Cambridge O Level

Cambridge International Examinations
Cambridge Ordinary Level

CANDIDATE NAME	

CENTRE NUMBER						CANDIDATE NUMBER				

* 4 2 5 5 8 7 2 8 4 5 *

ENVIRONMENTAL MANAGEMENT **5014/21**

Paper 2 **May/June 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.

This document consists of **17** printed pages and **3** blank pages.

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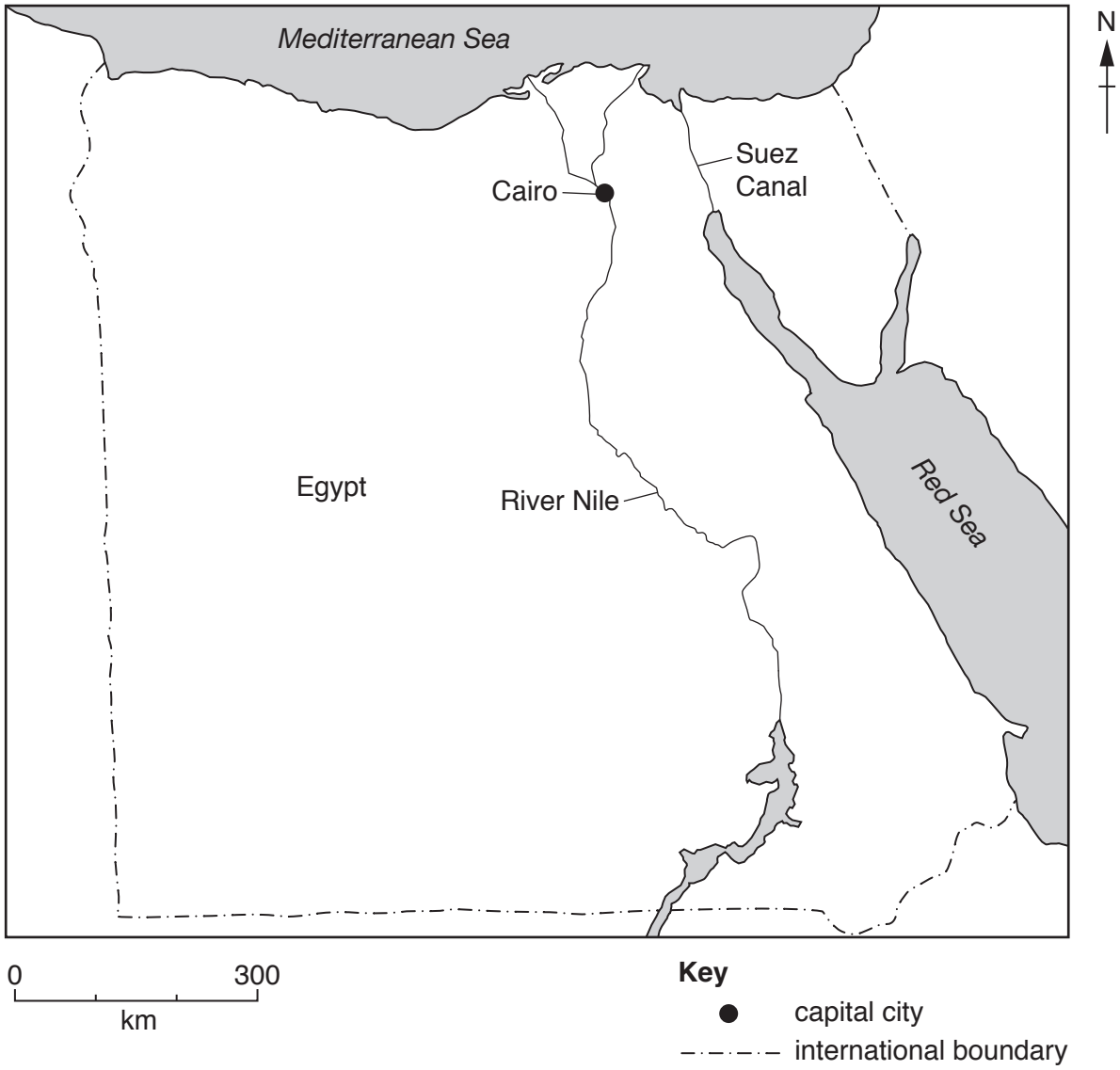
CAMBRIDGE International Examinations

map of the world

map of Egypt



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area of Egypt: 1 million km^2

population: 88 million (in 2015)

children per woman: 2.83

life expectancy: 73 years

currency: Egyptian pounds 7.8 EGP = 1 USD

languages: Arabic, English, French

climate: hot desert

terrain: plateau divided by the River Nile valley, Nile delta on coast

main exports: chemicals, cotton, crude oil, metal products, petroleum products, processed foods, textiles

1 In Egypt most economic activity takes place near the River Nile. The economy relies on exports of manufactured goods, construction and tourism. The Suez Canal links the Red Sea to the Mediterranean Sea and provides income for the country. Cairo is the capital city. It is the main industrial and business centre of Egypt. A quarter of Egypt's population lives in Cairo and the population of Cairo is growing at 3% per year. Most Egyptians still have a low standard of living.

(a) The map shows a development plan for Cairo.

(i) The Cairo city authorities considered a new housing development to the north and east of the city boundary. They decided only to allow development to the east.

Using the maps, suggest **two** reasons why the city authorities decided **not** to allow development to the north of the city.

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.....[2]

(ii) Estimate the area of the new housing development.

Show your working.

..... km^2 [2]

(iii) Suggest **two** advantages of developing to the east of Cairo.

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.....[2]

(iv) State **three** services that must be provided in the new housing development.

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.....[3]

(v) Suggest why the city authorities want many trees to be planted as part of the new housing development.

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.....[2]

(b) Suggest why farming takes place near the River Nile.

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.....[3]

(c) **(i)** Peas are an important crop for Egyptian farmers. Pea plants have root nodules that contain bacteria.

Explain how these bacteria help pea plants grow quickly.

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.....[2]

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(ii) Two students wanted to find out more about the pea harvest. The first student removed all the pea pods from two plants in a field before harvest.

The table shows the data measured by the first student.

pea pod	1	2	3	4	5	6	7	8	9	10	11	12
length of pea pod / mm	50	55	60	60	60	63	64	65	65	70	70	75
mass of pea pod containing peas / g	3	4	4	6	3	4	5	7	5	4	4	6
number of peas in pea pod	4	4	5	7	3	5	5	8	5	6	6	5

Using the data from the table, calculate the average mass of pods and peas.

Show your working.

.....[2]

(iii) State the range of the number of peas in a pod.

.....[1]

(iv) The farmer used a planting density of 60 pea plants per m^2. The average mass of peas per plant is 40 g.

Calculate the expected yield of peas for 1 m^2 of this crop.

Show your working.

..... g per m^2 [2]

(d) The second student said

‘Taking only one sample of two plants is not representative of the crop. I will take ten samples of three plants at random. To sample the plants I will use random numbers.’

The student will use the following method.

- use 10 m tapes to lay out an area 10 m × 10 m
- from the random number table select ten pairs of numbers
- the first pair of numbers is selected from columns 5 and 6 on row 5
- the remaining pairs are obtained by working down columns 5 and 6, selecting pairs from every fifth row, and then continuing with columns 9 and 10.

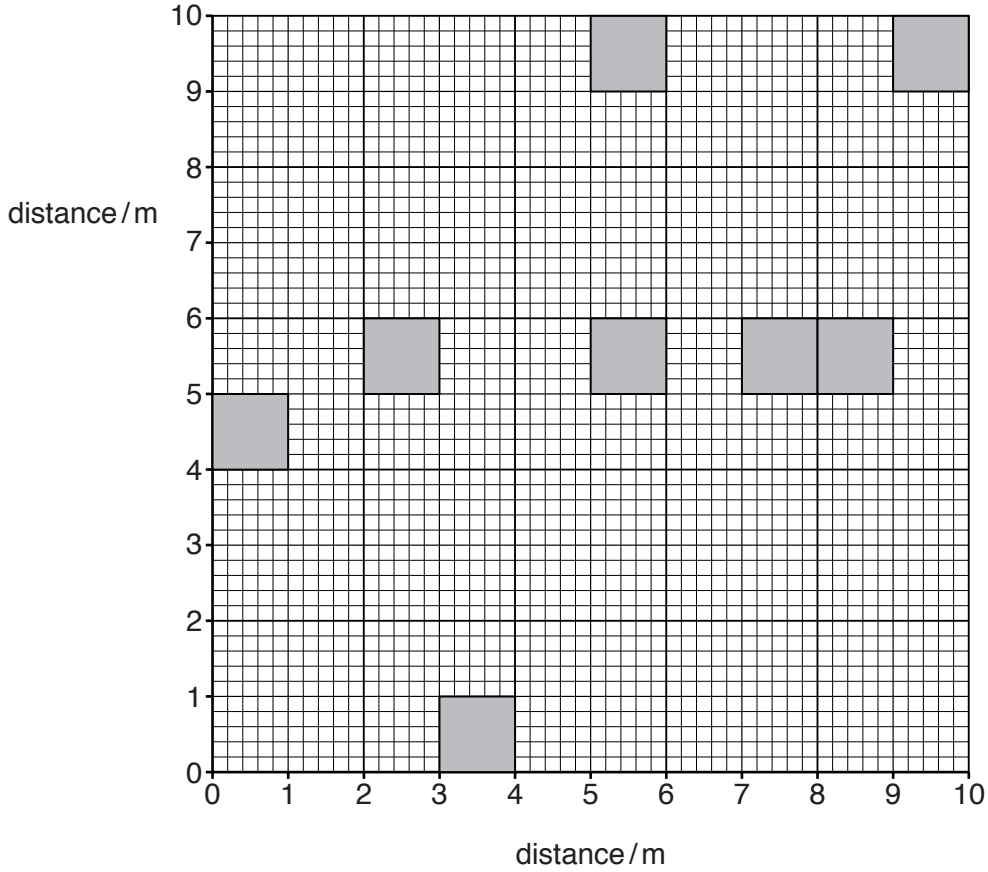
The first eight pairs of numbers have been circled.

random number table

row number	column number 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	8	0	8	4	2	5	2	6	8	2	4	7	1	8	4	7
2	3	5	6	3	2	1	9	6	8	2	1	1	9	0	4	5
3	1	3	3	0	6	3	3	1	3	7	5	3	9	6	9	3
4	3	5	6	5	0	0	1	6	2	2	4	8	6	4	3	2
5	7	8	5	0	5	9	2	5	5	5	8	8	7	8	1	1
6	4	4	9	0	5	4	1	7	9	7	2	7	6	1	5	3
7	6	6	4	5	9	1	0	4	9	3	1	8	8	8	1	9
8	8	6	2	6	5	9	9	5	1	2	1	5	9	7	5	3
9	4	8	5	5	4	5	2	0	7	5	5	4	0	6	1	2
10	8	4	9	6	7	5	1	9	0	4	7	4	7	8	1	8
11	6	7	2	2	9	8	6	9	9	3	6	1	7	8	7	5
12	8	7	4	6	5	9	3	2	5	1	1	5	2	7	2	1
13	5	6	4	1	1	4	1	7	1	4	1	9	7	4	3	4
14	7	4	4	4	9	2	0	0	8	8	4	0	5	8	8	2
15	8	2	7	9	3	0	1	8	4	6	7	2	3	7	4	3
16	0	1	6	1	7	6	1	7	1	0	2	4	2	3	8	7
17	7	3	8	8	9	7	5	9	7	5	5	6	6	6	2	4
18	7	8	3	0	4	7	1	4	3	8	9	6	2	9	1	9
19	9	8	8	7	4	2	1	6	6	5	2	6	4	5	3	5
20	1	2	6	1	2	5	1	6	9	5	6	9	2	3	1	0
21	3	9	4	7	4	9	3	7	7	6	3	4	2	5	4	3
22	4	5	5	0	8	1	0	3	1	2	5	0	2	3	0	4
23	1	3	4	4	9	6	9	7	2	8	8	3	6	9	7	6
24	8	9	7	6	5	8	2	3	8	4	8	7	0	4	5	0
25	7	7	1	0	9	9	4	3	6	9	7	8	8	2	7	8
26	6	9	5	9	6	0	0	8	8	4	4	2	2	2	8	2
27	7	9	4	1	2	3	1	2	2	4	3	1	6	7	0	2
28	2	2	8	4	0	8	9	6	8	1	0	7	5	6	4	2
29	9	5	9	4	7	4	1	8	8	3	8	5	6	0	4	5
30	4	6	1	3	8	5	4	9	6	3	6	9	3	2	0	8

The grid shows the 10 m × 10 m area of the field marked out by the student.

The pairs of random numbers circled have been plotted on the grid. The first number in each pair represents the distance along the *x*-axis, and the second number represents the distance along the *y*-axis.



(i) Circle the next **two** pairs of numbers on the random number table and draw these areas on the grid. [3]

(ii) Explain why the method used by the second student is better than the method used by the first student.

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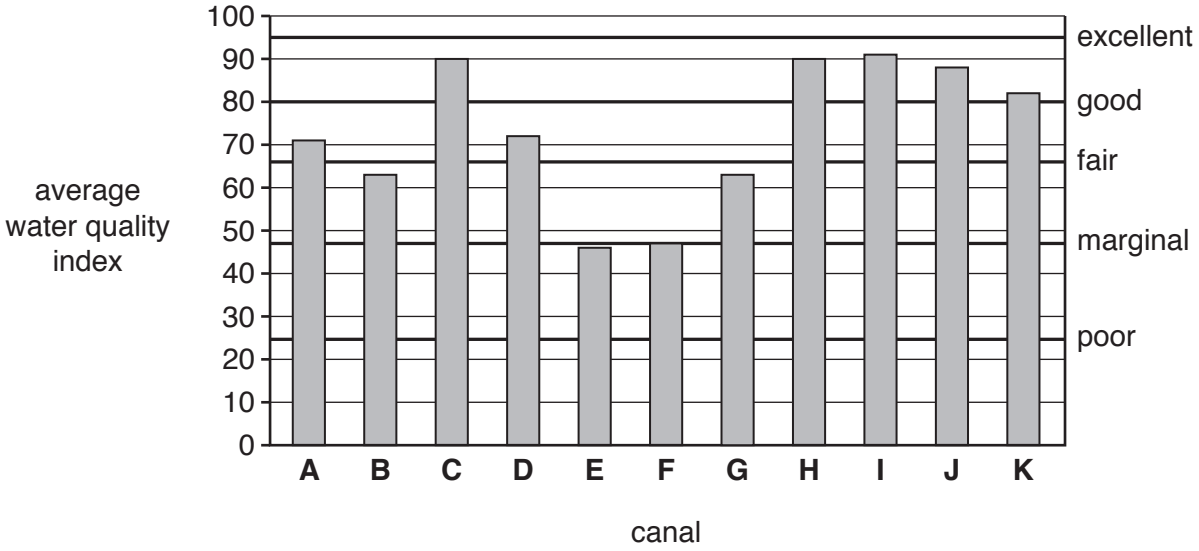
.....[3]

(e) Most of the water used in Egypt is supplied by canals from the River Nile. The water from the canals is tested regularly and a water quality index is calculated. The average value for the water quality index can be used to classify the water quality in a canal as excellent, good, fair, marginal or poor.

Some results for the average water quality index for eleven canals, labelled **A** to **K**, are shown on the graph. The average water quality index required for each classification is shown.



(i) Complete the table using information from the graph.

water quality	number of canals
excellent	0
good	.....
fair	.....
marginal	.....
poor	.....

[2]

The table below shows measurements taken from other canals, **P** to **U**.

canal	biological oxygen demand / arbitrary units	numbers of bacteria / arbitrary units	chromium concentration / arbitrary units	iron concentration / arbitrary units
P	0.2	43	0.4	0.5
Q	1.6	112	0.0	0.2
R	2.0	199	1.7	2.3
S	0.2	25	0.0	0.0
T	0.0	1	0.0	0.0
U	0.2	33	0.0	0.0

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(ii) Suggest which canal, **P** to **U**, from the table is likely to have the lowest water quality. Give reasons for your answer.

canal .....

reasons .....

.....

.....

.....
[2]

(iii) State which canal, **P** to **U**, from the table is the best source of drinking water. Give a reason for your answer.

canal .....

reason .....

.....
[1]

(iv) State which canal, **P** to **U**, from the table is most polluted by industrial wastes. Give a reason for your answer.

canal .....

reason .....

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[1]

(v) Suggest why the biological oxygen demand is highest in canal **R**.

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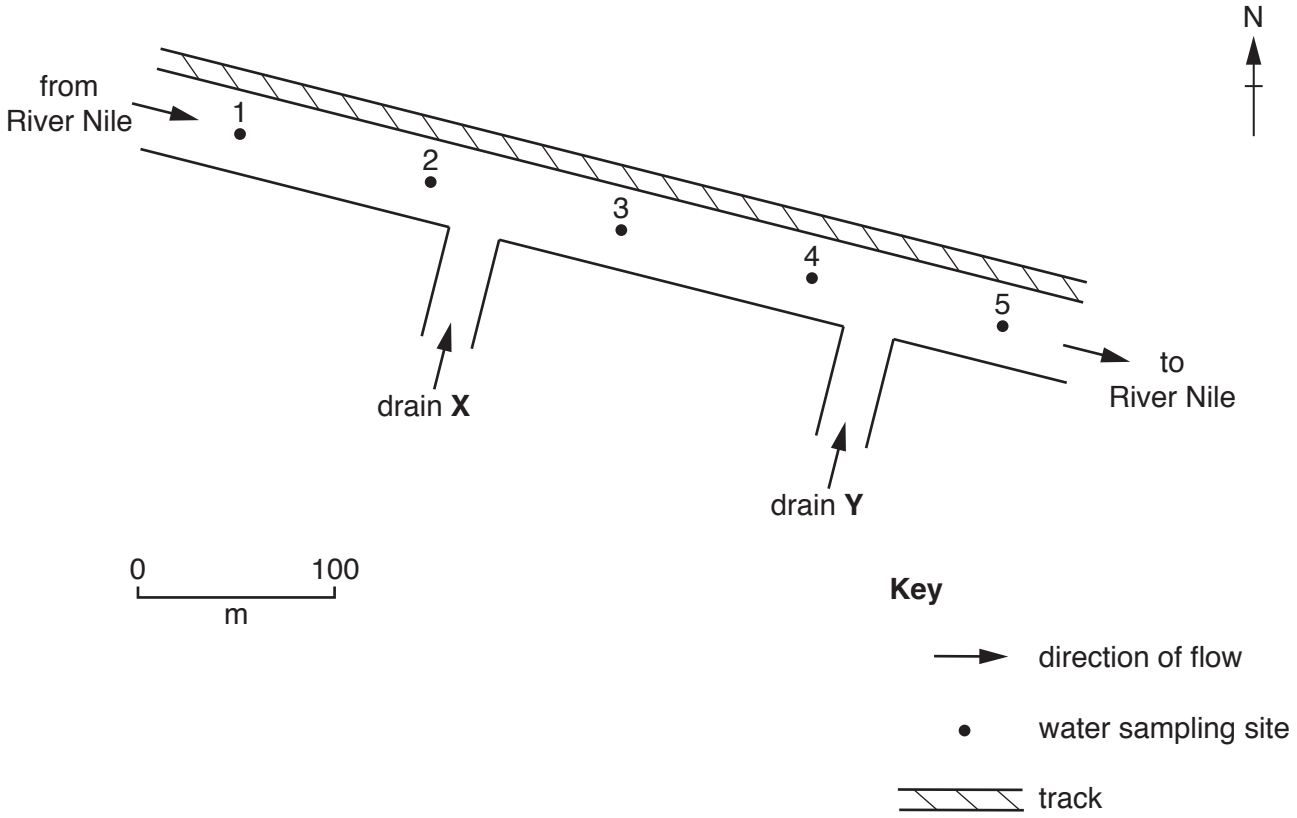
.....[2]

(f) A scientist measured the temperature and dissolved oxygen at five water sampling sites along a canal.



The results are shown in the table.

water sampling site	1	2	3	4	5
water temperature / °C	20.0	20.1	19.9	20.0	20.1
dissolved oxygen / arbitrary units	8.0	7.9	3.5	6.4	8.0

(i) Calculate the percentage increase in dissolved oxygen from water sampling site 3 to water sampling site 5.

Show your working.

.....% [2]

(ii) Suggest why the scientist measured the water temperature at each sampling site.

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.....[1]

(iii) The scientist decided that drain **X** was a source of pollution for the canal.

Explain why.

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.....[2]

(g) The demand for water in Egypt is predicted to increase to 88 billion cubic metres by 2017.

Suggest ways in which the quality of water supplies can be maintained in Egypt.

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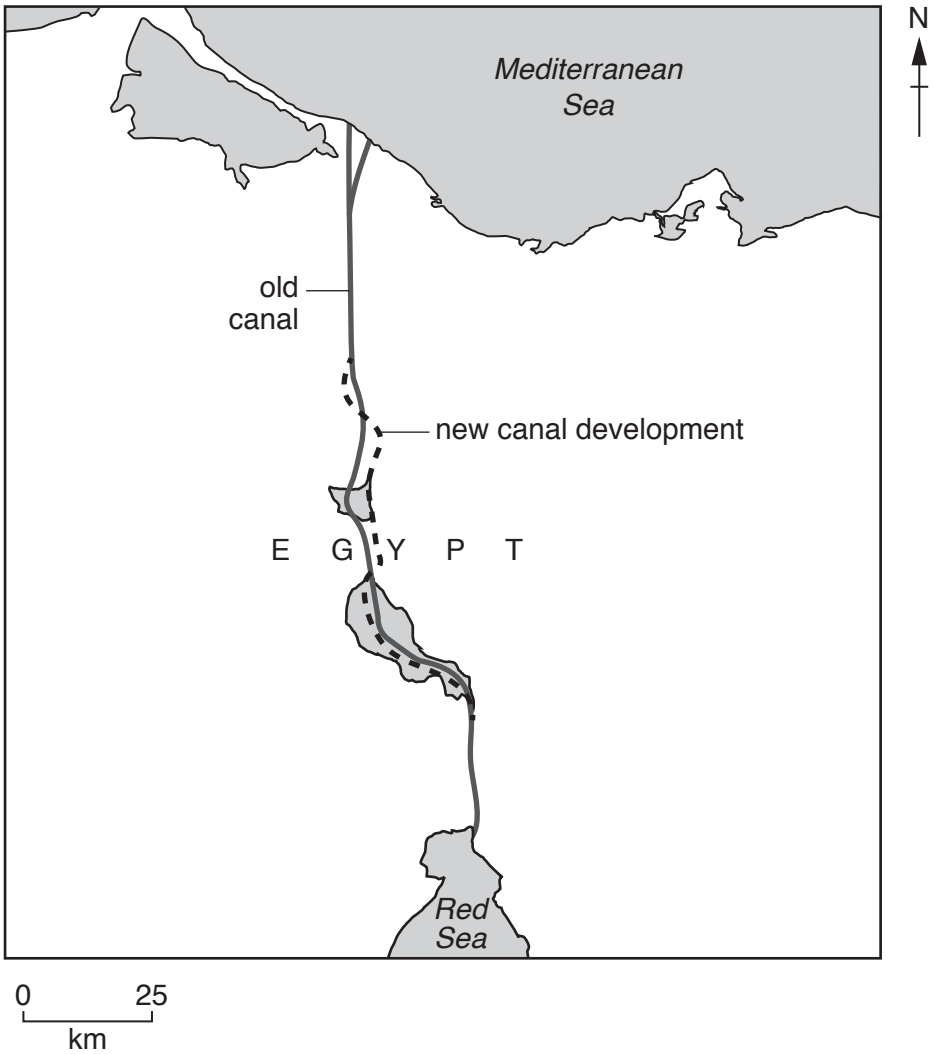
.....[3]

2 **(a)** The Suez canal is an important source of income for the Egyptian government. To maintain this income and create jobs, the government will carry out a new canal development.

The map shows the route of the new canal development.



facts about the new canal development

- 35 km of new canal development to be built next to the old canal
- deepening 37 km of the old canal
- ship waiting time reduced by 8 hours
- increase canal capacity to 97 ships a day
- new industrial areas built on both sides of the canal connected by 4 new road tunnels
- a million new jobs created

A survey on the proposed canal development was carried out using questionnaires. The table shows the results.

question asked	percentage yes	percentage no
Do you think the government should invest in this development?	72	28
Do you think your standard of living will improve?	66	34
Would you like a job at the new canal?	52	48
Would you invest some of your money in this development?	72	28

(i) Describe how the answers to the questionnaires were processed to give the results of the survey shown in the table.

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.....[2]

(ii) Some of the people surveyed lived near the canal and others far away.

Explain the advantages for the decision makers of producing two tables of results.

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.....[2]

(iii) Suggest **two** reasons why the government decided to ask if people would be willing to invest in the new canal development.

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.....[2]

(iv) Suggest benefits of building new industrial areas near the canal.

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.....[2]

(v) Describe how the government could encourage businesses to start up in the new industrial area.

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.....[1]

(vi) Some government advisers think that reducing ship waiting time will increase income from the canal. Other advisers think this will not increase income from the canal.

State your point of view and give reasons for your answer.

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.....[3]

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(b) Some marine species have already migrated from the Red Sea to the Mediterranean Sea. Scientists are worried that the new canal development will allow more invasive species to move from the Red Sea to the Mediterranean Sea.

(i) Suggest **two** ways in which invasive species could move to the Mediterranean Sea through the canal.

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.....[2]

(ii) Describe problems that invasive species can cause in marine ecosystems.

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.....[3]

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