FOR OFFICIAL USE

C

	KU	PS
Total Mark		

3700/403

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

Scottish candidate number

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.

DO NOT WRITE IN THIS MARGIN

Marks | KU | PS

1. Tobacco smoke contains many harmful substances such as nicotine, tar and carbon monoxide.

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

..... **1**

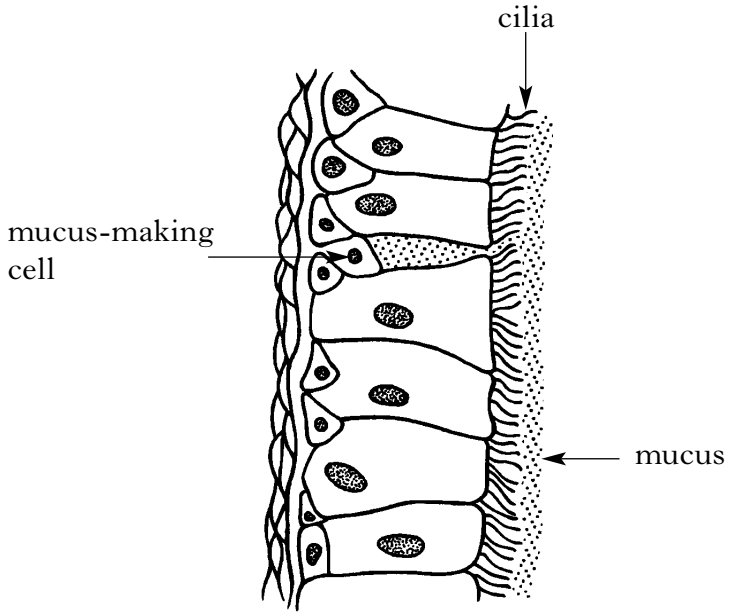
(*b*) **Tar** coats the inside of the lungs. Why is this harmful?

..... **1**

(*c*) What substance in red blood cells combines with **carbon monoxide**?

..... **1**

2. The diagram below shows part of the windpipe.



Describe how **mucus** and **cilia** keep the lungs clean and free of dirt.

Mucus .....

.....

Cilia .....

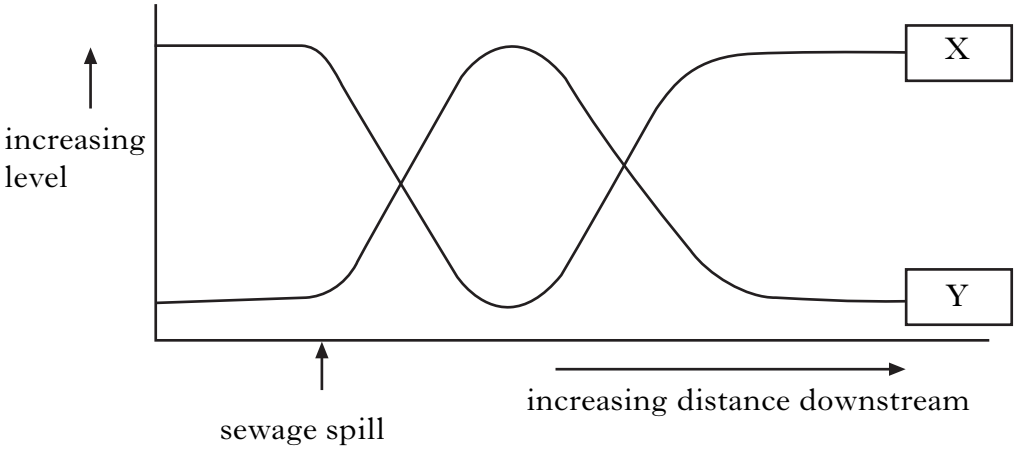
..... **2**

DO NOT WRITE IN THIS MARGIN

Marks | KU | PS

3. (*a*) Organic waste from a sewage works was accidentally spilled into a river.

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



Which line, X or Y, shows the **oxygen** level in the river?

..... **1**

(*b*) A field beside the river was sprayed with insecticide.
Heavy rain washed some of the insecticide into the river.

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

water weed ⟶ tadpole ⟶ minnow ⟶ heron

(Circle) the correct answer. **1**

[Turn over

DO NOT WRITE IN THIS MARGIN

Marks | KU | PS

4. An investigation was carried out to find out if blood pressure changes with age. Each measurement of blood pressure has an upper and lower value. Three men, aged 24, 26 and 28, each had their blood pressure measured.

Age (years)	*Blood pressure* (mm Hg)	
	upper value	lower value
24	120	80
26	115	85
28	116	82

The investigation was **fair** but could be **improved** to make the results more reliable.

Suggest **two improvements**.

1 .....

.....

2 .....

..... **2**

5. Match each **property** to its correct **description**. The first one has been done for you.

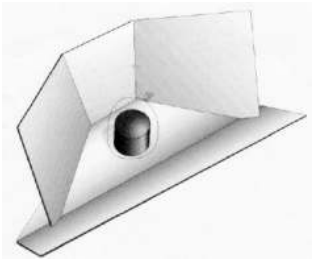
Property	**Description**
good electrical conductivity	allows heat to flow through it easily
good thermal conductivity	allows an electrical current to flow through it easily
hard	can withstand damage to its surface caused by heat
strong	can withstand damage to its surface caused by friction
heat resistant	can withstand damage to its surface caused by impact
wear resistant	can support a heavy load without breaking

3

DO NOT WRITE IN THIS MARGIN

Marks	KU	PS

6. Use the information in the passage below to answer the following questions.



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.

In one aid project, refugees were provided with solar cookers instead of firewood. Solar cookers use heat from the sun as their source of energy. Constructed from shiny, foil-covered cardboard, the cookers fold flat and are easy to transport. They are reliable and simple to operate.

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.

(*a*) Why are refugees not allowed to collect firewood from outside the camp?

.....

..... **1**

(*b*) Solar cookers do not use firewood.

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

.....

..... **1**

(*c*) How does the plastic bag help to cook the food?

..... **1**

(*d*) Why does heating water to 100 °C make it safe to drink?

..... **1**

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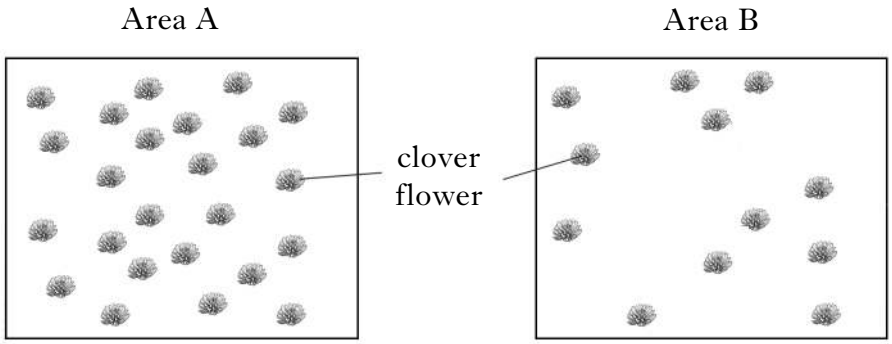
Marks	KU	PS

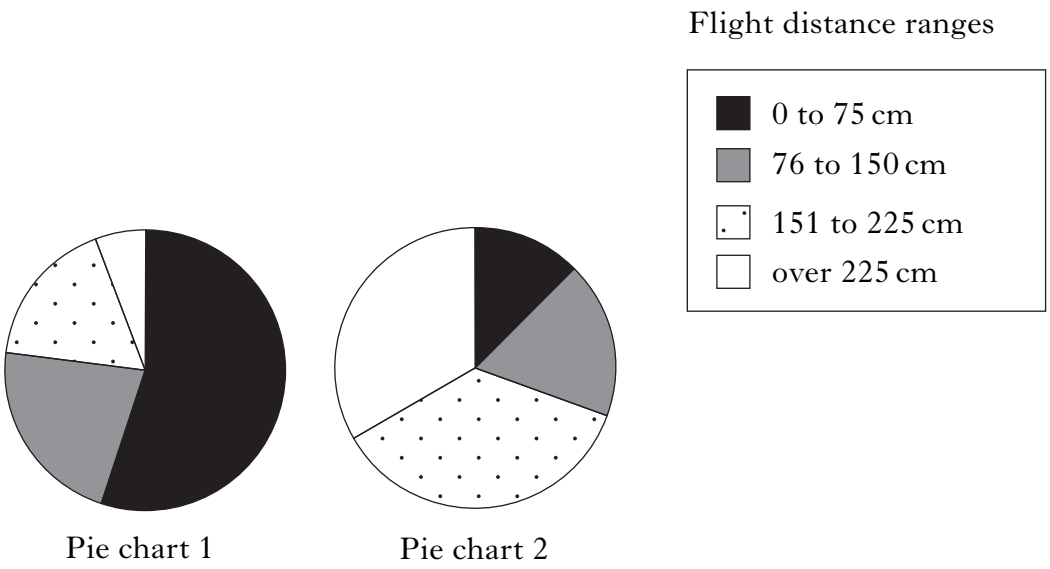
7. Bees feed on pollen and nectar by visiting many different clover flowers.

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.



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

Pie chart .....

Explain your answer.

.....

..... **1**

DO NOT WRITE IN THIS MARGIN

Marks | KU | PS

7. (continued)

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

Bee	*Distance* (cm)
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.

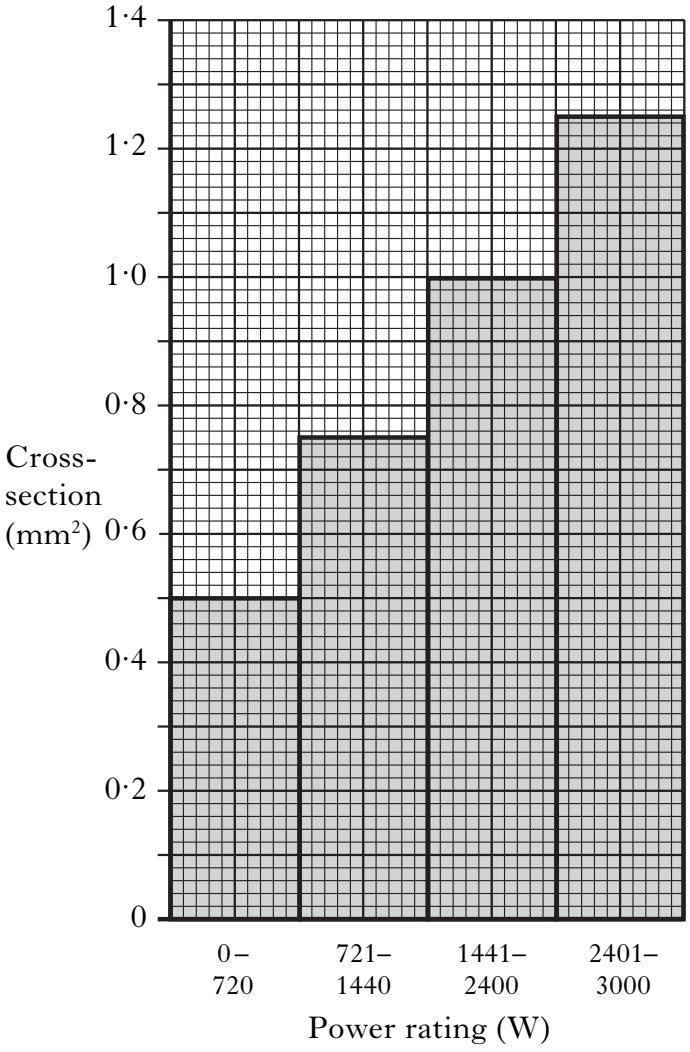
.....

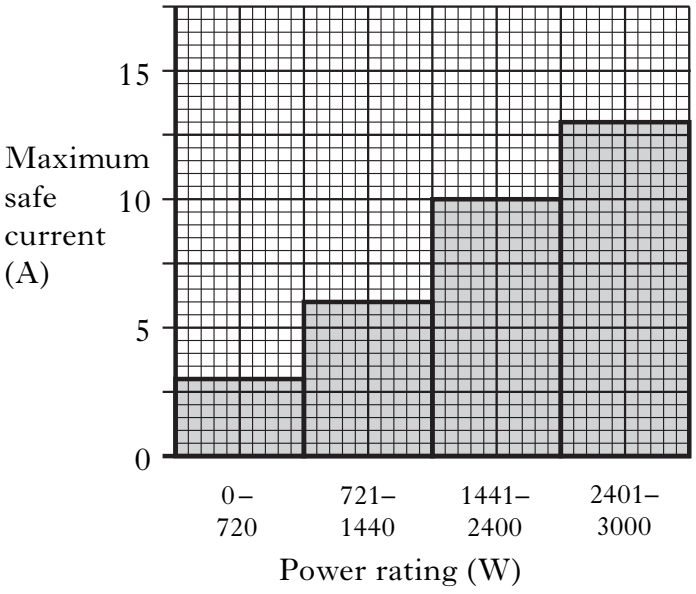
..... **2**

[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.

Appliance	*Power rating* (W)
Food mixer	600
Hairdryer	1000
Kettle	2000
Heater	2500

DO NOT WRITE IN THIS MARGIN

Marks	KU	PS

8. (continued)

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

1 .....

.....

2 .....

..... **2**

(*b*) Use the graphs and the table to answer the questions below.

(i) What is the cross-section for the cable of a heater?

..... mm^2 **1**

(ii) What is the maximum safe current for the cable of a hairdryer?

..... A **1**

(*c*) What size of fuse would be needed for the food mixer?

..... A **1**

[Turn over

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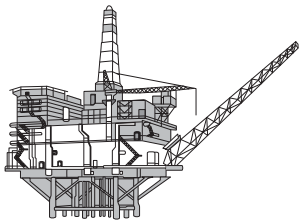
Marks	KU	PS

9. The machinery used on an oil platform is made from different metals. Sea water can cause corrosion of some of these metals.



(*a*) Give **two** examples of how the effects of corrosion will add to the costs of the oil industry.

1 .....

2 ..... **2**

(*b*) What would be the best method of protecting the **moving** parts of the machinery against corrosion?

..... **1**

(*c*) Some parts of the machinery are made from **aluminium**.

What is the best method for protecting aluminium from corrosion?

..... **1**

(*d*) The steel leg supports are protected from corrosion by **galvanising**.

What metal is used to galvanise steel?

..... **1**

DO NOT WRITE IN THIS MARGIN

Marks	KU	PS

10. Read the information below and use it to complete the flow diagram.

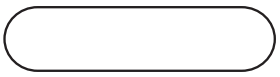
The Manufacture of Nitric Acid

Air and ammonia are heated in a reactor with a platinum catalyst.

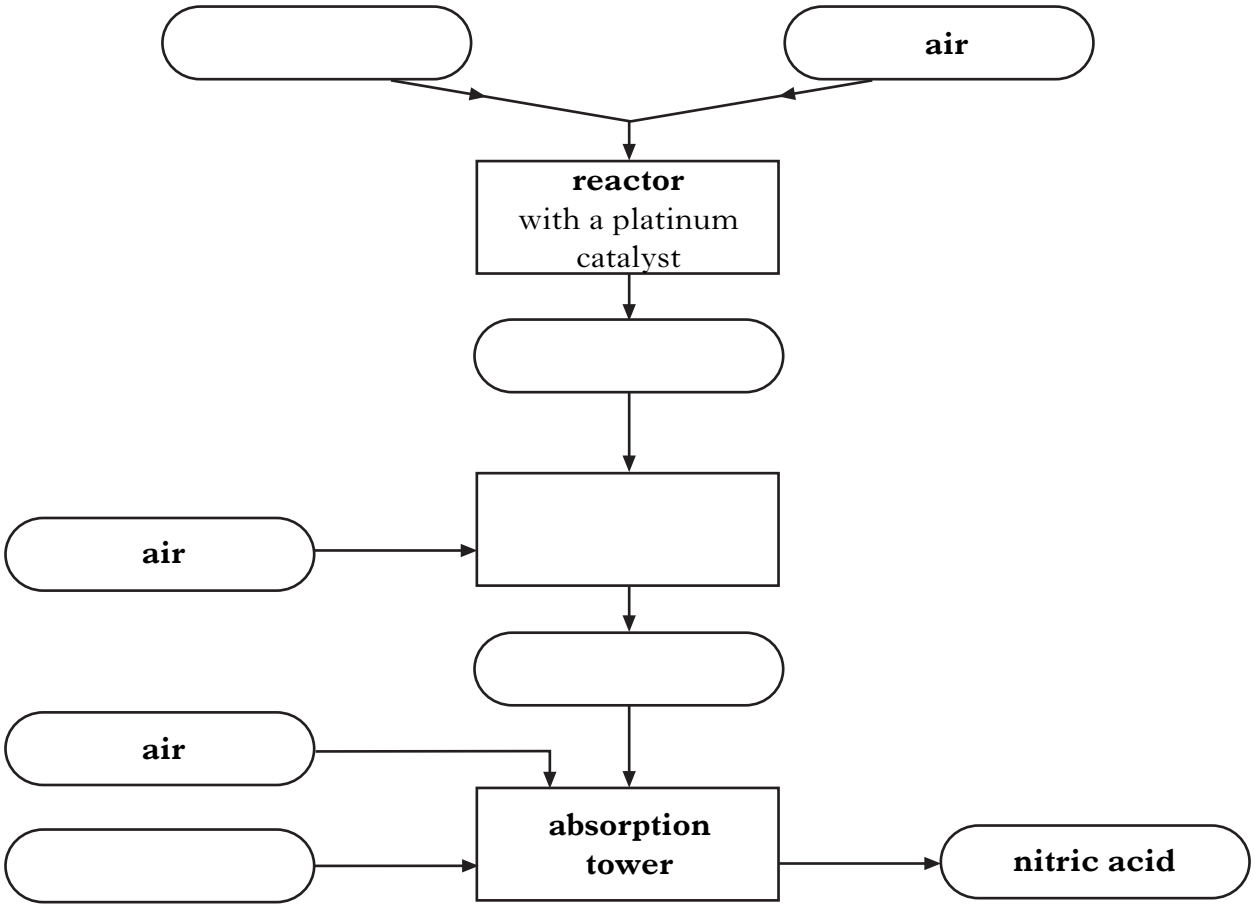
Nitrogen monoxide gas is produced. This gas is mixed with more air, in an oxidising tower, and nitrogen dioxide gas is produced. The nitrogen dioxide gas passes into an absorption tower, where it is mixed with more air and water to produce nitric acid.

Key

this shape shows a part of the manufacturing equipment



this shape shows a chemical substance



2

[Turn over

DO NOT WRITE IN THIS MARGIN

Marks | KU | PS

11. Oil exploration companies carry out different types of survey to find crude oil.

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

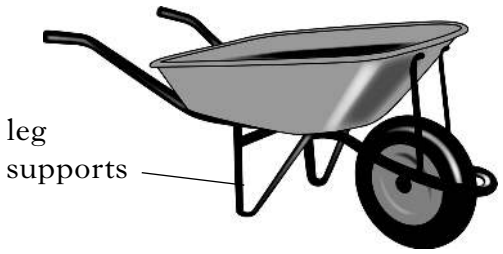
Survey	**Description**
aerial survey	setting off small explosions and recording the echoes
geological survey	boring holes so that rocks from underground can be studied
seismic survey	collecting and examining different rocks from an area
test drilling	taking photos from a satellite to produce a map

3

(*b*) Name the **process** used to separate crude oil into useful products.

..... **1**

12. A manufacturer wants to develop a new improved material to replace the steel leg supports of a wheelbarrow.



What **two** properties should the new material have?

1 .....

2 ..... **2**

DO NOT WRITE IN THIS MARGIN

Marks | KU | PS

13. (*a*) Iodine-131 is a radioactive substance and has a half-life of 8 days.
A sample of iodine-131 has an activity of 400 counts per minute.
What is the activity after 8 days?

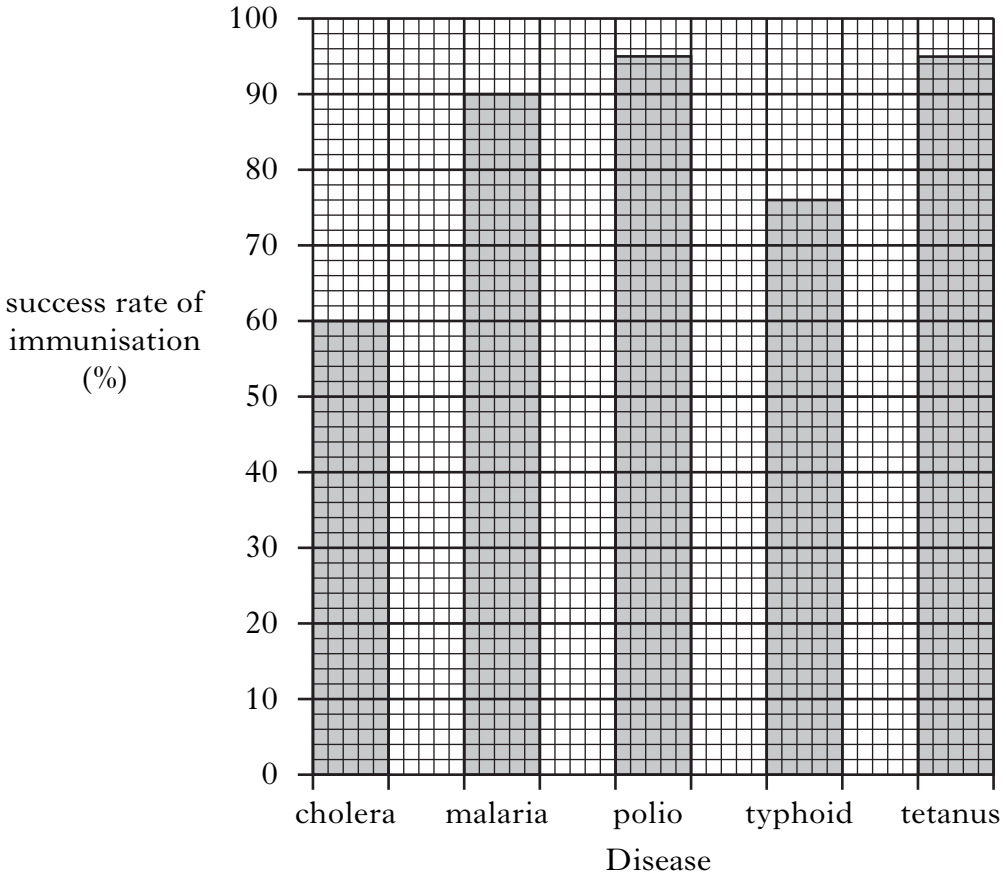
..... counts per minute **1**

(*b*) Complete the sentence below by (circling) the correct word in the box.

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.

Disease	*How immunisation is given*	*Possible reaction to immunisation*	*Duration of protection*
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

DO NOT WRITE IN THIS MARGIN

Marks | KU | PS

14. (continued)

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

(*a*) For how long does the immunisation with the lowest success rate give protection?

…… **1**

(*b*) What is the success rate of the immunisation which is given by three injections over a period of seven months?

……% **1**

(*c*) What is the possible reaction to immunisation to the disease which has a 76% success rate of immunisation?

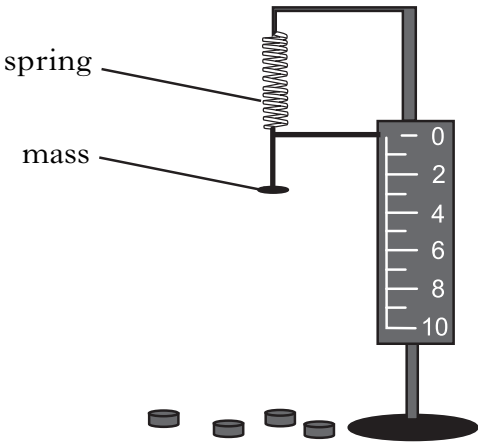
…… **1**

[Turn over

DO NOT WRITE IN THIS MARGIN

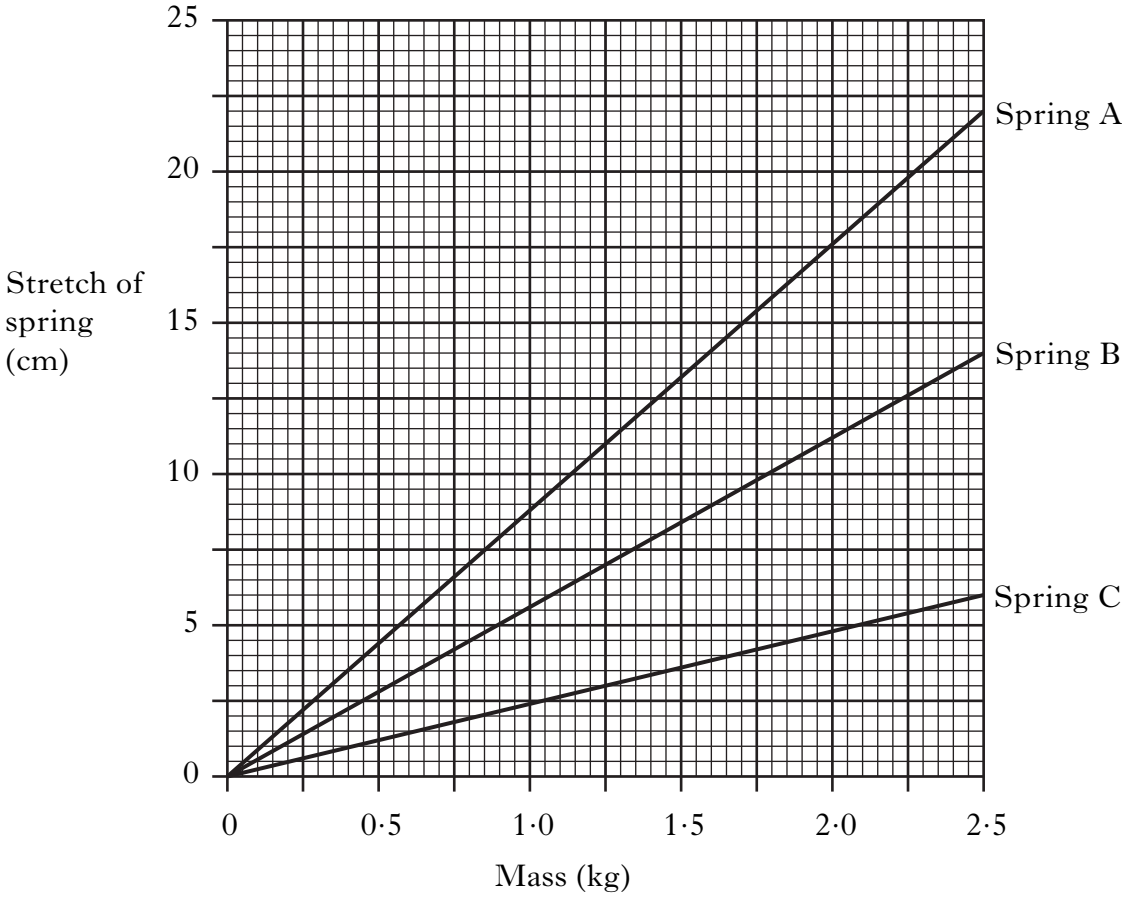
Marks	KU	PS

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.



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Marks | KU | PS

15. (continued)

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

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

1 .....

.....

2 .....

..... **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 **1**

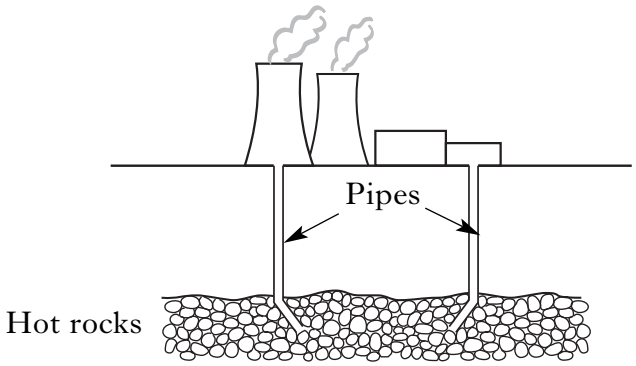
(*c*) Another spring has a width of 2·0 cm.

Predict the stretch of this spring when a 1·0 kg mass is hung on it.

..... cm **1**

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 [cold / hot] rock layer.

The water is [heated / cooled] to form [steam / ice] which is used to make electricity. **2**

[Turn over

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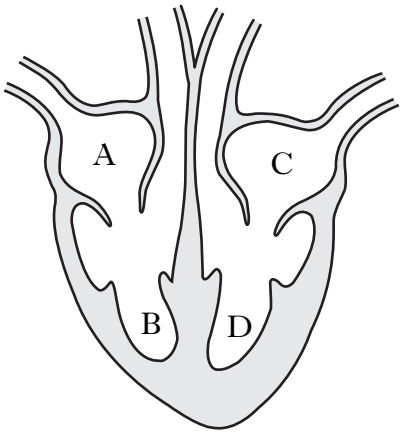
Marks | KU | PS

17. The diagram below shows the four chambers inside the heart.



(*a*) Which two chambers collect blood entering the heart?

Letters ..... and **1**

(*b*) Name chamber A.

..... **1**

(*c*) Explain why the muscular wall of chamber D is thicker than the muscular wall of chamber B.

.....

..... **1**

18. What type of blood vessel has

(*a*) very thin walls to allow exchange of gases with body cells?

..... **1**

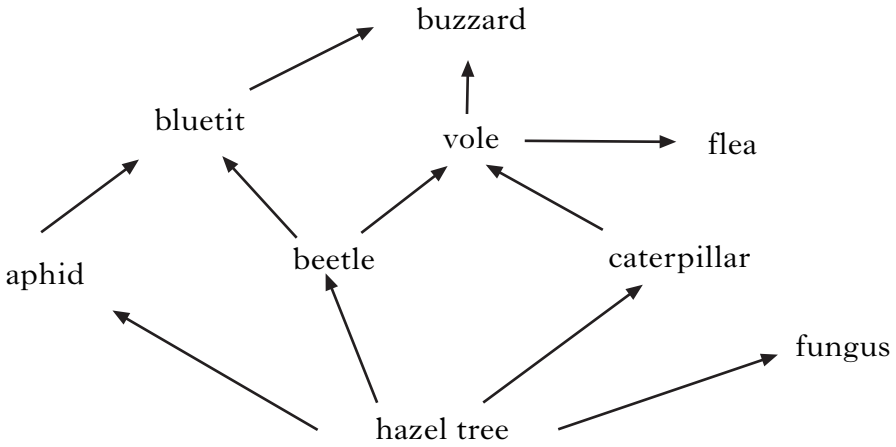
(*b*) thin walls and valves?

..... **1**

DO NOT WRITE IN THIS MARGIN

Marks	KU	PS

19. A woodland food web is shown below.



(*a*) Name the organism in this food web which is a decomposer.

..... **1**

(*b*) Decomposers get their energy by decaying natural waste.
This releases materials which can be used again by

A producers

B predators

C consumers

D prey.

Underline the correct answer. **1**

(*c*) A group of voles all living in the same area is called a

A family

B habitat

C population

D community. **1**

Underline the correct answer.

(*d*) What is the advantage of having a large number of links in a food web?

..... **1**

DO NOT WRITE IN THIS MARGIN

Marks | KU | PS

20. The table shows information about the percentage of men and women drinking more than the recommended weekly limit of alcohol.

Gender	*Age range* (years)	*Percentage drinking more than weekly limit* (%)
Male	16–24	36
Male	25–44	27
Male	45–64	24
Female	16–24	25
Female	25–44	16
Female	45–64	14

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

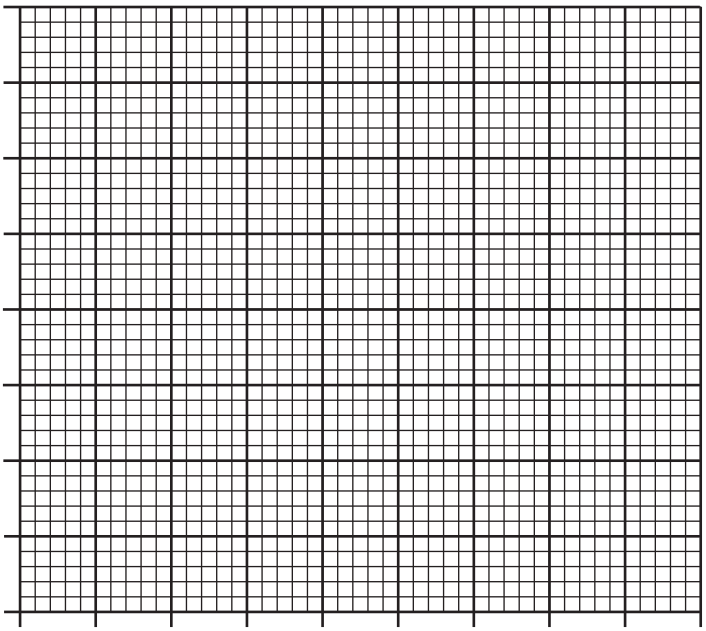
1 .....

.....

2 .....

..... **2**

(*b*) Draw a **single** bar graph to show all of the information in the table.
(Additional graph paper, if required, is provided on page 27.)



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Marks | KU | PS

20. (continued)

(*c*) The recommended weekly limit for men is 21 units of alcohol.
One unit of an alcoholic drink contains 8 g of alcohol.
In one week a man drank 40 g **more** than his recommended limit of alcohol.

How many **units** of alcohol did he drink in that week?

Space for working

..... units **2**

21. The boxes below show the names of some gases.

1 nitrogen	2 carbon dioxide	3 ozone
4 carbon monoxide	5 oxygen	6 sulphur dioxide

Which box shows a gas that

(*a*) is formed by incomplete combustion of fossil fuels?

Box number **1**

(*b*) is broken down by CFCs?

Box number **1**

(*c*) causes acid rain pollution?

Box number **1**

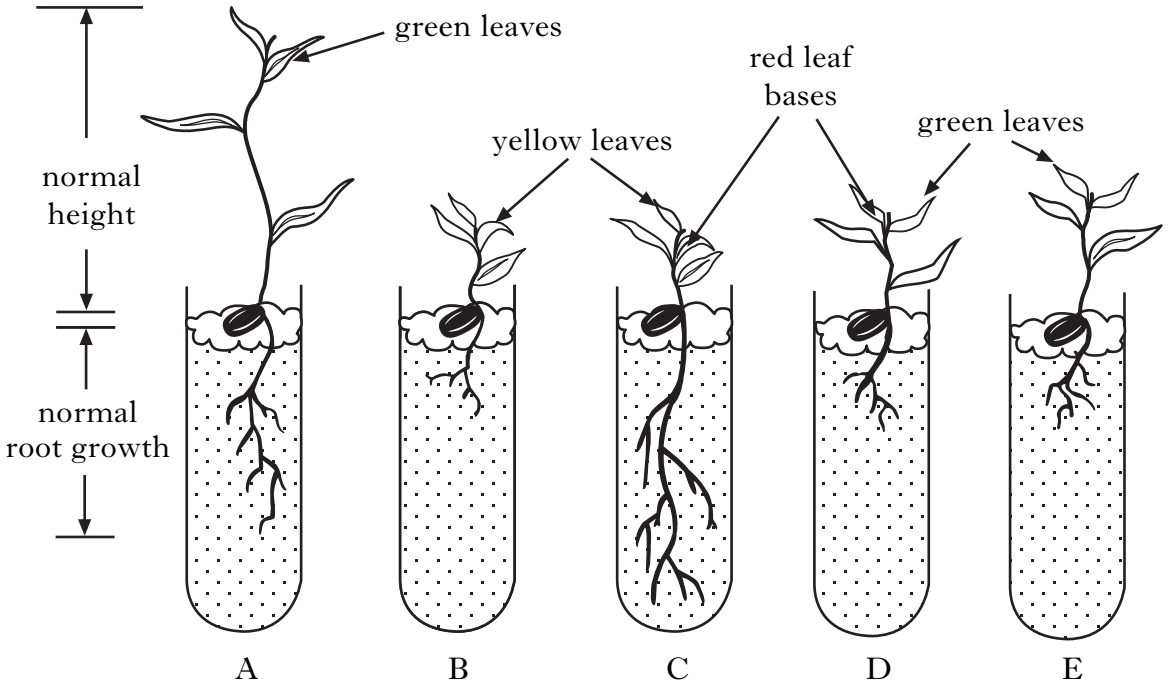
[Turn over

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.

Mineral missing from solution	*Effect on growing plant*
nitrogen	smaller height yellow leaves red leaf bases longer roots
phosphorus	smaller height green leaves red leaf bases shorter roots
potassium	smaller height green leaves shorter roots
magnesium	smaller height yellow leaves shorter roots

DO NOT WRITE IN THIS MARGIN

Marks | KU | PS

22. (continued)

(*a*) What colour are the leaves of a plant growing in a solution with all the minerals?

..... **1**

(*b*) Give **two** pieces of information about the **leaves** of a plant growing in a solution with no nitrogen.

.....

..... **1**

(*c*) Which mineral is missing from the solution in experiment B?

1 nitrogen

2 phosphorus

3 potassium

4 magnesium

Underline the correct answer. **1**

(*d*) Which experiment has no phosphorus in the solution?

Tick (✓) the correct box.

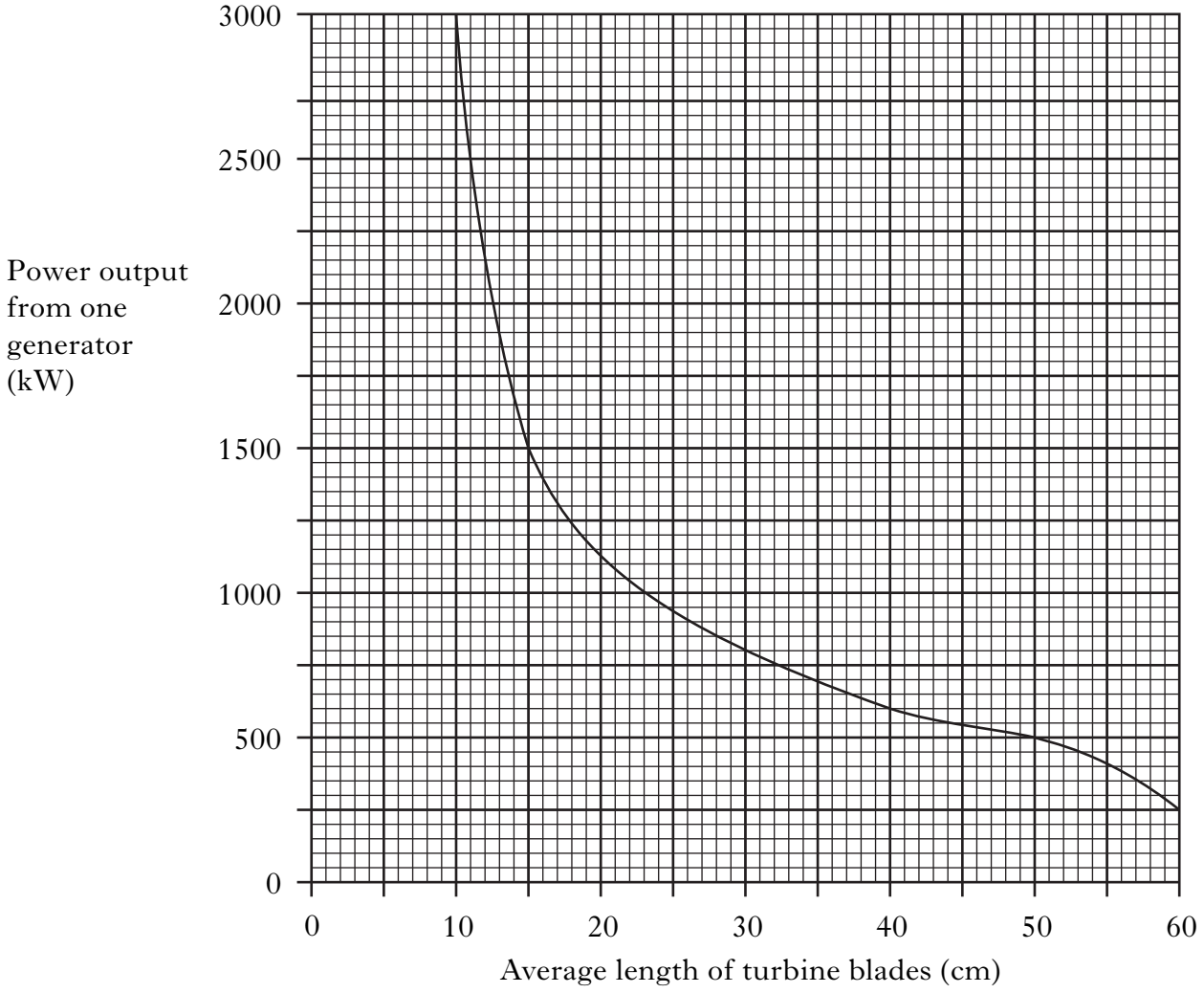
B	
C	
D	
E	

1

[Turn over

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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23. (continued)

(*a*) If the turbine blades have an average length of 50 cm, how many generators are needed to produce a power of 20 000 kW?

Space for working

Answer **2**

(*b*) What is the percentage decrease in power output from a generator if the average length of the turbine blades is increased from 15 cm to 40 cm?

Space for working

Answer ..... % **2**

[Turn over

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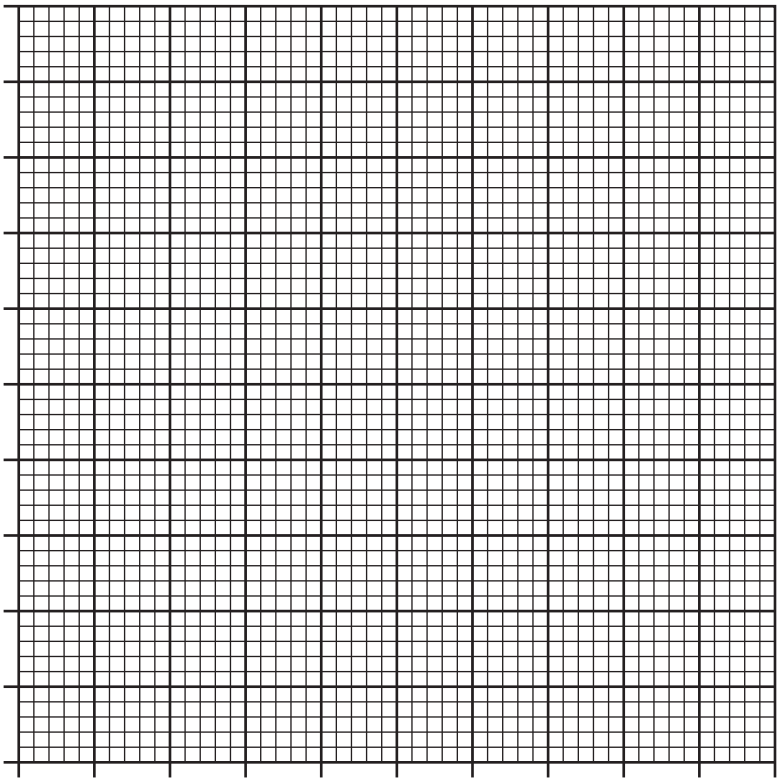
24. The table shows the mass of potassium chloride and the mass of ammonium chloride which can dissolve in 100 g of water at different temperatures.

Temperature (°C)	*Mass* (g)	
	Potassium chloride	*Ammonium chloride*
0	27	29
20	33	37
40	39	46
60	45	56
80	51	67
100	57	79

Using the same axes, show these results as **two** line graphs.

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



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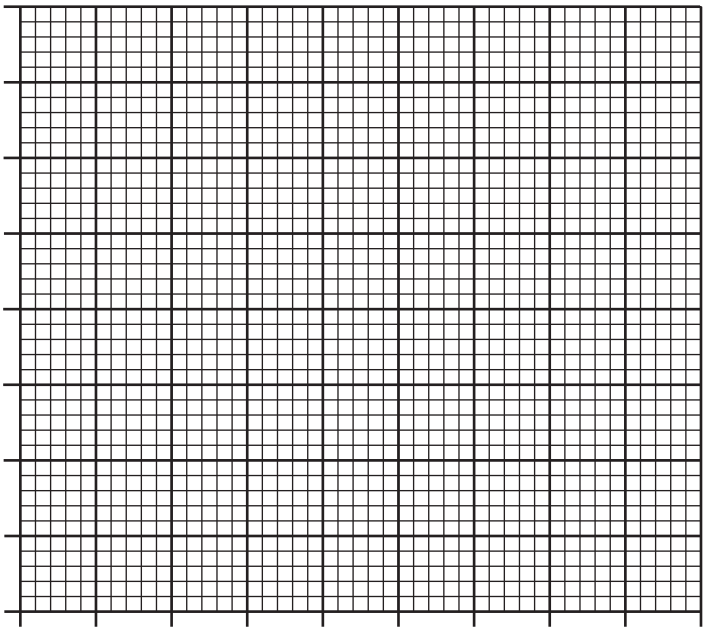
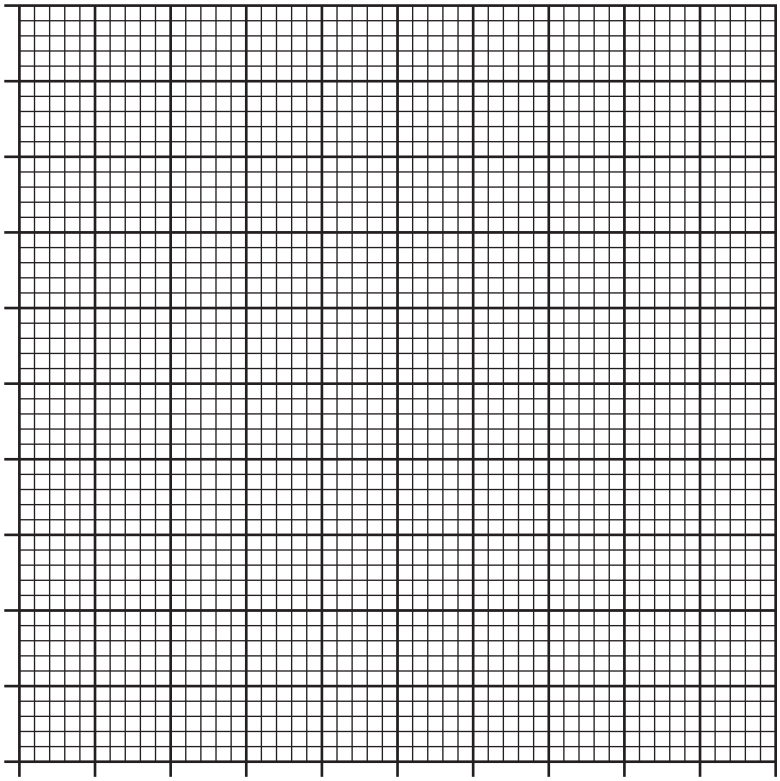
Marks	KU	PS

ADDITIONAL GRAPH PAPER FOR USE IN QUESTION 20(*b*)



ADDITIONAL GRAPH PAPER FOR USE IN QUESTION 24



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