Cambridge O Level

Cambridge International Examinations
Cambridge Ordinary Level

CANDIDATE NAME	

CENTRE NUMBER						CANDIDATE NUMBER				

7710312512

ENVIRONMENTAL MANAGEMENT **5014/22**

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 **16** printed pages.

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CAMBRIDGE International Examinations

map of the world

map of Oman

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area of Oman: 309 500 km^2

population: 3.3 million

children per woman: 2.86

life expectancy: 75 years

currency: Omani Rial (0.38 OMR = 1 USD)

languages: Arabic, English, Baluchi, Urdu

climate: hot, arid; humid along the coast, high number of sunshine hours

terrain: central plain, mountains in the north and south

main exports: petroleum, fish, metals, textiles

1 **(a)** Oman has small oil reserves compared to some of its neighbours. The government development plan encourages diversification and industrialisation. The labour force is growing rapidly. Large numbers of different types of small and medium-sized businesses have been started.

(i) Suggest the advantages to the people of Oman of developing different types of small and medium-sized businesses.

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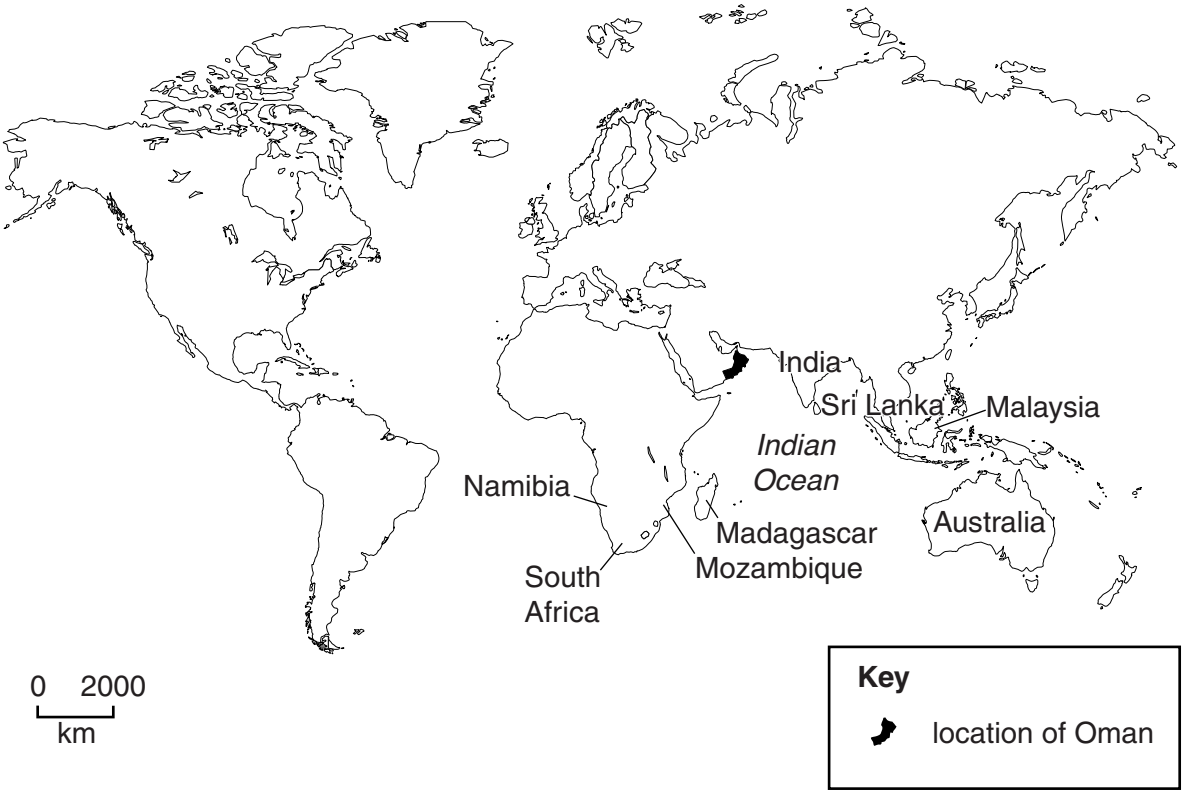
(ii) Monazite ore contains rare and valuable metals. Oman is developing a processing plant near the port of Duqm to extract these metals. The monazite ore will be imported from several sources.

The map shows most of the major producers of monazite ore and the location of Oman.



Suggest reasons why Oman is a good location for processing monazite ore.

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(iii) The stages for developing the monazite processing plant in Oman are shown.

1. cost-benefit analysis
2. environmental impact assessment
3. design of processing plant
4. construction of processing plant
5. extraction of rare metals

Suggest why an environmental impact assessment has to be carried out.

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Stage one of the processing plant should be working by 2016. The table shows information about the processing plant.

	stage one (2016)	stage two (2026)
land area / ha	5	10
water supply / m^3	90 000	1 000 000
electricity supply / MWh	4 million	40 million
capital cost / USD	25 million	250 million

(iv) Suggest how the processing plant could be supplied with the water and electricity it needs.

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(v) Look at the table below, which shows the chemicals needed for stage one and stage two.

	mass of chemicals	
chemicals	stage one (2016) / tonnes	stage two (2026) / tonnes
acids	39 000	74 000
caustic soda	1000	45 000
sodium carbonate	12 000	15 000
others	14 000	22 000

Calculate the percentage increase in the use of caustic soda and the percentage increase in the use of sodium carbonate from stage one to stage two.

Space for working.

caustic soda ..... %

sodium carbonate ..... % [2]

(b) Extracting rare metals from monazite ore produces waste chemicals. Suggest how these waste chemicals should be managed to limit their impact on the environment.

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(c) The port of Duqm is being enlarged to handle bulk cargo and shipping containers. Suggest the advantages to the government of Oman of building a large port.

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2 **(a)** Look at the climate data for a location near Duqm.

	J	F	M	A	M	J	J	A	S	O	N	D
average temperature /°C	22	22	25	29	33	35	34	31	30	30	26	20
rainfall /mm	28	18	10	10	0	3	0	0	0	3	10	18

Using the climate data explain why it is **not** possible to grow vegetables in fields near Duqm.

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(b) Large greenhouses (glass houses) have been built to grow vegetables. Seawater is used in the greenhouses as follows.

- seawater is pumped from the sea
- water evaporates in the greenhouse
- evaporating water cools the air in the greenhouse
- water is condensed and used to grow plants
- salt is returned to the sea

(i) Explain how evaporating water can cool plants in the greenhouse.

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(ii) Vegetables can be grown in some greenhouses without soil. The roots of the plants grow in channels of moving water. The concentration of mineral nutrients in the water is kept constant allowing the plants to grow rapidly.

Is this way of growing vegetables sustainable? Give reasons for your answer.

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(iii) Suggest **two** advantages to human health of eating vegetables.

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3 **(a)** Look at the photograph, which shows date fruit on date palm trees growing in some areas of Oman.

To produce good quality date fruit, the trees must be irrigated. Water is pumped from bore-holes. This draws salts out of the rocks, making the water saline.

A scientist decided to investigate whether saline irrigation water reduced the size and quality of date fruit.

A field was divided into three plots. Each plot had 15 date palm trees of the variety called duke. Each plot was given the same volume of irrigation water with different amounts of salt added. Samples of date fruit were taken at random from each plot at harvest time. The results for the date fruit harvest are shown in the table.

plot	salinity / ppm	average mass / g	average length / mm	average diameter / mm
one	3500	49.2	28.3	20.2
two	7000	46.1	26.2	19.8
three	10 500	40.4	24.6	19.9

(i) Describe the effect of increasing salinity for:

average mass, ...

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average length, ...

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average diameter. .....

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(ii) Suggest **one** other effect of salinity on date fruit that the scientist could have measured.

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(iii) Explain why the scientist divided one field into three plots.

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(iv) The scientist decided to measure the yield of two other local varieties of date palm, barhi and lulu, growing on one farm. Five date palm trees of each variety were selected at random. All the date fruit were removed from the trees and weighed at harvest time. The results are shown in the table.

date palm tree	barhi yield / kg per tree	lulu yield / kg per tree
1	19.6	20.1
2	17.3	22.0
3	11.0	19.4
4	16.9	24.5
5	18.2	23.0
average	16.6	.....

Complete the table. [1]

Space for working.

(v) State the range of yield for each variety.

Space for working.

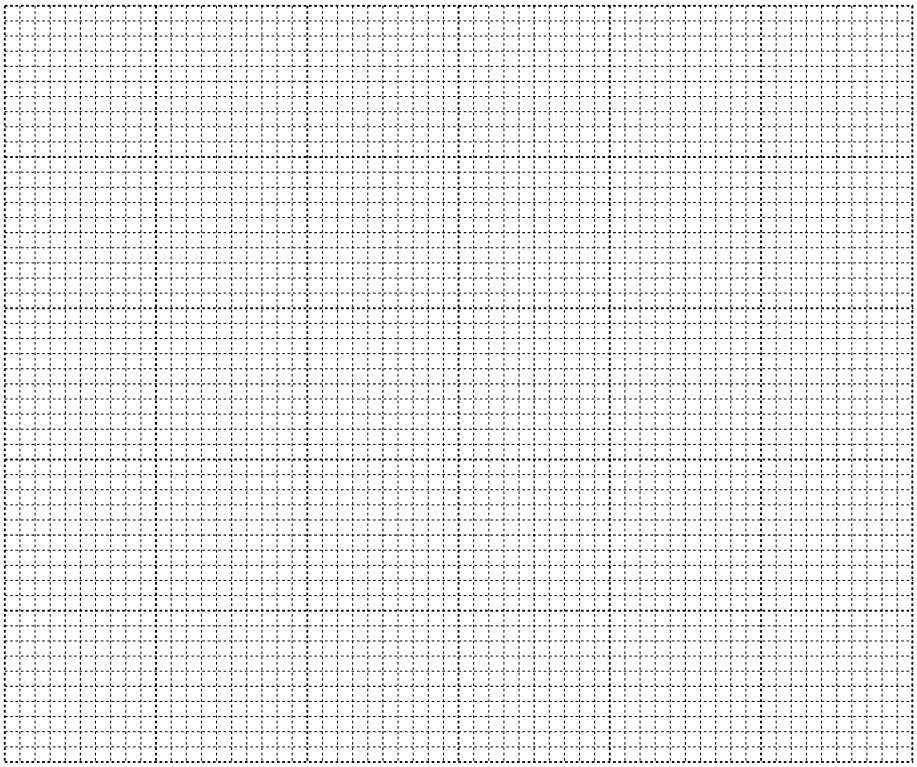
barhi ..... kg per tree

lulu ..... kg per tree [2]

(b) The salinity of the irrigation water used on this farm was 2 000 ppm. The scientist decided to measure the yield of six new varieties using water with the same salinity (2 000 ppm). The results are shown in the table.

date palm variety	average yield / kg per tree
A	5.6
B	15.8
C	23.2
D	8.0
E	17.0
F	22.0

(i) Plot a bar chart of the information in the table on the grid. [4]



(ii) State the letters of **two** date palm varieties from the table above that might give the lowest yield in the future. Give reasons for your answer.

date palm variety ..... and .....

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QUESTION 3 CONTINUES ON PAGE 14

(c) There are more than 200 crop species that can grow in saline conditions. These include quinoa, pigeonpea, guar and cowpea.

A student wanted to find out how cowpea germination is affected by saline water. The student proposed three different plans.

plan one
Put 10 cowpea seeds in a dish with saline water. Record any changes every day for 10 days.

plan two
Make a salt solution using 0.1 g of salt dissolved in 10 cm^3 of water. Make a second solution using 0.2 g of salt in the same volume of water. Place 10 cowpea seeds in dishes in each solution and in water with no salt. Record the root length each day for 10 days.

plan three
Put 10 cowpea seeds in a dish with saline water and 10 cowpea seeds in another dish with water with no salt. Record any changes every day for 10 days.

(i) Explain why **plan three** is better than **plan one**.

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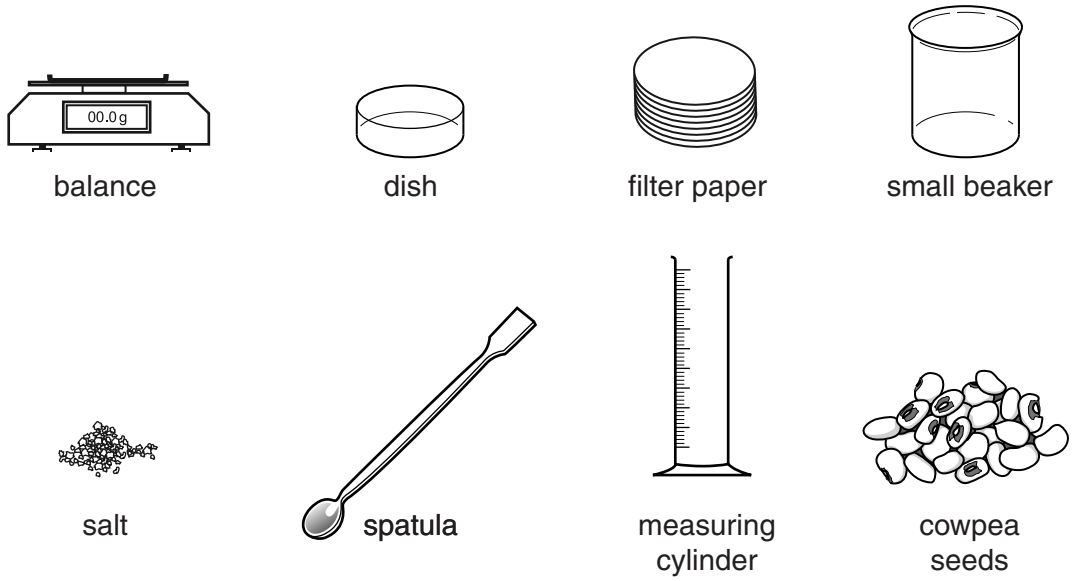
(ii) Draw a table in the space below to record the results of **plan two**. [3]

(iii) Describe a method, using the equipment shown, to set up a dish of seeds in 0.2 g of salt as required for **plan two**.



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(d) **(i)** Cowpeas have bacteria living in their roots that can fix nitrogen from the air. How could growing cowpeas be an advantage for farmers?

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(ii) Scientists have collected the seeds of many wild plants that grow in saline conditions. These seeds are stored in seed banks.

Explain why governments invest in seed banks.

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(iii) Suggest how these seeds can be used to develop crops that can grow in saline conditions in the future.

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