Cambridge Assessment International Education

Cambridge International AS Level

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

0396330495

ENVIRONMENTAL MANAGEMENT **8291/22**

Paper 2 Management in Context **October/November 2023**

1 hour 45 minutes

You must answer on the question paper.

No additional materials are needed.

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You may use a calculator.
- You should show all your working and use appropriate units.

INFORMATION

- The total mark for this paper is 80.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **24** pages. Any blank pages are indicated.

[Turn over

1 **(a)** Spraying aerosols into the stratosphere and growing crops with shiny leaves are two geo-engineering methods that can counteract climate change.

(i) Explain how spraying aerosols into the stratosphere can counteract climate change.

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..... [2]

(ii) Explain how growing crops with shiny leaves can counteract climate change.

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..... [2]

(b) Researchers use computer models to predict the impact of geo-engineering strategies on climate change.

Table 1.1 is a summary of the findings.

Table 1.1

	impact		
geo-engineering strategy	**global temperature reduced**	**increased floods and droughts**	**number of people adversely impacted / billion**
spraying aerosols into the stratosphere	yes	yes	3
growing crops with shiny leaves	yes	yes	1.4

(i) Suggest how managing the Earth's climate can result in increased floods and droughts.

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..... [2]

(ii) Evaluate the use of the geo-engineering strategies in Table 1.1 for counteracting climate change.

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..... [2]

(iii) Suggest what further research can be carried out to confirm the impact of the geo-engineering strategies in Table 1.1.

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..... [1]

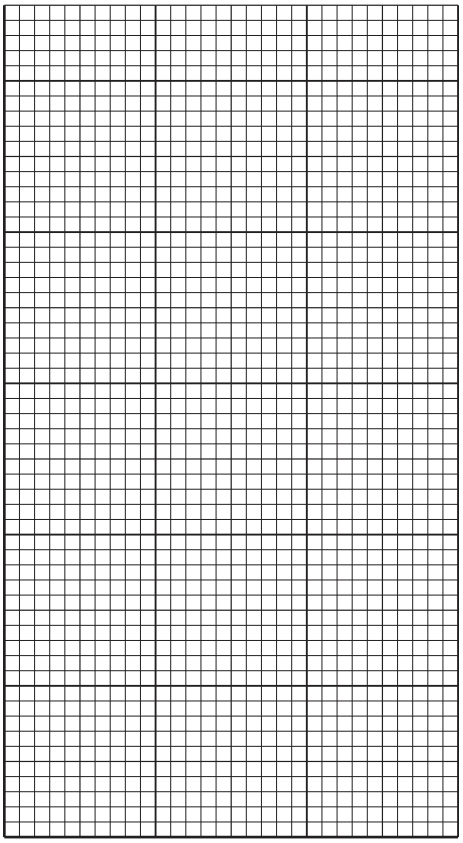
(c) A report predicted how rising sea levels will result in coastal flooding in 2050.

Table 1.2 shows the number of people predicted to be affected by coastal flooding for five countries.

Table 1.2

country	number of people / million
China	93
Bangladesh	42
India	36
Vietnam	31
Indonesia	23

Plot the data as a bar chart.



[4]

(d) Explain why flooding can lead to water insecurity.

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..... [3]

(e) Explain why drought leads to food shortages and malnutrition.

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..... [3]

(f) A report by the World Health Organization stated that malnutrition causes 35% of all deaths in under five-year-olds.

Fig. 1.1 shows the percentage of under five-year-old children who are underweight.

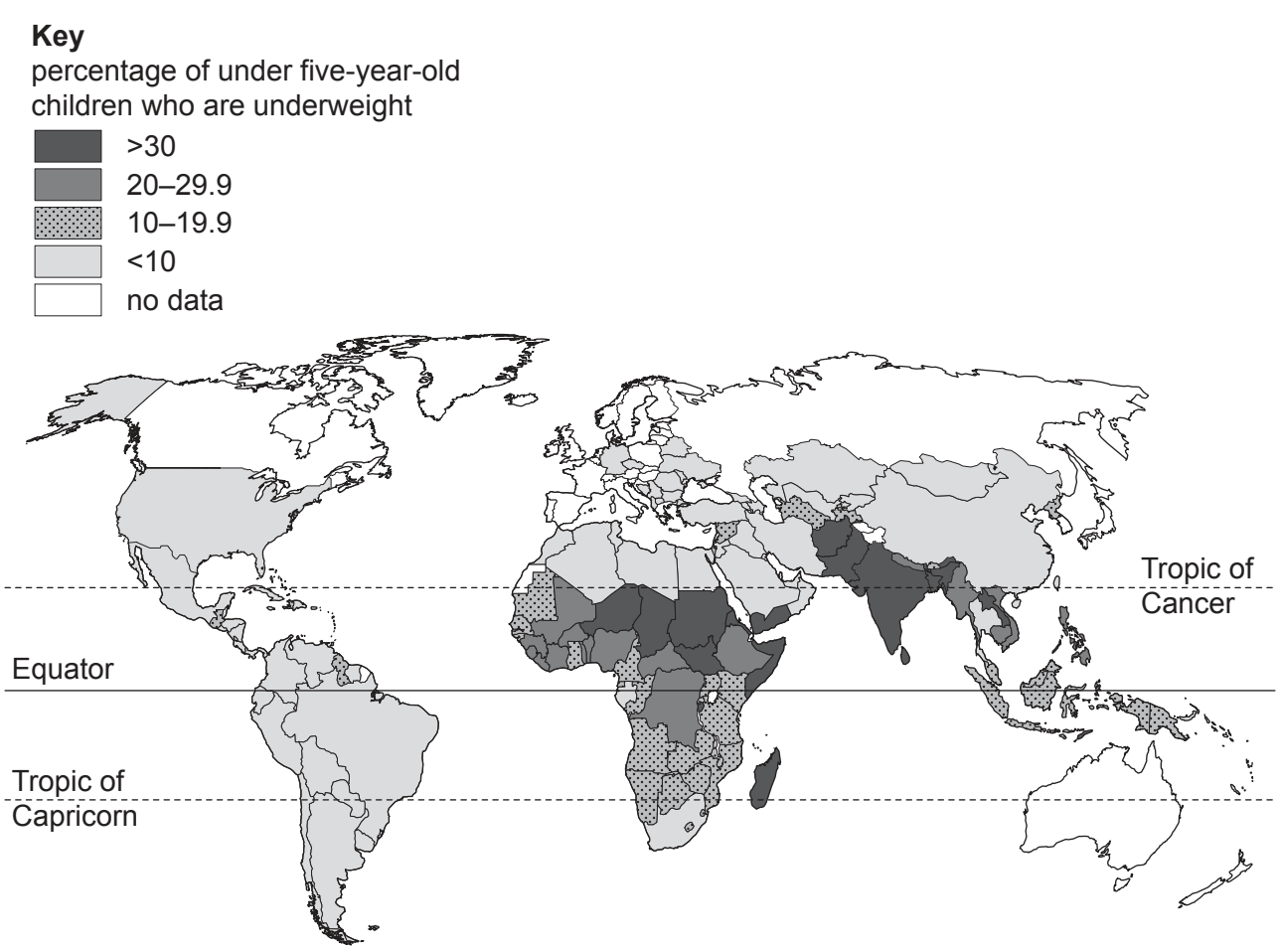

Fig. 1.1

Describe the distribution of under five-year-old children who are underweight, shown in Fig. 1.1.

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..... [3]

[Total: 22]

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2 **(a)** A student investigates the concentration of sulfate ions in a lake.

The student makes the following hypothesis:

'The concentration of sulfate ions in lake water increases on rainy days.'

The method the student follows is shown:

- collect five samples of lake water and record whether it is a rainy or a dry day
- measure the concentration of sulfate ions in each water sample.

(i) State the dependent variable in this investigation.

..... [1]

(ii) State **one** variable the student should control in this investigation.

..... [1]

(iii) Another student wants to repeat this investigation.

Describe what **other** information is needed in the method so that the same investigation can be repeated.

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..... [4]

(b) Table 2.1 shows the student's results.

Table 2.1

water sample	concentration of sulfate ions in mg / dm^3	wet or dry day
1	251	wet
2	133	dry
3	275	wet
4	304	wet
5	220	wet

(i) Calculate the mean concentration of sulfate ions shown in Table 2.1.

Give your answer to **three** significant figures.

mean = ... mg / dm^3 [2]

(ii) Calculate the range for the concentration of sulfate ions shown in Table 2.1.

range = ... mg / dm^3 [1]

(iii) The student's hypothesis was:

'The concentration of sulfate ions in lake water increases on rainy days.'

Interpret the data in Table 2.1 to conclude whether the student's hypothesis is correct.

Support your conclusion with evidence from Table 2.1.

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..... [1]

(iv) Suggest **one** way the investigation can be improved.

.....

..... [1]

(c) One source of sulfate ions in water is acid deposition.

(i) State the maximum pH for wet deposition to be classed as acidic.

pH = ... [1]

(ii) Outline the formation of acid deposition from sulfur dioxide.

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..... [3]

(iii) State **two** impacts of acid deposition on crops.

1 .....

2 .....
[2]

(iv) Fig. 2.1 shows the emissions of sulfur dioxide in four regions.

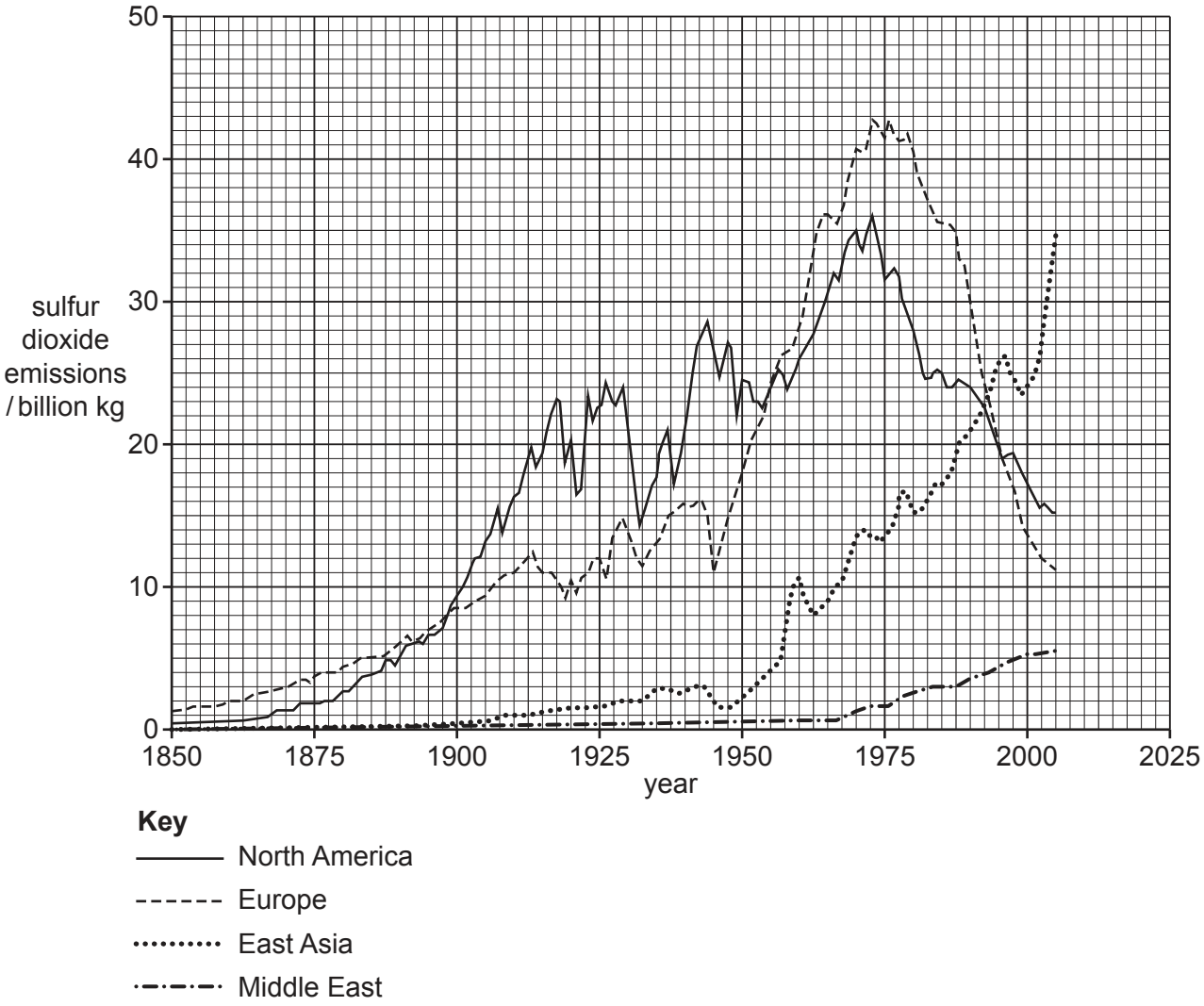

Fig. 2.1

Compare the trends in data shown in Fig. 2.1.

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..... [3]

(v) Suggest why legislation at a local level is **not** enough to reduce emissions of sulfur dioxide.

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..... [2]

[Total: 22]

3 Rice is the main food of three billion people and provides one fifth of the calories consumed globally.

(a) Fig. 3.1 shows rice growing in paddy fields.

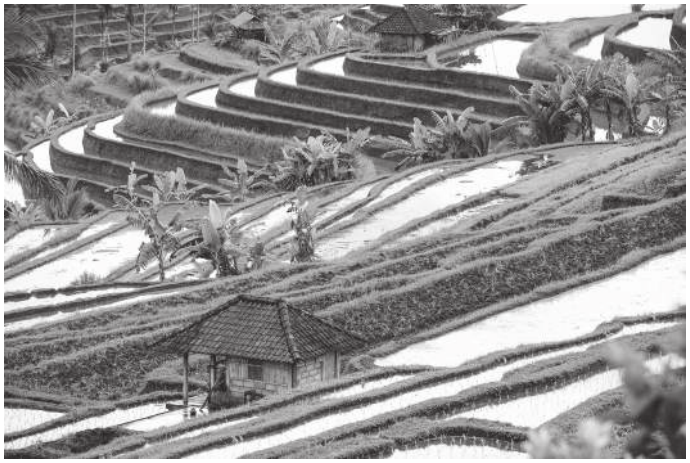

Fig. 3.1

A rice paddy field is a flooded field of land with growing rice plants.

This method of growing rice has been used for thousands of years.

Methane and carbon dioxide are formed during this method. The annual carbon footprint of growing rice in paddy fields is equal to that of the air transport industry.

(i) Suggest why some climate scientists are developing varieties of rice that do **not** need to be grown in paddy fields.

Give reasons for your answers.

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..... [3]

(ii) Suggest **one** benefit to rice farmers of growing rice in paddy fields.

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..... [1]

(b) A farmer investigates different varieties of rice plants to compare the yield from each plant.

The farmer uses this method:

- select four different fields, **A** to **D**
- plant a different variety of rice in each field
- collect the rice crop and measure the mass of rice per hectare.

Table 3.1 shows the results.

Table 3.1

field	mass / tonnes per ha
A	4.3
B	5.7
C	0.5
D	6.0

(i) Suggest **two** pieces of information the farmer should record about each field for this investigation.

1 .....

2 .....
[2]

(ii) The farmer is concerned that one of the fields contains an insect pest.

Suggest which field may contain an insect pest. Give a reason for your answer.

field .....

reason .....
[1]

(iii) The farmer uses a sweep net to survey the field for insect pests.

Describe how to carry out a sweep net survey.

You should include in your answer how to:

- select where to survey
- use a sweep net
- prevent collected insects escaping.

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..... [4]

(iv) Describe the limitations of using a sweep net to survey insects.

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..... [2]

(v) The farmer concludes that the field contains insect pests.

Outline the advantages and disadvantages of using a chemical insecticide to kill the insect pests rather than biological control.

advantages .....

.....

.....

.....

disadvantages .....

.....

.....

.....

[4]

(vi) The farmer groups the insect pests into four classifications and records the numbers of each insect.

Table 3.2 shows the results.

Table 3.2

classification of insect	number of each insect, *n*
grasshopper	167
earwig	231
aphid	48
thrips	95

Use the formula to calculate Simpson's index of diversity, *D*.

$$D = 1 - \left(\Sigma\left(\frac{n}{N}\right)^2\right)$$

Use the following steps:

- calculate *N*, the total number of insects

N = ...

- calculate $\left(\frac{n}{N}\right)^2$ for each classification

grasshopper = ...

earwig = ...

aphid = ...

thrips = ...

- calculate $\Sigma\left(\frac{n}{N}\right)^2$

$\Sigma\left(\frac{n}{N}\right)^2$ = ...

- calculate *D*.

D = ...

[4]

[Total: 21]

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4 **(a)** The UK government promotes the use of electric cars.

Electric cars do not use fossil fuel to power them. In 2022, most of the electricity used to charge an electric car in the UK came from burning fossil fuel.

Fig. 4.1 shows a poster from the UK, which promotes the benefits of electric cars.

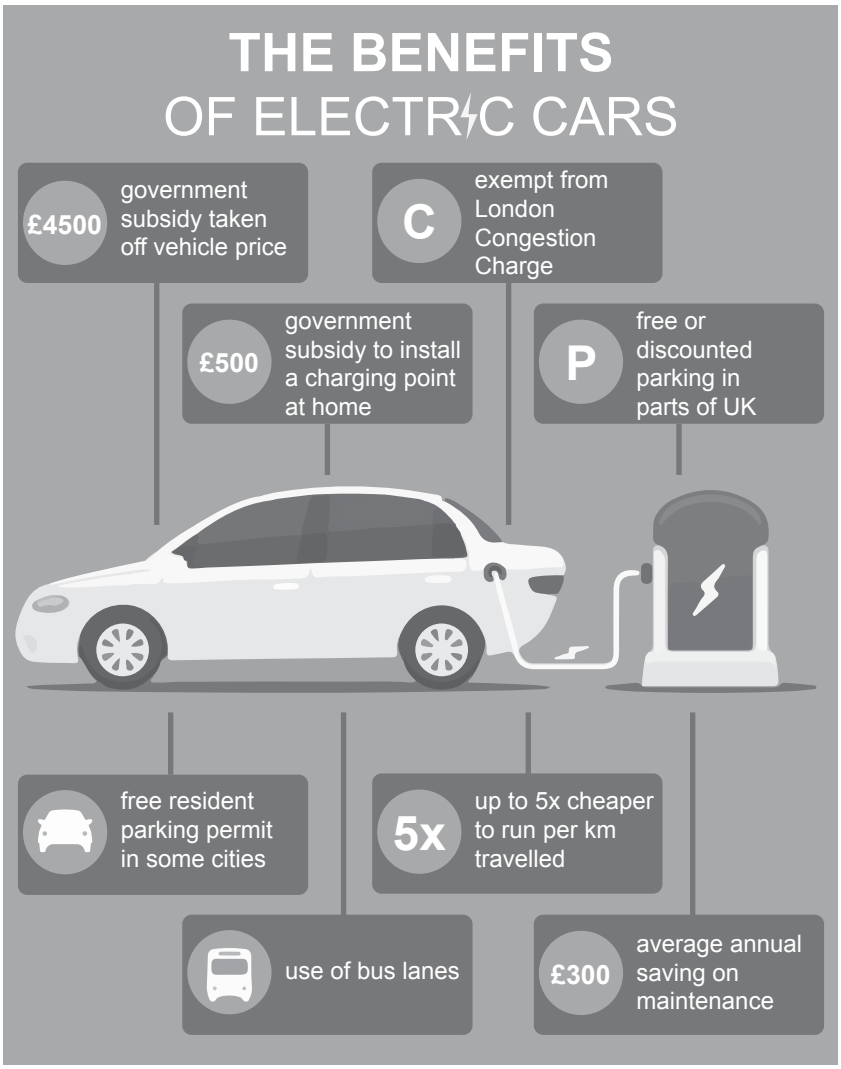

Fig. 4.1

People are encouraged to switch from petrol and diesel cars to electric cars.

Outline the advantages and disadvantages of switching to electric cars compared to petrol or diesel-powered cars.

advantages .....

.....

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.....

disadvantages .....

.....

.....

.....

[5]

(b) Fig. 4.2 shows a questionnaire used to survey people on their views on owning an electric car. The type of question used in Fig. 4.2 is called an open question.

question	response
What would encourage you to buy an electric car in the future?	
What are your views on electric cars?	

Fig. 4.2

(i) Explain the disadvantage of using open questions compared with yes / no questions in a questionnaire.

.....

..... [1]

(ii) Fig. 4.3 shows the tally chart used to record that 14 of the people surveyed own an electric car.

	number of people
own an electric car	𝍸 𝍸 IIII
would buy an electric car	

Fig. 4.3

Complete Fig. 4.3 to show that 23 people would buy an electric car in the future. [1]

(c) Fig. 4.4 shows data for the number of electric cars in three European countries.

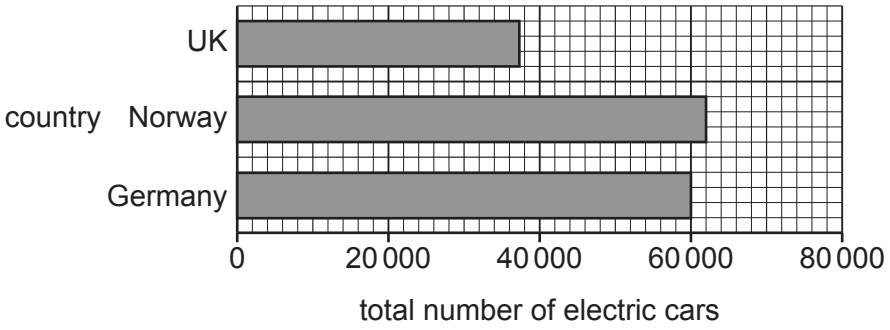

Fig. 4.4

Fig. 4.5 shows the total percentage of electric cars in the three countries.

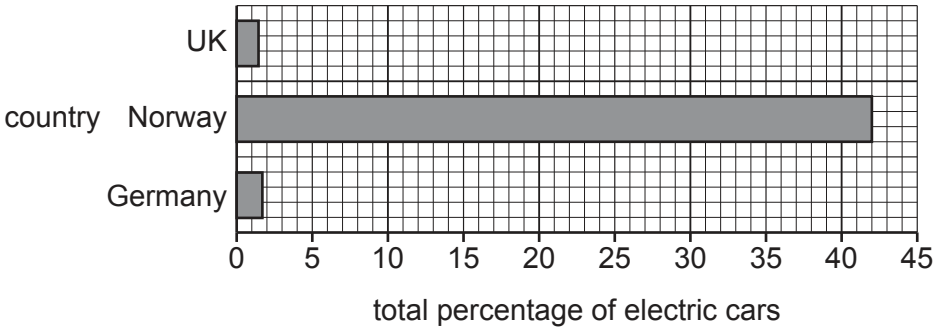

Fig. 4.5

(i) State the total number of electric cars in Norway.

..... [1]

(ii) State the total percentage of electric cars used in Norway.

..... [1]

(iii) Suggest the advantage of using the data in Fig. 4.5 compared to Fig. 4.4.

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..... [2]

(d) (i) State **two** causes of energy insecurity.

1 .....

2 .....
[2]

(ii) State **two** economic impacts of energy insecurity.

1 .....

2 .....
[2]

[Total: 15]

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