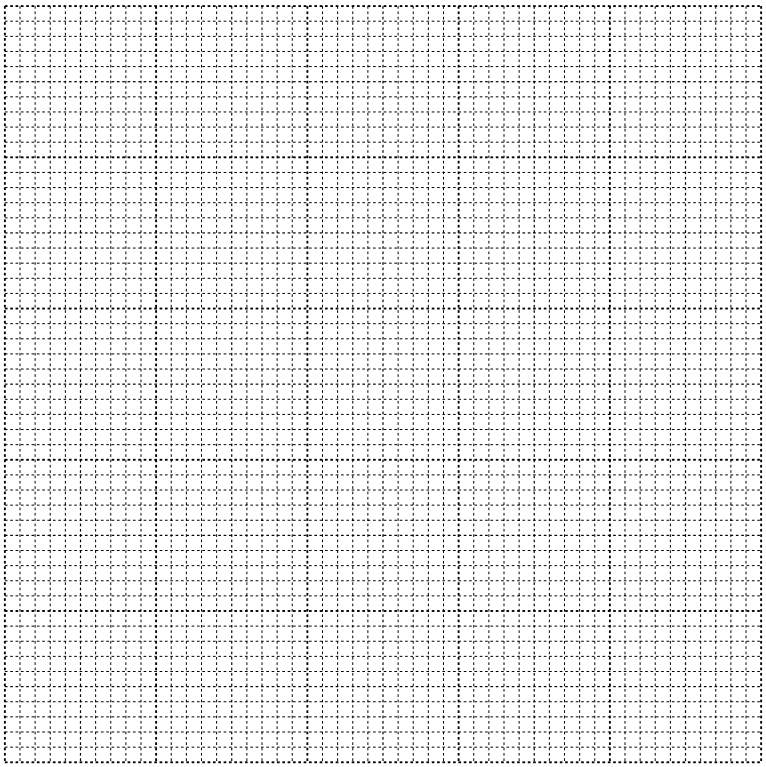
.....[3]

(c) The scientist selected four plots of equal size in a date palm tree garden. Half of each plot was sprayed with an equal quantity of the chemical chosen by the scientist. The results are shown below.

average number of infected date palm trees	
untreated	treated
24.0	12.5

Plot the information as a bar chart on the grid below. [4]



(d) The highest populations of adult red palm weevils are in March and April.

(i) Suggest when farmers should spray the date palm trees. Give a reason for your answer.

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.....[1]

(ii) State **one** safety measure the farmers should take when spraying date palm trees.

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.....[1]

(iii) Suggest **one** other way of controlling the red palm weevils without using chemicals.

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.....[1]

[Turn over

(e) The government of the UAE is supporting the production of dates by setting up research laboratories. Samples of all the date palm trees are being taken for DNA profiling. Research is also being carried out to improve date palm tree reproduction. Tissue culture is also being used to increase the number of date palm trees.

(i) Suggest why the government is supporting the production of dates.

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.....[4]

(ii) Suggest how this research could improve date palm tree farming in the future.

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.....[3]

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