

FOR OFFICIAL USE

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**3700/403**

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|            | KU | PS |
| Total Mark |    |    |

NATIONAL  
QUALIFICATIONS  
2010

THURSDAY, 27 MAY  
1.00 PM – 2.30 PM

SCIENCE  
STANDARD GRADE  
Credit Level

**Fill in these boxes and read what is printed below.**

Full name of centre

Town

Forename(s)

Surname

Date of birth

Day    Month    Year

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Scottish candidate number

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Number of seat

- 1 Answer as many questions as you can.
- 2 Read the whole of each question carefully before you answer it.
- 3 Write your answers in the spaces provided. Showing working may help in some questions.
- 4 Before leaving the examination room you must give this book to the Invigilator. If you do not, you may lose all the marks for this paper.



[illegible]

- (a) Why does **nicotine** make it difficult for smokers to give up smoking?

.....

**1**

1

- .....

1

- 
- A diagram of a columnar epithelium. The cells are tall and rectangular, arranged in a single layer. The apical surface (top) is covered with numerous fine, hair-like structures labeled "cilia". The basal surface (bottom) is attached to a basement membrane, represented by a wavy line. One cell is specifically labeled "mucus-making cell" with an arrow pointing to it. This cell contains a large, dark, oval nucleus and a granular cytoplasm. A layer of mucus, represented by a dense collection of small dots, is shown being secreted from the apical surface of the cells, with an arrow labeled "mucus" pointing to it.

Mucus .....

.....

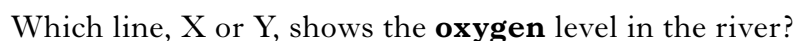
Cilia .....

.....

2

[illegible]

- The graph below shows what happened to the levels of **oxygen** and **bacteria** in the river after the sewage spill.



.....

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- Which organism from the food chain below would contain the highest level of insecticide?

(Circle) the correct answer.

1

**[Turn over**

[illegible]

- | <i>Age</i><br>(years) | <i>Blood pressure</i> (mm Hg) |             |
|-----------------------|-------------------------------|-------------|
|                       | upper value                   | lower value |
| 24                    | 120                           | 80          |
| 26                    | 115                           | 85          |
| 28                    | 116                           | 82          |

Suggest **two** improvements.

1 .....

2 .....

- ## Property

good electrical conductivity

## Description

allows heat to flow through it easily

good thermal conductivity

allows an electrical current to flow through it easily

hard

can withstand damage to its surface caused by heat

strong

can withstand damage to its surface caused by friction

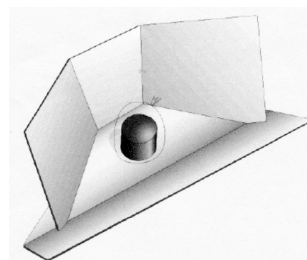
heat resistant

can withstand damage to its surface caused by impact

wear resistant

can support a heavy load without  
breaking

- Half of the world's population uses wood fires to cook food. When natural disasters occur, large numbers of people are moved into temporary refugee camps. In order to protect the local environment, refugees are not allowed to collect firewood from outside the camp. They must rely on limited wood supplies being provided by aid workers.



To use a solar cooker, a black pot containing the food is placed inside a large plastic bag. The bag is then placed in the centre of the solar cooker. The shiny surface of the cooker reflects the sun's rays onto the pot. The pot heats up and the plastic bag traps this heat, cooking the food. After ten days use, the bags must be replaced as they become too brittle. Rather than wasting the plastic, the refugees recycle the bags to make baskets, mats and rope.

The solar cooker can also be used to treat drinking water. When water reaches 100 °C, disease-causing parasites are killed. This makes the water safe to drink.

- .....

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- Give **two** other advantages of solar cookers.

.....

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- .....

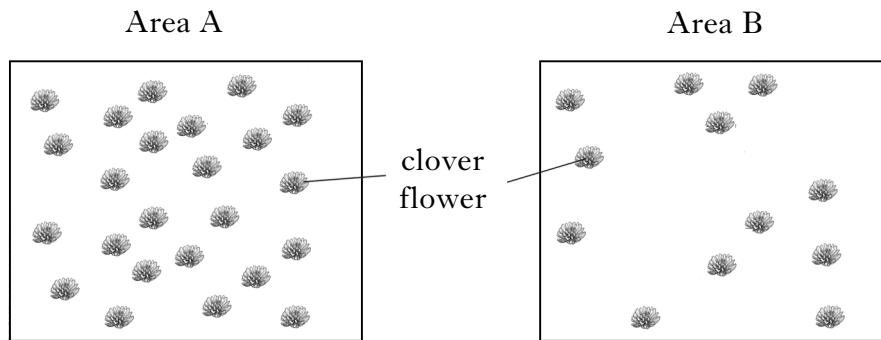
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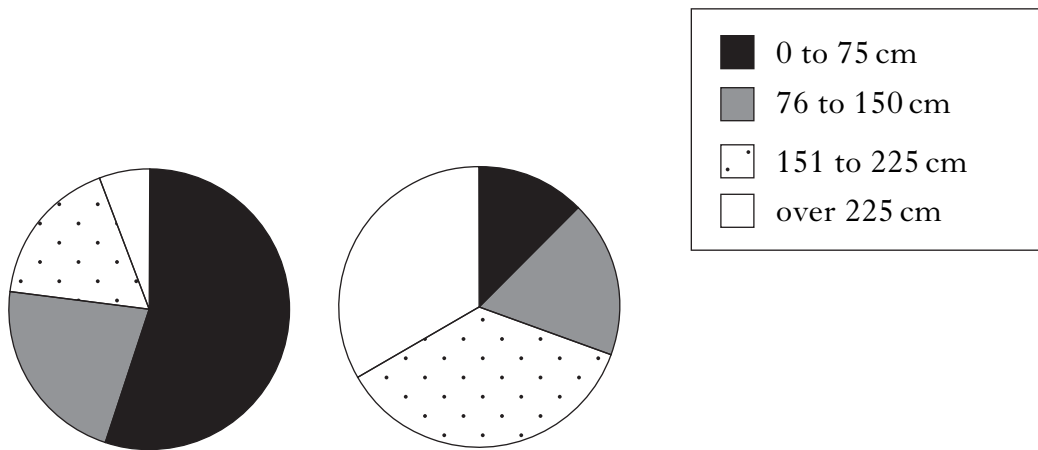
KU PS

7. Bees feed on pollen and nectar by visiting many different clover flowers. Bees were observed feeding in two different areas, **A** and **B**.



The flying distances of individual bees from flower to flower was recorded. The results are shown in the pie charts below.

Flight distance ranges



- (a) Which pie chart shows the results for Area A?

Pie chart .....

Explain your answer.

.....  
.....

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7. (continued)

(b) In a third area, the distances travelled by six bees were recorded.

| <i>Bee</i> | <i>Distance (cm)</i> |
|------------|----------------------|
| 1          | 235.0                |
| 2          | 126.5                |
| 3          | 91.0                 |
| 4          | 106.0                |
| 5          | 183.0                |
| 6          | 221.5                |

Calculate the average distance travelled by the bees.

Space for working

..... cm

2

(c) The bees are part of a simple food chain.

clover → bee → dragonfly

Give **two** ways in which energy can be lost from a food chain.

.....

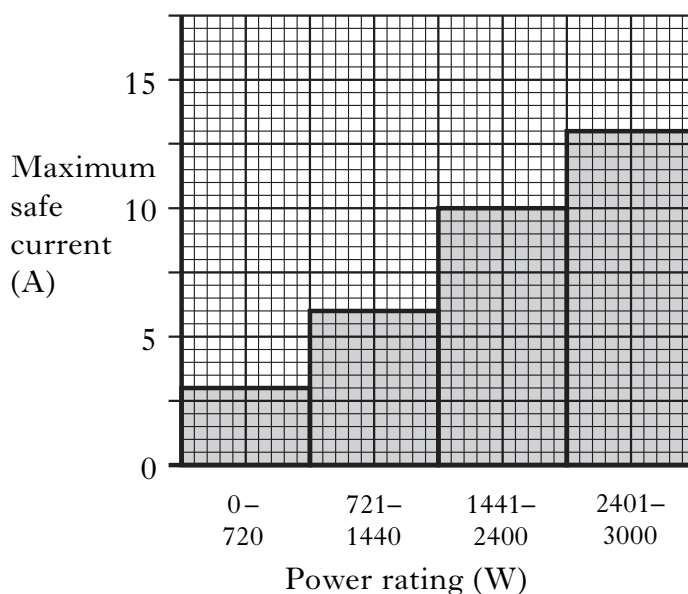
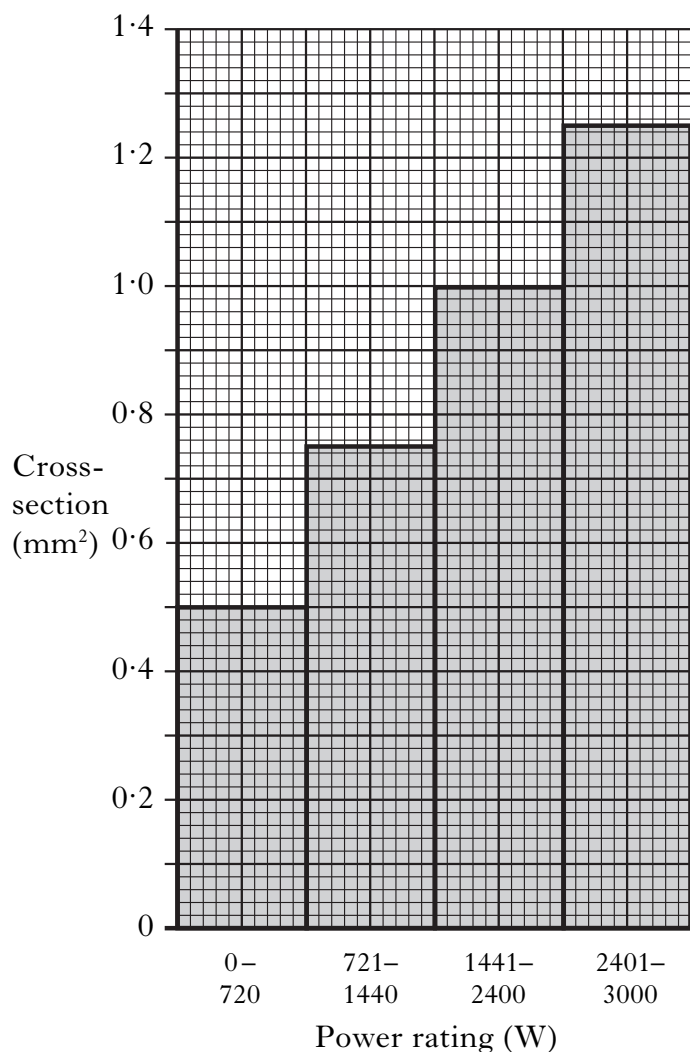
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[Turn over

8. Different electrical appliances need different types of cable.  
Cables can have different cross-sections and can carry different maximum safe currents.

The graphs below show the **cross-section** and **maximum safe current** for cables with different power ratings.



The table shows the **power ratings** of some appliances.

| <i>Appliance</i> | <i>Power rating (W)</i> |
|------------------|-------------------------|
| Food mixer       | 600                     |
| Hairdryer        | 1000                    |
| Kettle           | 2000                    |
| Heater           | 2500                    |



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- 1 .....

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- .....

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- .....

- 2

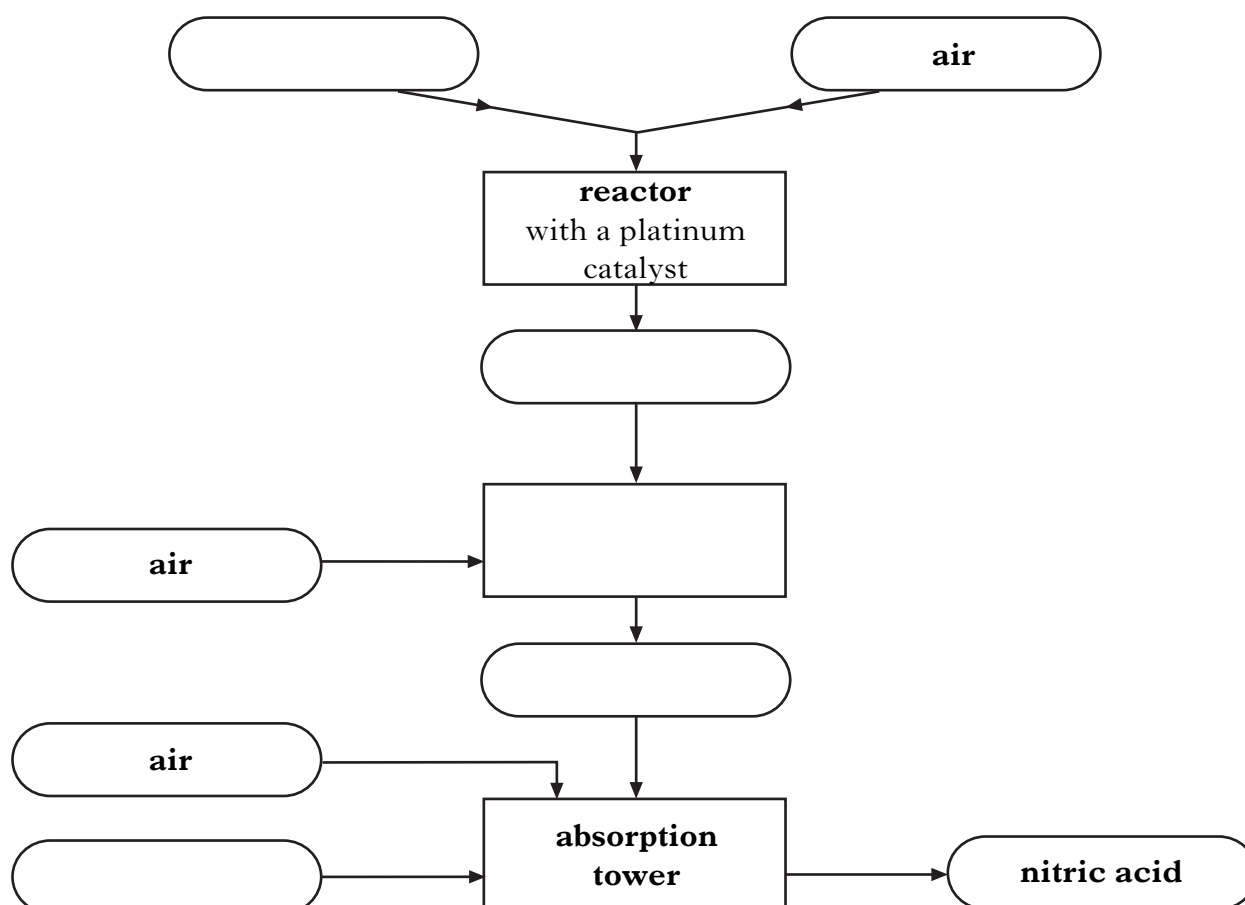
**[Turn over**

[3700/403]

*Page eleven*

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this shape shows a chemical substance



[illegible]

- (a) Draw a line from each **survey** to match its correct **description**.

| Survey            | Description                                                |
|-------------------|------------------------------------------------------------|
| aerial survey     | setting off small explosions and recording the echoes      |
| geological survey | boring holes so that rocks from underground can be studied |
| seismic survey    | collecting and examining different rocks from an area      |
| test drilling     | taking photos from a satellite to produce a map            |

- 
- A diagram of a wheelbarrow. It has a single large wheel at the front and two handles at the back. The frame is made of metal. A label 'leg supports' with a line pointing to the frame is located on the left side.

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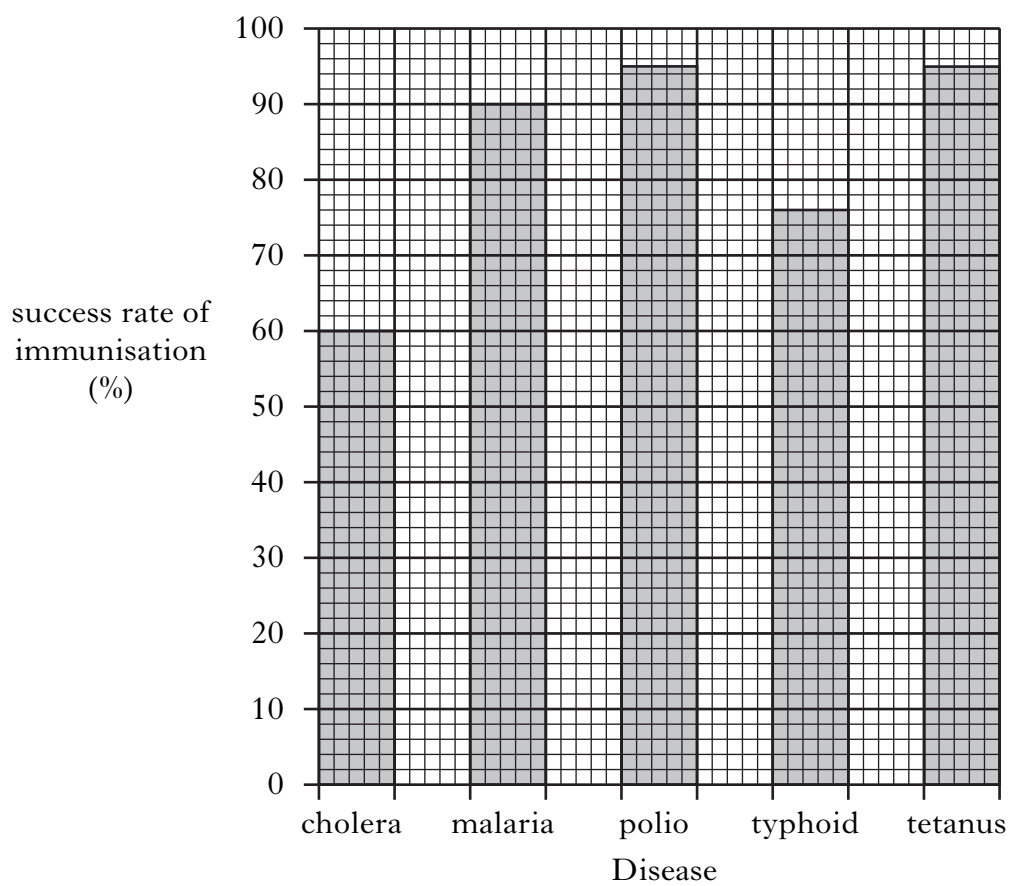
- ..... counts per minute

- The longer the half-life of radioactive waste, the longer  
shorter the time it has to be stored before it becomes safe.

1

**[Turn over**

14. The graph below shows the success rate of immunisation against different diseases.



The table below gives more information about these immunisations.

| <i>Disease</i> | <i>How immunisation is given</i>                                       | <i>Possible reaction to immunisation</i> | <i>Duration of protection</i>            |
|----------------|------------------------------------------------------------------------|------------------------------------------|------------------------------------------|
| cholera        | two injections with at least a week between them                       | fever and headache                       | six months                               |
| malaria        | tablets taken daily while in malaria area                              | usually none                             | only for the time that tablets are taken |
| polio          | three injections with a month between each                             | in rare cases polio develops             | ten years                                |
| typhoid        | one tablet each day for three days                                     | sickness and headache                    | one year                                 |
| tetanus        | two injections one month apart then a third injection six months later | headache                                 | five years                               |

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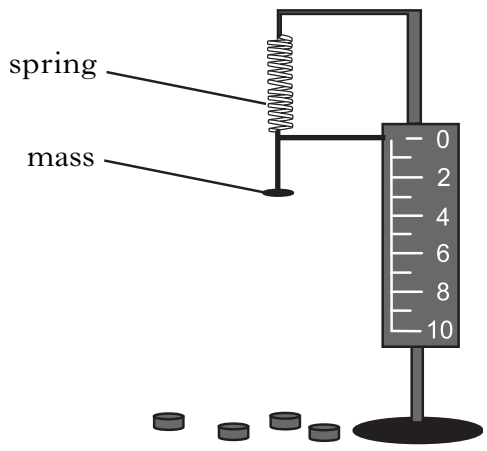
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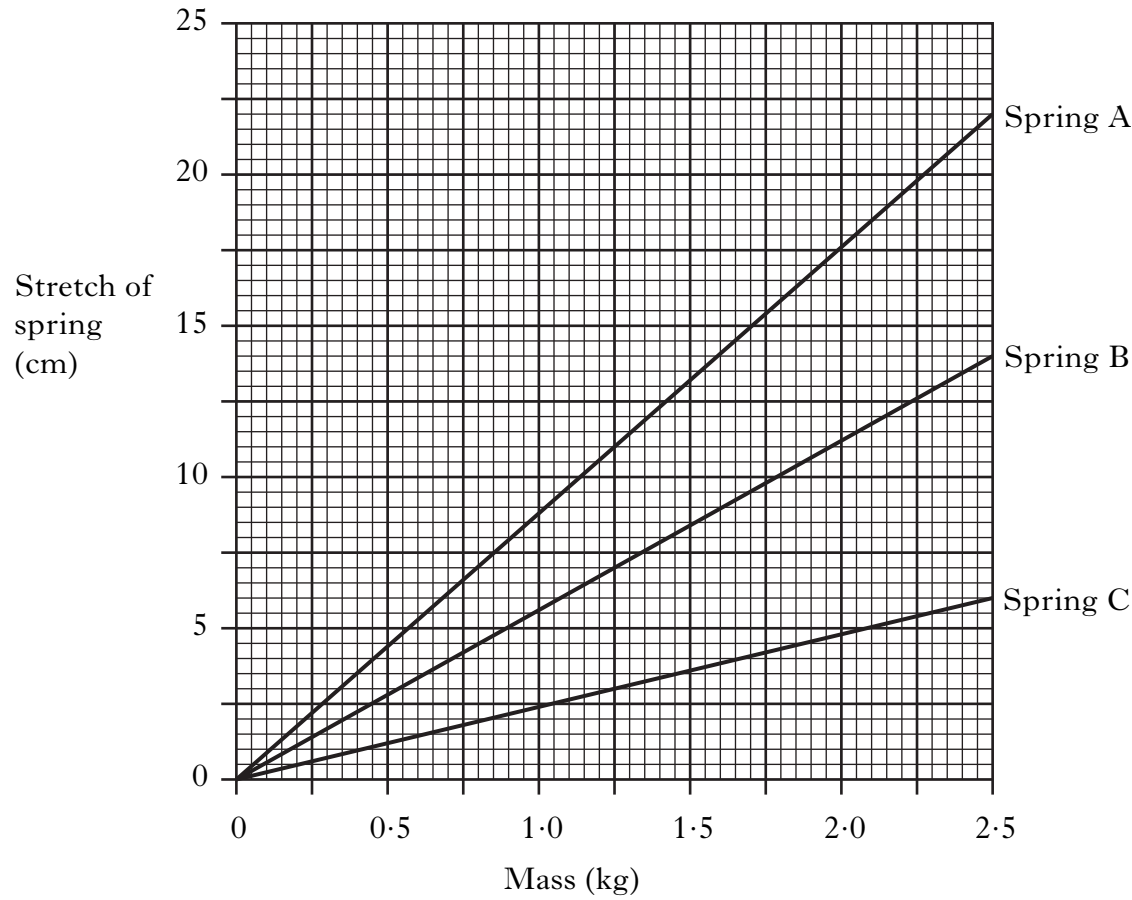
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15. A spring stretches when a mass is hung on it.  
The stretch of three springs was tested using the apparatus shown in the diagram.  
The width of each spring is shown in the table.



| Spring | Width (cm) |
|--------|------------|
| A      | 0.5        |
| B      | 1.5        |
| C      | 2.5        |

The results are shown in the graph below.



| Marks | KU | PS |
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15. (continued)

Use the graph and the table to answer the questions below.

(a) Draw **two** conclusions from the information.

- 1 .....
- 2 .....

(b) What mass must be hung from a spring with a width of 0.5 cm to make it stretch by 15 cm?

..... kg

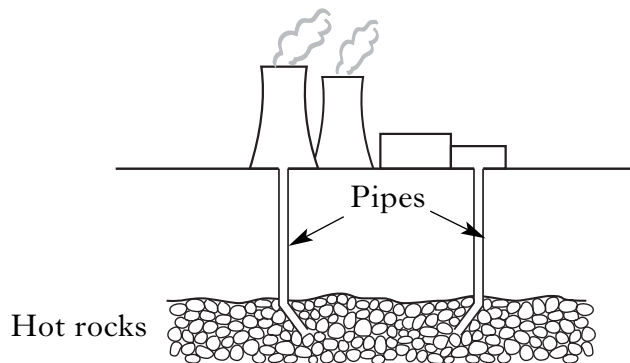
(c) Another spring has a width of 2.0 cm.

Predict the stretch of this spring when a 1.0 kg mass is hung on it.

..... cm

16. The sentences below describe how geothermal energy is obtained.

Complete each sentence by circling the correct word in the boxes.



A pump is used to send 

|      |
|------|
| cold |
| hot  |

 water down to a 

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| cold |
| hot  |

 rock layer.

The water is 

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| heated |
| cooled |

 to form 

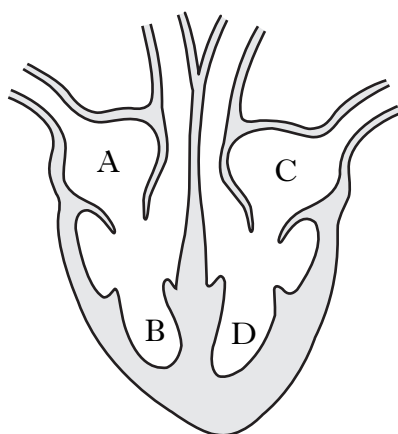
|       |
|-------|
| steam |
| ice   |

 which is used to make electricity.

[Turn over

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- [illegible]



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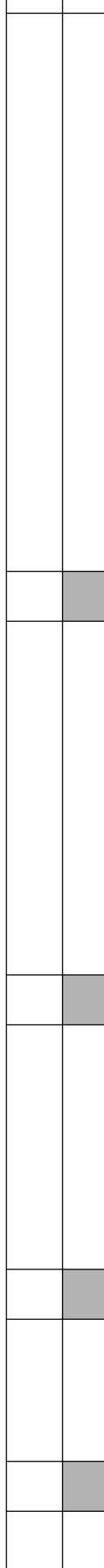
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- (a) Draw **two** conclusions from the information in the table.

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- [illegible]

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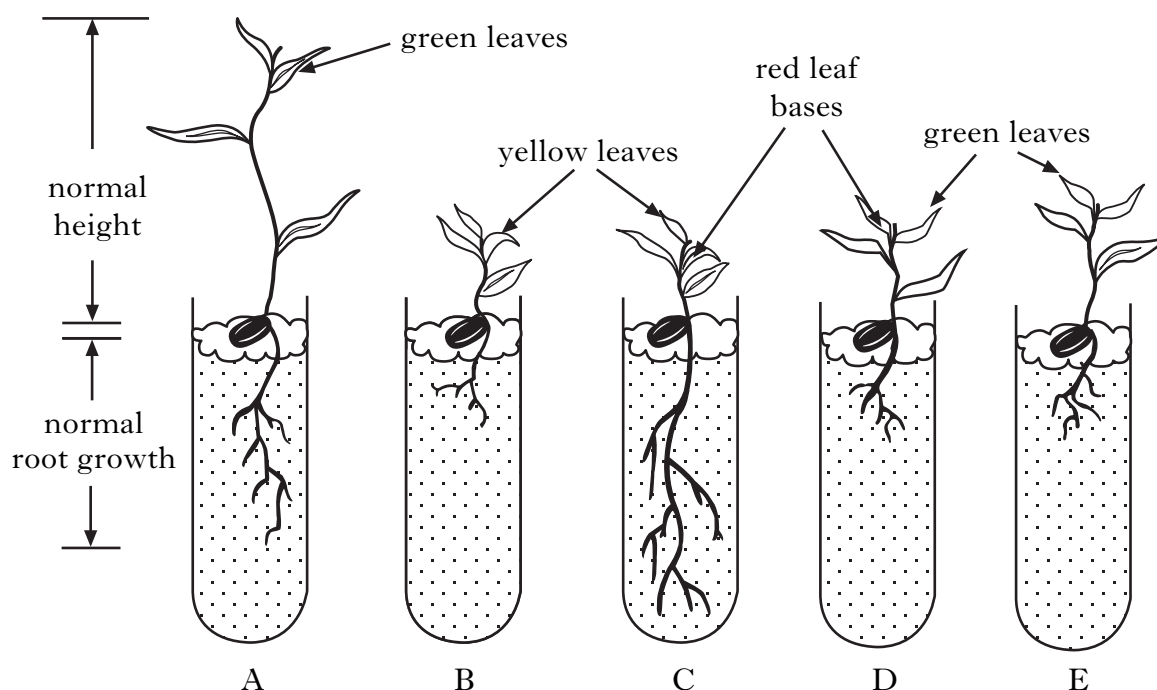


22. The effect of some minerals on plant growth was investigated. When a mineral is missing, the plant will not grow properly.

In experiment A, a plant was grown in a solution containing nitrogen, phosphorus, potassium and magnesium. These minerals are all needed for healthy growth.

In experiments B, C, D and E, each solution had one of these minerals missing.

The results are shown below.



The table shows the effect on a growing plant if a mineral is missing from the solution.

| <i>Mineral missing from solution</i> | <i>Effect on growing plant</i>                                    |
|--------------------------------------|-------------------------------------------------------------------|
| nitrogen                             | smaller height<br>yellow leaves<br>red leaf bases<br>longer roots |
| phosphorus                           | smaller height<br>green leaves<br>red leaf bases<br>shorter roots |
| potassium                            | smaller height<br>green leaves<br>shorter roots                   |
| magnesium                            | smaller height<br>yellow leaves<br>shorter roots                  |

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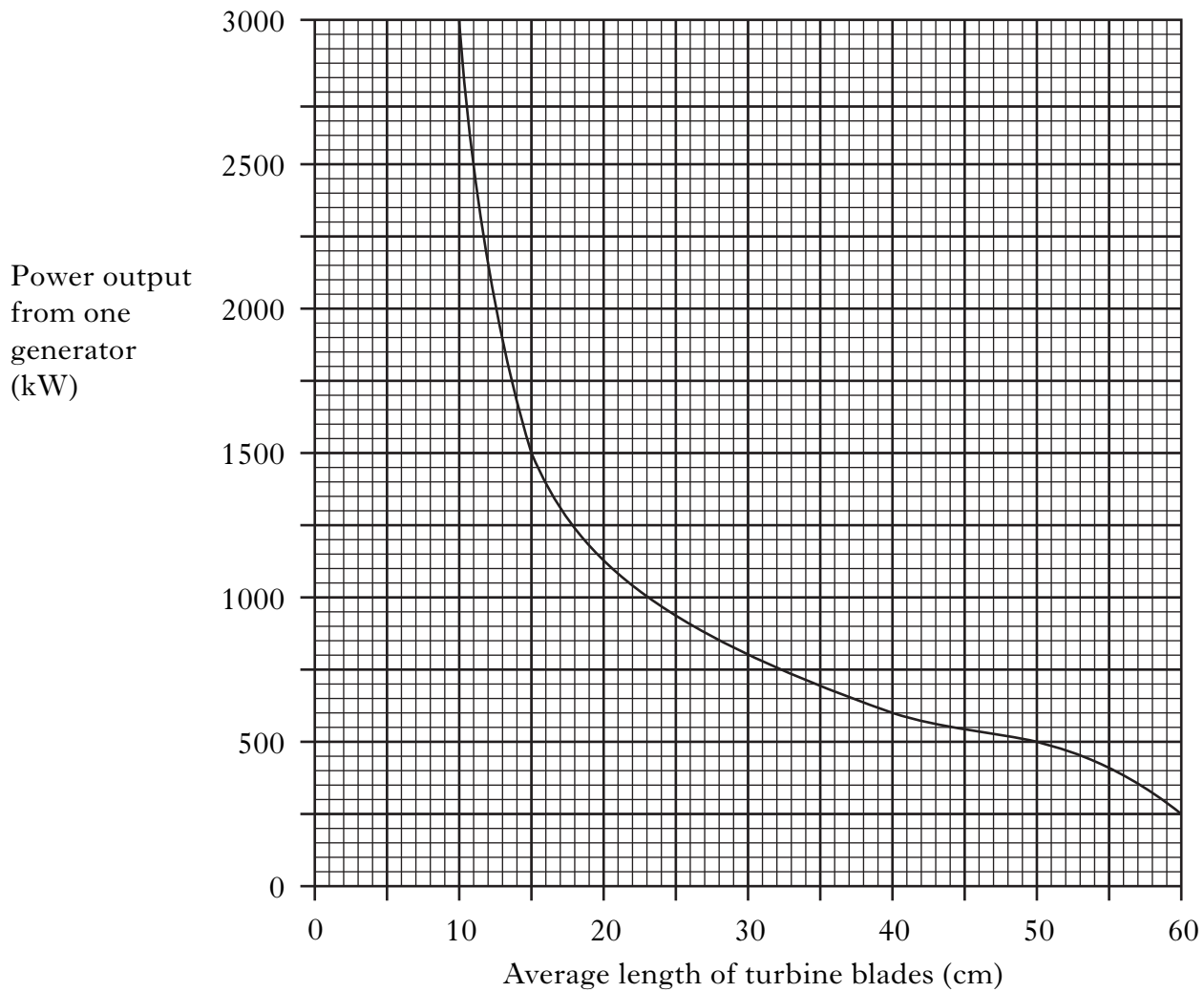
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- 23.** In a power station, turbines turn a generator.

The graph shows how the power output from the generator varies with the average length of the turbine blades.



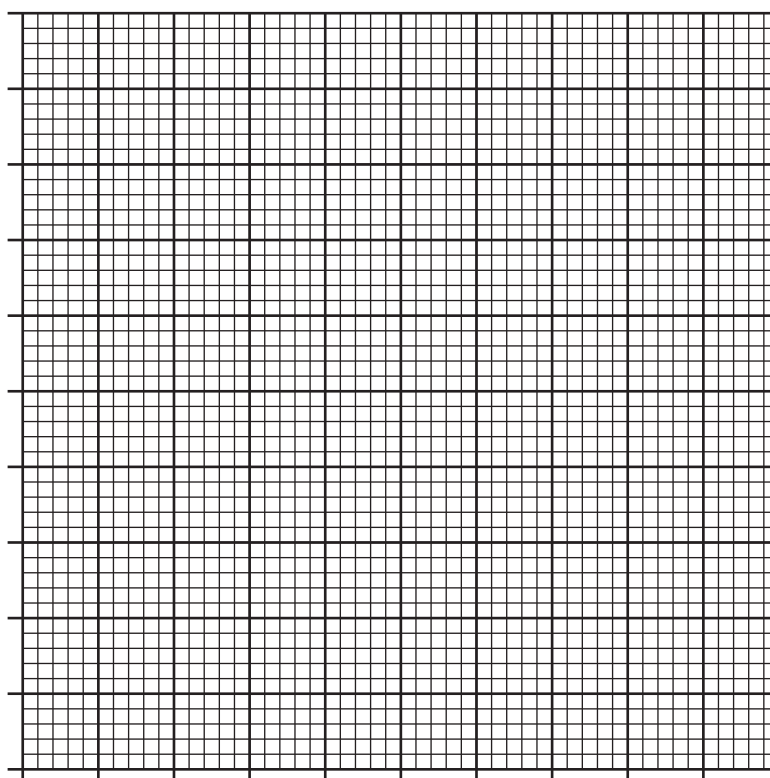


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3

(Additional graph paper, if required, can be found on page 27.)

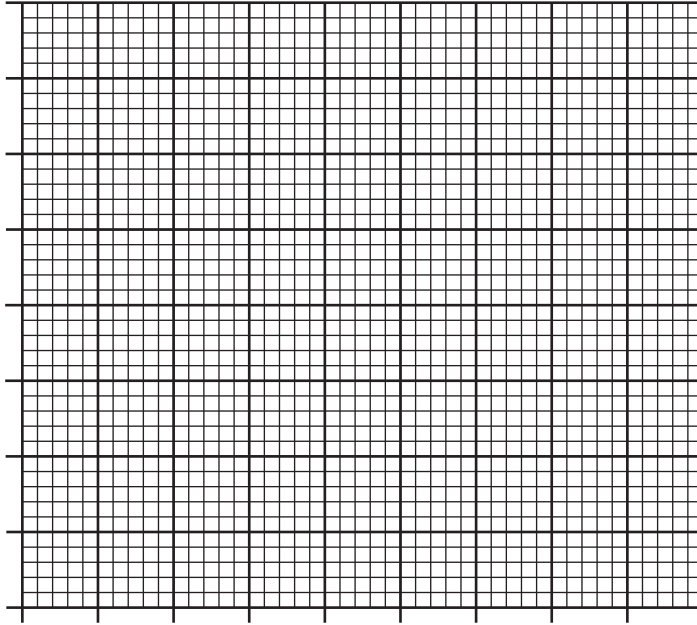


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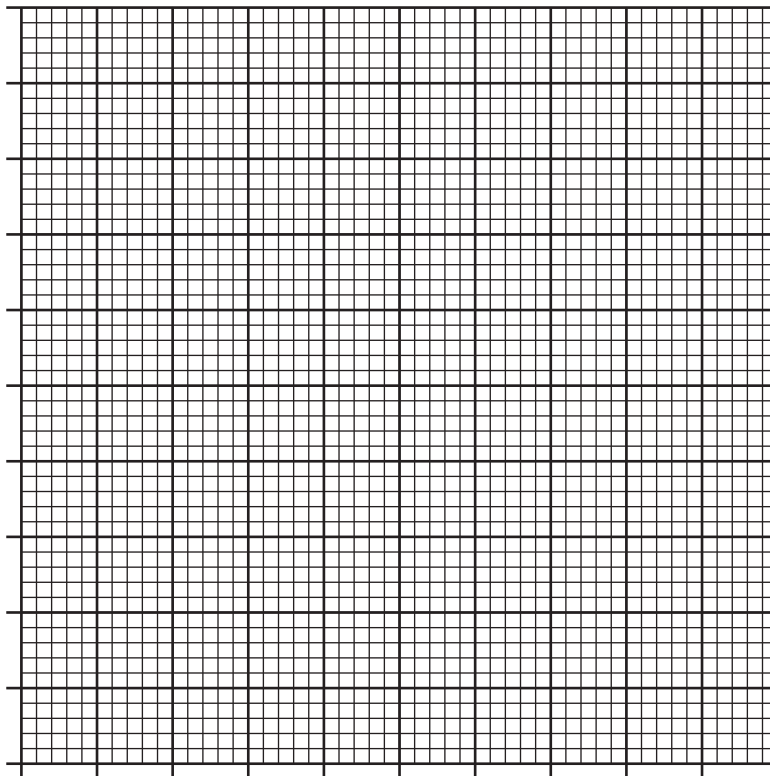
Marks

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ADDITIONAL GRAPH PAPER FOR USE IN QUESTION 20(b)



ADDITIONAL GRAPH PAPER FOR USE IN QUESTION 24



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