FOR OFFICIAL USE

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	KU	PS
Total Mark		

3700/31/01

NATIONAL QUALIFICATIONS 2012

MONDAY, 30 APRIL
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.

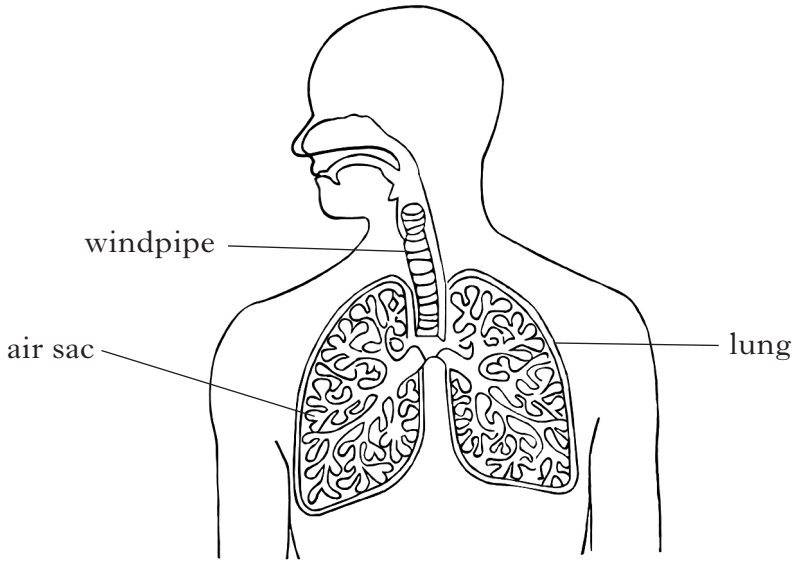
3 Write your answers in the spaces provided. Showing working may help in some questions.

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. The diagram below shows part of the respiratory system.



(*a*) (Circle) the correct words to complete the following sentences.

(i) The windpipe is kept open by rings of [bone / fibre / cartilage]. **1**

(ii) The windpipe divides into two [bronchi / bronchioles]. **1**

(*b*) Name the type of blood vessel which surrounds the air sacs.

..... **1**

(*c*) Describe the self-cleaning mechanism of the lungs.

.....

.....

..... **2**

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2. Increasing carbon dioxide concentration in the atmosphere is responsible for environmental changes.

(*a*) (i) Give **one** reason why the carbon dioxide concentration in the atmosphere is increasing.

..... **1**

(ii) Give **two** examples of environmental changes that have been linked to increasing carbon dioxide concentration in the atmosphere.

1 .....

2 ..... **2**

(*b*) The upper layer of the atmosphere contains a gas which protects us from harmful solar radiation.

Name this gas.

..... **1**

3. Burning plastics produce gases that are harmful to humans.

Complete the table below.

Plastic	*Harmful gas produced when plastic burns*	*Effect of harmful gas on the human body*
	hydrogen cyanide	damages the brain and nervous system
polystyrene		stops blood from carrying oxygen
polyvinylchloride (PVC)	hydrogen chloride	

3

[Turn over

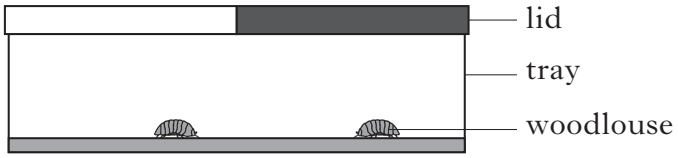
DO NOT WRITE IN THIS MARGIN

Marks | KU | PS

4. An investigation was carried out to find out how light affects where woodlice are found.

Two woodlice were placed in a tray with a plastic lid. Half of the lid was black to keep out light. The other half was clear to let in light.

After 1 minute the number of woodlice in each half of the tray was recorded.



Results

Number of woodlice in light	*Number of woodlice in dark*
1	1

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

Suggest **two improvements**.

1 .....

2 ..... **2**

DO NOT WRITE IN THIS MARGIN

Marks | KU | PS

5. The boxes below describe some properties of materials.

1 supports a heavy load without breaking	2 allows heat to pass through	3 allows electricity to pass through
4 bends without snapping	5 catches fire easily	6 resists damage by impact

Which box describes

(*a*) flammability? Box number **1**

(*b*) thermal conductivity? Box number **1**

(*c*) flexibility? Box number **1**

(*d*) hardness? Box number **1**

[Turn over

DO NOT WRITE IN THIS MARGIN

Marks | KU | PS

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

Lactose intolerance is the inability to digest lactose, the main sugar in milk. Normally, the cells that line the small intestine produce an enzyme called lactase. Lactase digests the milk sugar by breaking it down into simple substances, such as glucose, that can be absorbed into the blood. If the small intestine is not producing lactase, the body cannot digest lactose. This leads to symptoms of lactose intolerance, such as nausea and diarrhoea. Many people with lactose intolerance also suffer from bloating, which is a build up of gas in the intestine caused by the action of bacteria on undigested lactose.

Most babies produce high levels of lactase, enabling the digestion of milk. After the age of 2 years, the body begins to produce less lactase. In some individuals, the body fails to produce enough lactase, leading to the development of lactose intolerance in older children and adults.

The most common diagnostic tests for this condition are known as the *lactose tolerance test* and the *hydrogen breath test*. Both tests involve giving the patient a drink with a high concentration of lactose. For the lactose tolerance test, blood samples are taken to measure the blood glucose level. This shows how well lactose is being digested. For the hydrogen breath test, breath samples are analysed at regular intervals. Raised levels of hydrogen indicate the presence of undigested lactose in the intestine.

These tests are not given to babies and very young children as the high lactose drink may cause diarrhoea and severe dehydration. Many doctors simply recommend changing the child's diet from dairy milk to a non-dairy alternative, such as soya milk.

(*a*) State **two** symptoms of lactose intolerance.

..... **1**

(*b*) Why do most babies produce high levels of lactase?

..... **1**

(*c*) Why does lactose intolerance develop in some older children and adults?

..... **1**

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6. (continued)

(*d*) Give **one** way in which the *lactose tolerance test* and the *hydrogen breath test*

(i) are similar. .....

..... **1**

(ii) are different. .....

..... **1**

(*e*) Explain why the diagnostic tests are not given to very young children.

..... **1**

[Turn over

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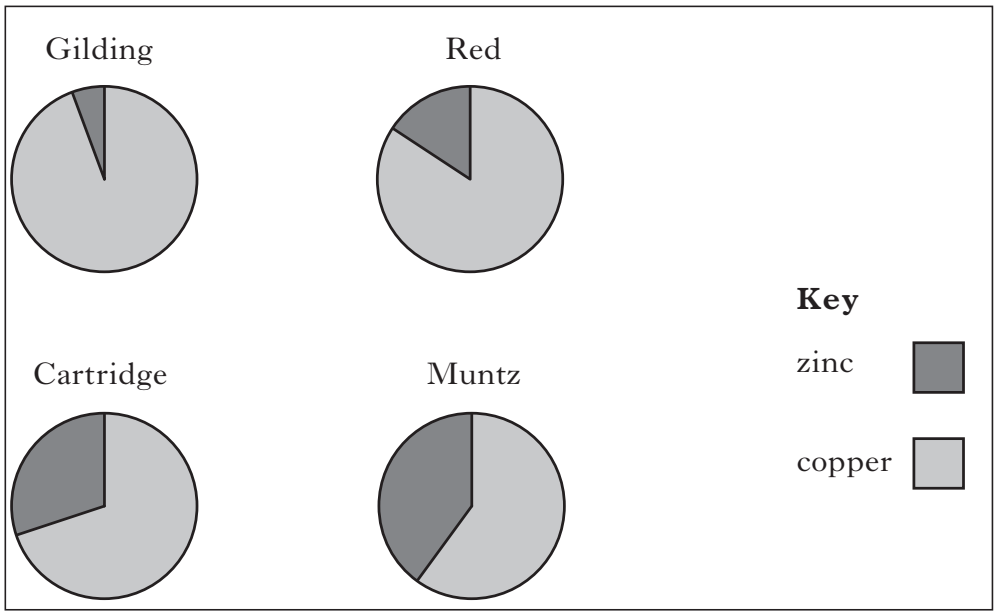
7. The pie charts below show the composition of different types of brass.



The table below shows some of the properties of the different types of brass.

Type of brass	*Tensile strength* (MPa)	*Hardness* (units)
Gilding	245	52
Red	280	64
Cartridge	357	72
Muntz	378	80

(*a*) What conclusion can be drawn about the **composition** of brass and its **hardness**?

.....

..... **1**

(*b*) Predict the tensile strength of brass which contains 75% copper.

..... MPa **1**

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8. Natural disasters can limit the growth in the number of organisms living in a habitat.

(*a*) Give **one** other factor which can limit the growth in the number of organisms living in a habitat.

..... **1**

(*b*) What word is used to describe the number of organisms of **one type** living in a habitat?

..... **1**

9. Use words from the boxes to answer the questions.

anodising	electroplating	packaging	waterproofing
galvanising	spray painting	pesticide treatment	alloying

Which method would be used to

(*a*) protect the aluminium frame of a bicycle?

..... **1**

(*b*) apply a thin layer of gold to electronic components?

..... **1**

(*c*) protect walking boots?

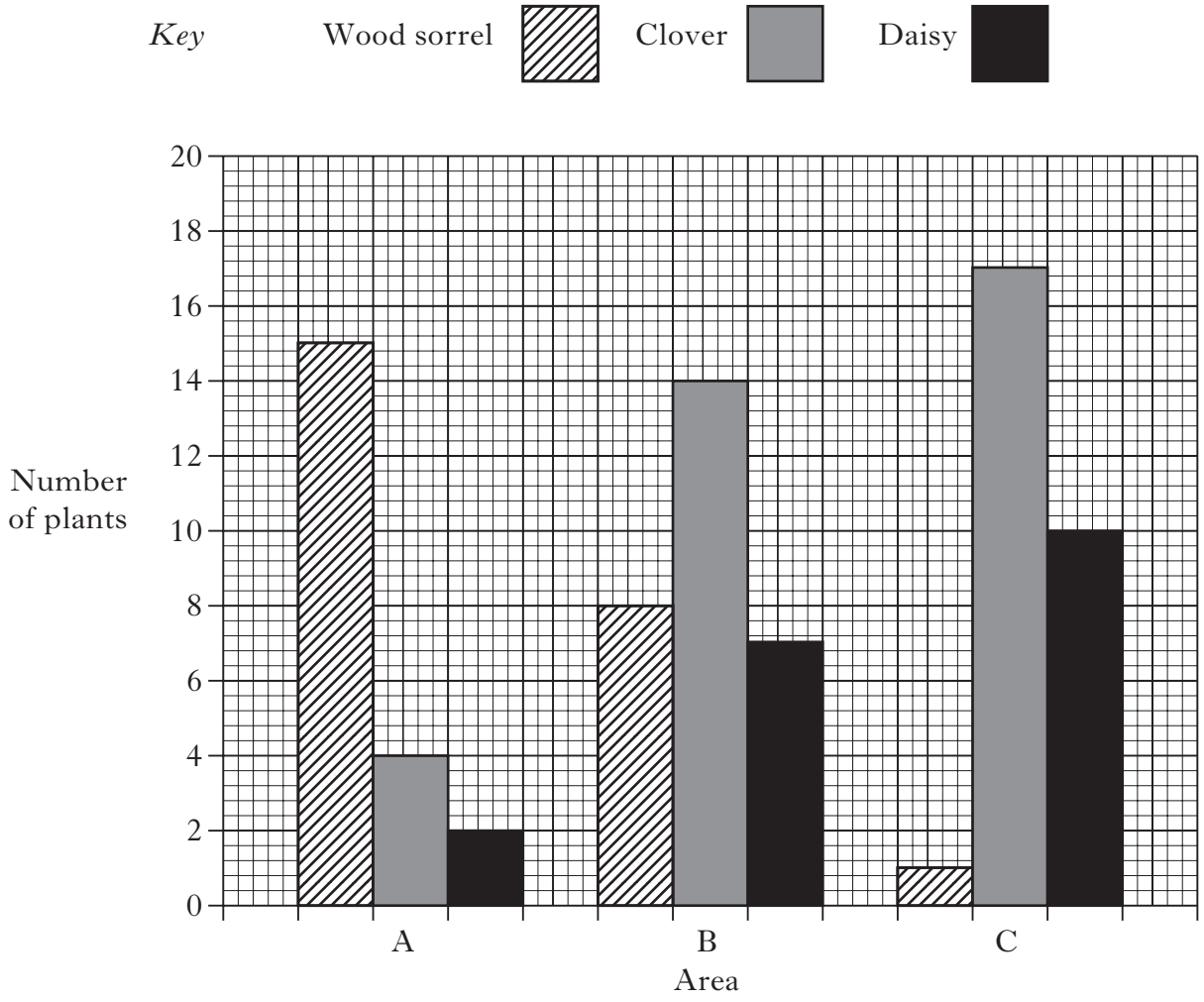
..... **1**

(*d*) cover a steel lamp post with a layer of zinc?

..... **1**

[Turn over

10. A group of students investigated the effect of light intensity on the numbers of wild plants in a woodland. They counted the numbers of wood sorrel, clover and daisies in areas A, B and C. For each area they recorded the light intensity. The results are shown in the bar graph and table below.



Area	*Light intensity* (units)
A	5
B	10
C	15

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10. (continued)

(*a*) Draw **two** conclusions using information from **both** the bar graph **and** the table.

1 .....

.....

2 .....

..... **2**

(*b*) What is the light intensity in the area with the highest total number of plants?

..... units **1**

(*c*) Predict the number of wood sorrel plants in an area which has a light intensity of 7 units.

..... **1**

11. The boxes below show some gases.

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

(*a*) Which **two** boxes show a gas that causes acid rain?

Boxes ..... and **2**

(*b*) Which box shows the gas formed by incomplete combustion of petrol in a car engine?

Box **1**

[Turn over

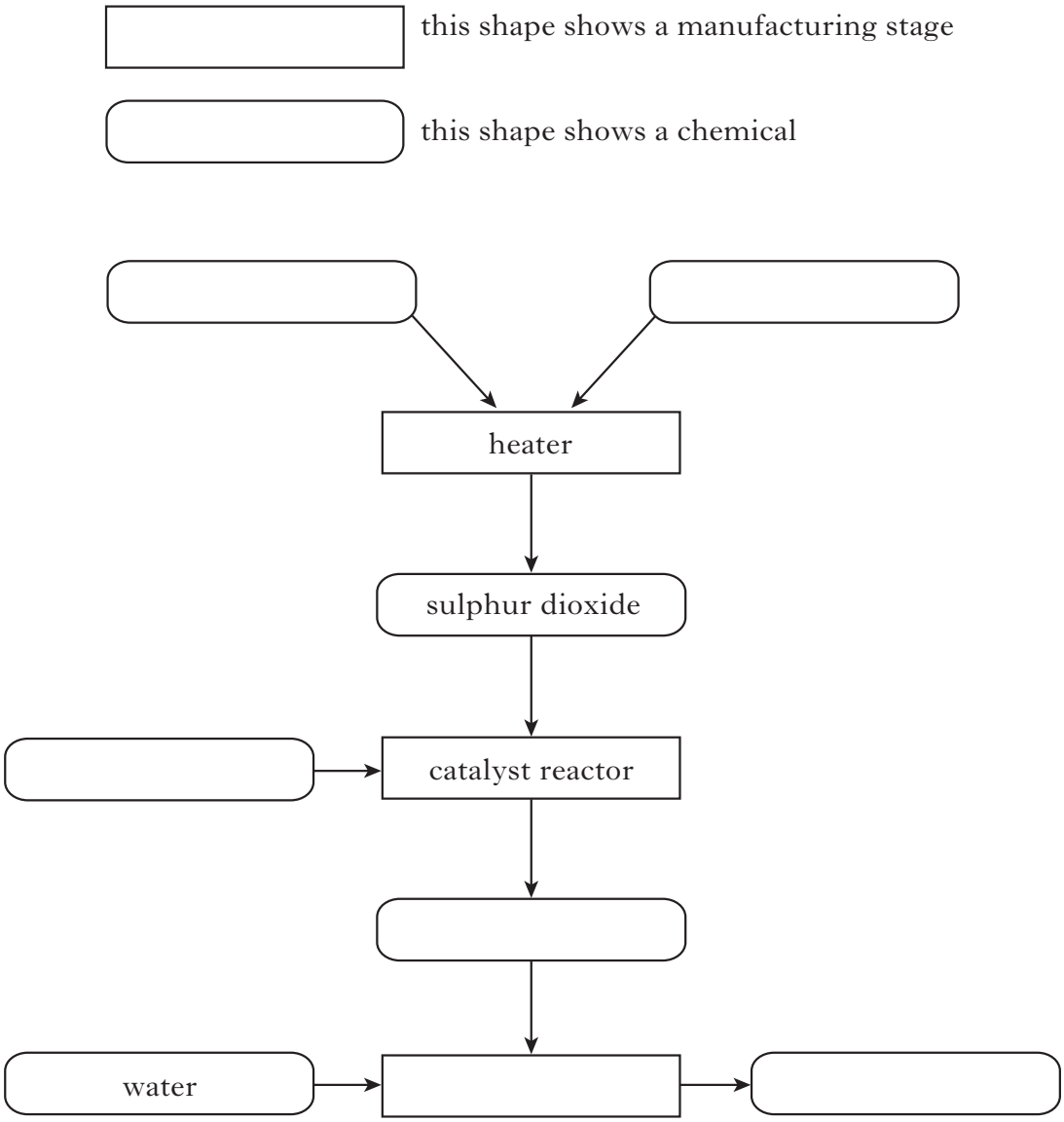
DO NOT WRITE IN THIS MARGIN

Marks | KU | PS

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

The Manufacture of Sulphuric Acid

Iron pyrites and air are heated to form sulphur dioxide. The sulphur dioxide then reacts with oxygen in a catalyst reactor. The sulphur trioxide formed in this reaction passes into an absorber. Water is added to the absorber and the final product is sulphuric acid.



2

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Marks | KU | PS

13. Use words from the boxes to answer the questions.

oxidation	gravity survey	distillation
combustion	test drilling	mining

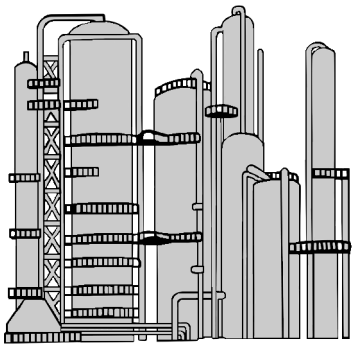
(*a*) Which process is used to separate crude oil into fractions?

..... **1**

(*b*) Which **two** processes are used to detect oil bearing rocks?

..... and **1**

14. In a factory making fertilisers, the walls of the reactors are made of steel.



Give **two** examples of how corrosion of the steel adds to the cost of operating the factory.

1 .....

2 ..... **2**

[Turn over

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Marks | KU | PS

15. The table below shows the percentage of men and women being treated for heart disease.

Age range (years)	*Percentage being treated for heart disease* (%)	
	men	*women*
45 – 54	3	1
55 – 64	9	5
65 – 74	17	11
75 – 84	20	16

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

1 .....

.....

2 .....

..... **2**

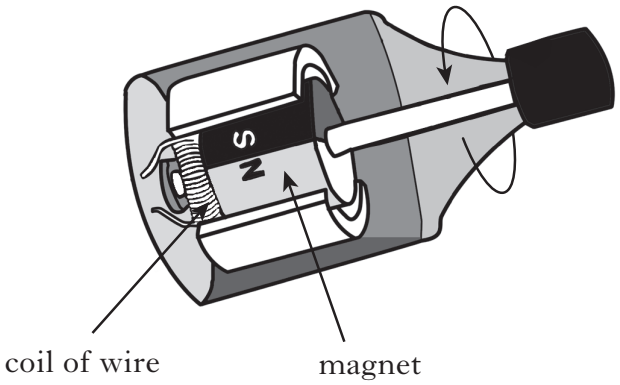
(*b*) In a sample of 250 women aged 75–84 years, calculate how many are being treated for heart disease.

Space for working

..... women **2**

Marks | KU | PS

16. The diagram shows a simple electrical generator.



The magnet rotates beside a coil of wire and this produces an electrical current.

The current can be increased by using **more turns of wire** in the coil.

Give **two** other ways in which the electrical current can be increased.

1 .....

2 ..... **2**

17. The following table shows the number of river pollution incidents reported to an Environmental Agency in one year.

Type of pollution incident	*Number of reports*
Oil spill	9
Farm waste	27
Industrial waste	16
Rubbish dumping	63
Discoloured water	65

What percentage of the total number of reports was about rubbish dumping?

Space for working

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

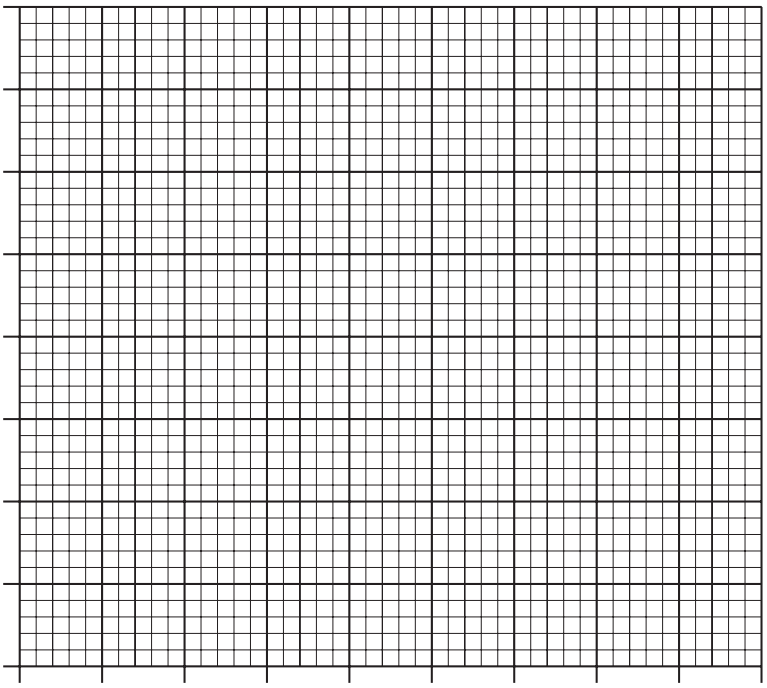
DO NOT WRITE IN THIS MARGIN

Marks | KU | PS

18. The table shows the oil production from three North Sea oilfields in the years 2004 and 2006.

Oilfield	*Oil production* (thousands of tonnes)	
	2004	*2006*
Buchan	370	320
Thistle	180	160
Tartan	175	105

(*a*) Construct a **single bar graph** to show all of this information.
(Additional graph paper, if required, is provided on *Page twenty-five*.)



3

(*b*) Calculate the percentage decrease in oil production in the Tartan oilfield between 2004 and 2006.

Space for working

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

Marks	KU	PS

19. Which of the following statements correctly describes a heart attack?

A. The coronary vein is blocked and prevents carbon dioxide getting to the heart muscle.

B. The coronary artery is blocked and prevents carbon dioxide getting to the heart muscle.

C. The coronary vein is blocked and prevents oxygen getting to the heart muscle.

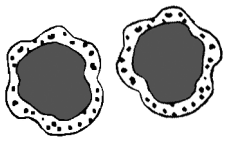
D. The coronary artery is blocked and prevents oxygen getting to the heart muscle.

Underline the correct answer. **1**

20. The diagram shows parts of human blood.

Red blood cells

Platelets



White blood cells

(*a*) Name the chemical in red blood cells which carries oxygen.

..... **1**

(*b*) What is the function of the platelets?

..... **1**

(*c*) The treatment used to stimulate white blood cells to produce antibodies is

A hypothermia

B immunisation

C accumulation

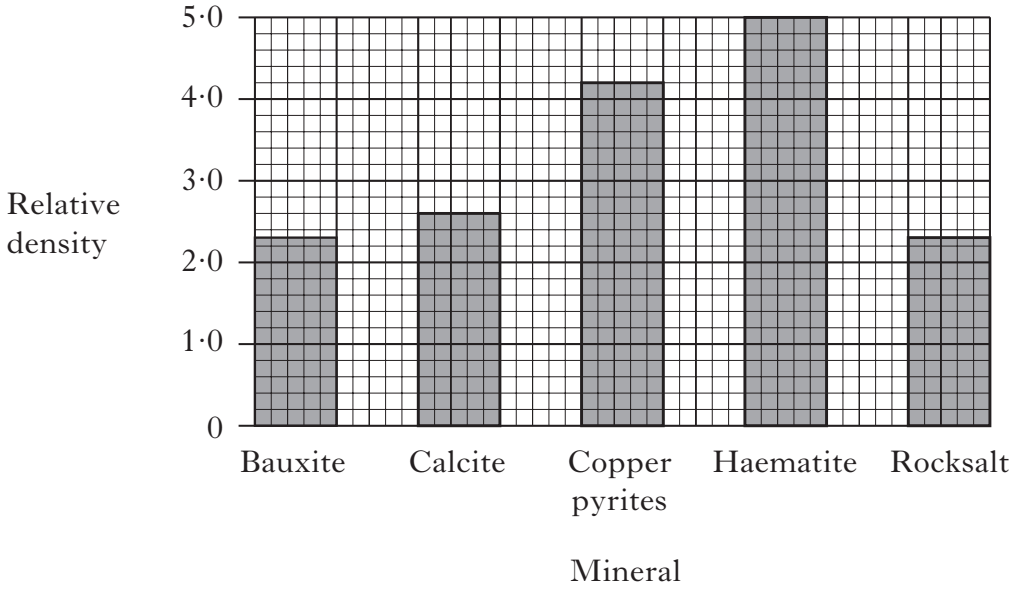
D respiration.

Underline the correct answer. **1**

[Turn over

21. Some information about minerals found in the Earth's crust is given below.

Mineral	*Supply in Earth's crust*	*Annual world production* (million tonnes)	*Hardness value*	*Reaction with acid*
Bauxite	plentiful	80	2·0	no gas given off
Calcite	plentiful	1500	3·5	gas given off
Copper pyrites	limited	20	4·2	no gas given off
Haematite	plentiful	900	5·2	no gas given off
Rocksalt	plentiful	150	2·2	no gas given off



The **relative density** of a mineral is a measure of its density compared to water.

The **hardness** of a mineral is tested by scratching it.
A mineral with a higher hardness value can scratch any mineral with a lower hardness value.

Carbonate minerals react with acid to give off **gas**.

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Marks | KU | PS

21. (continued)

Use **all** of the information to answer the following questions.

(*a*) What is the relative density of the mineral with a limited supply in the Earth's crust?

..... **1**

(*b*) Which mineral is a carbonate?

..... **1**

(*c*) A fingernail has a hardness value of 2·5.

List all the minerals that can be scratched by a fingernail.

..... **1**

(*d*) What is the annual production of the mineral which has a relative density of 2·6?

..... million tonnes **1**

[Turn over

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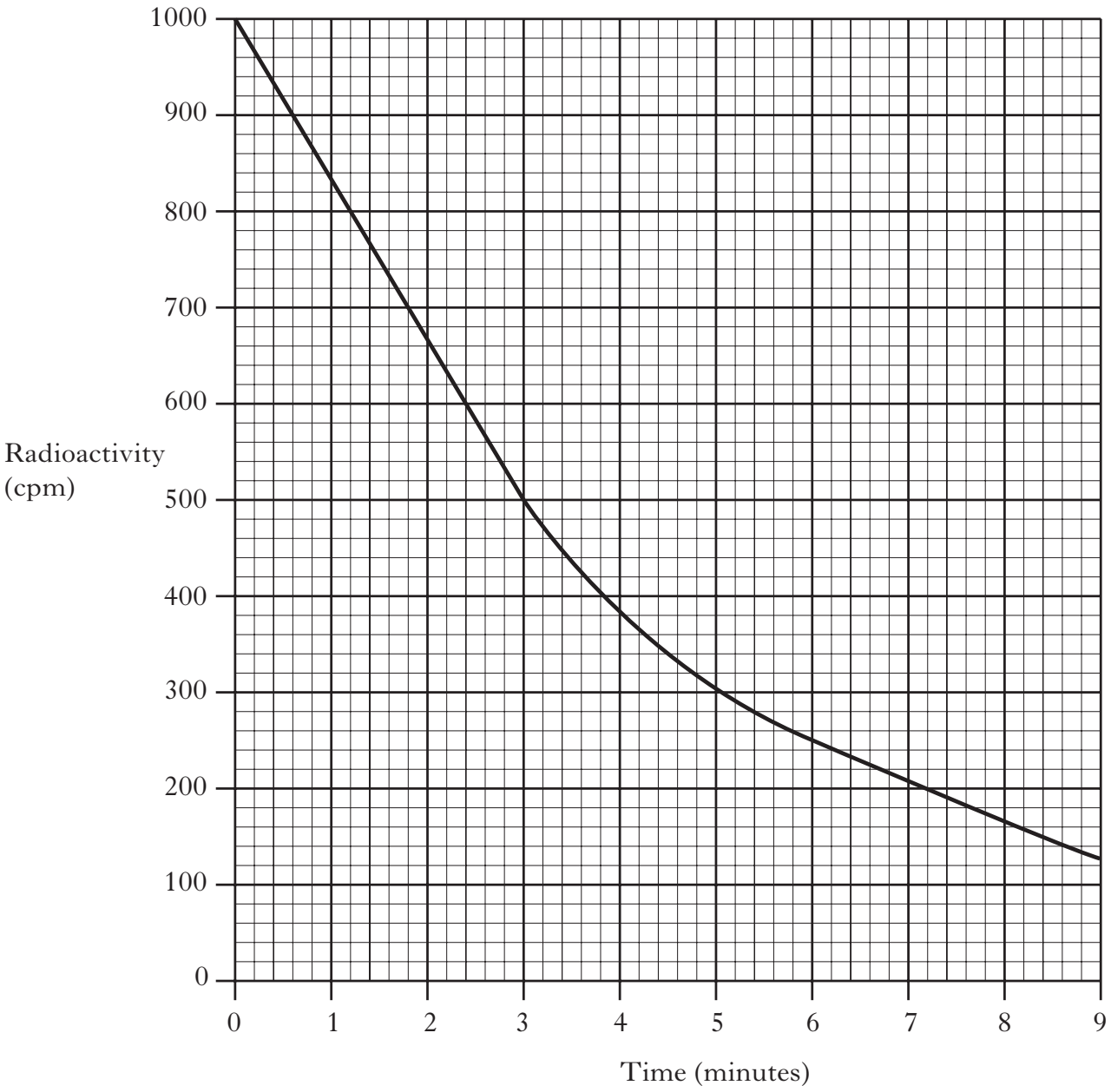
Marks | KU | PS

22. (*a*) The radioactivity of a sample of polonium-210 was measured and plotted on the graph shown.



What is the half-life of polonium-210?

..... minutes **1**

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Marks | KU | PS

22. (continued)

(*b*) The table gives information about three radioactive substances.

Radioactive Substance	*Half-life*
Bismuth-212	60·6 minutes
Radon-220	55·0 seconds
Lead-212	10·6 hours

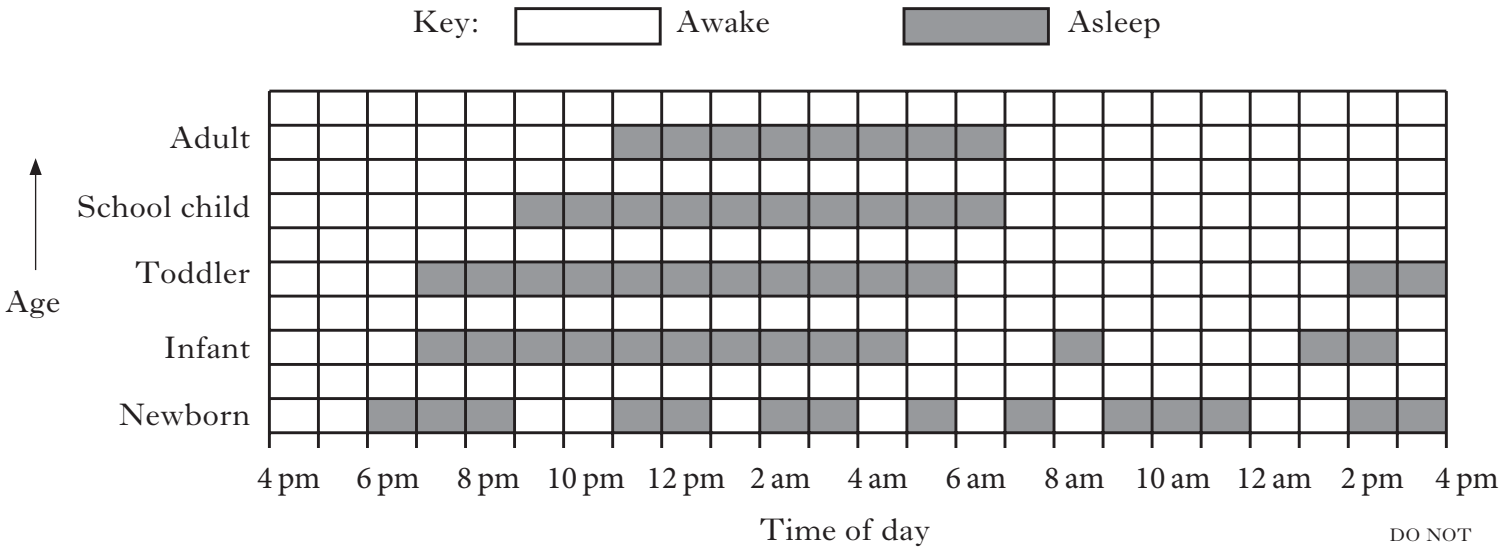
Which radioactive substance must be stored for the longest time before it becomes safe?

..... **1**

[Turn over

23. As humans get older their sleep patterns change.

The chart below shows sleep patterns over a 24 hour period for five people.



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Marks	KU	PS

(*a*) Which person

(i) has the longest continuous period of sleep?

..... **1**

(ii) sleeps for a total of 10 hours?

..... **1**

(*b*) Which **two** people are awake between 2 pm and 4 pm?

..... and **1**

(*c*) The infant has the same sleep pattern every day for one week.

Calculate the total number of hours of sleep the infant gets in this week.

Space for working

Answer ..... hours **2**

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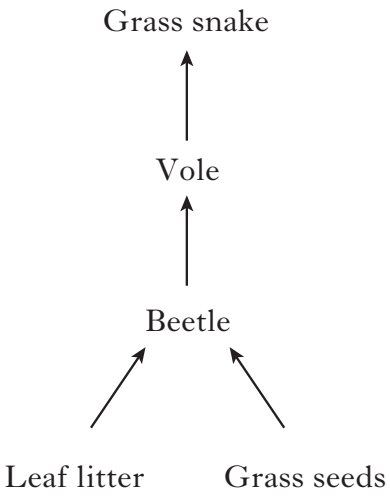
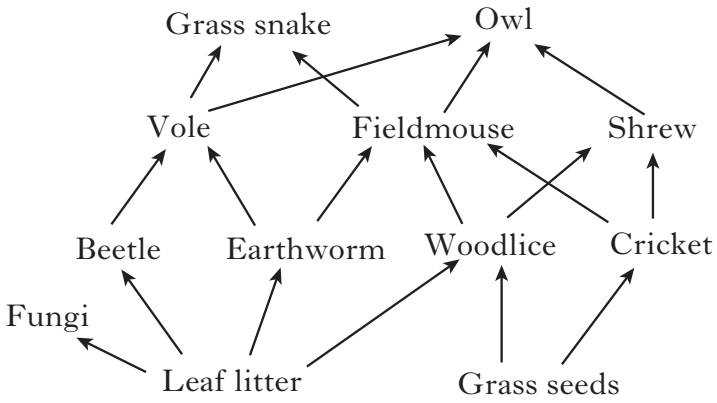
Marks | KU | PS

24. Two food webs are shown below.

Food web A



Food web B



(*a*) Which food web is more stable?

.....

Explain your answer

.....

..... **1**

(*b*) What word is used to describe organisms, such as fungi, which help to break down natural waste?

..... **1**

(*c*) Which of the following statements correctly describes the levels of pesticide in a food chain?

A A plant at the start of the food chain has the highest level of pesticide.

B An animal that eats plants has the highest level of pesticide.

C An animal at the end of the food chain has the highest level of pesticide.

D All the organisms in the food chain have the same level of pesticide.

Underline the correct answer. **1**

DO NOT WRITE IN THIS MARGIN

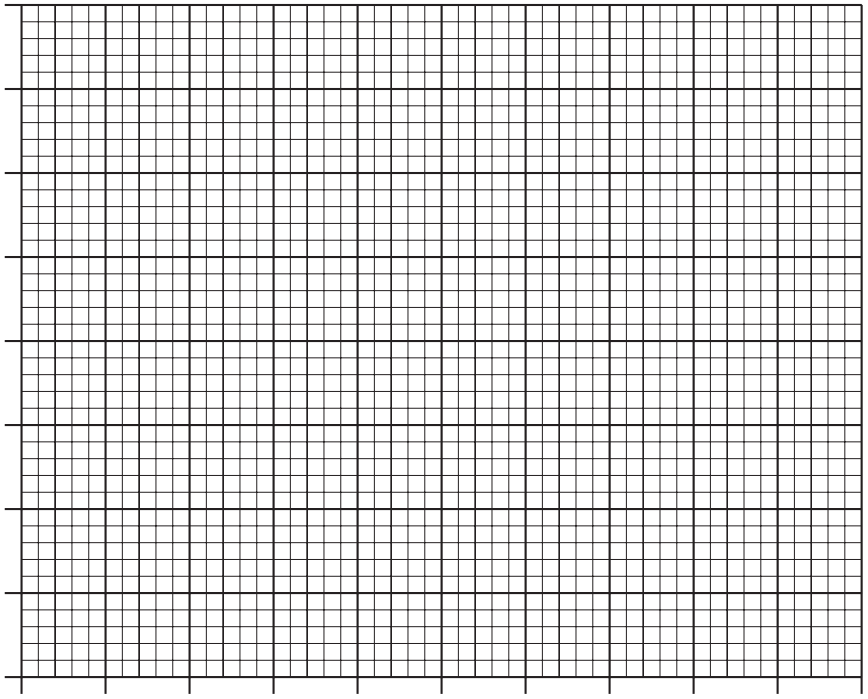
Marks | KU | PS

25. The table below shows the mass of ammonia produced at different temperatures and pressures.

Pressure (atm)	*Mass of ammonia* (tonnes)	
	at 350 °C	*at 450 °C*
50	600	300
100	900	600
150	1100	800
200	1300	900
250	1400	1000

(*a*) Using the **same axes**, show the results as two **line** graphs. Label each line clearly.

(Additional graph paper, if required, can be found on *Page twenty-six*.)



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(*b*) Predict the mass of ammonia formed at a temperature of 400 °C and a pressure of 175 atm.

..... tonnes **1**

[*END OF QUESTION PAPER*]

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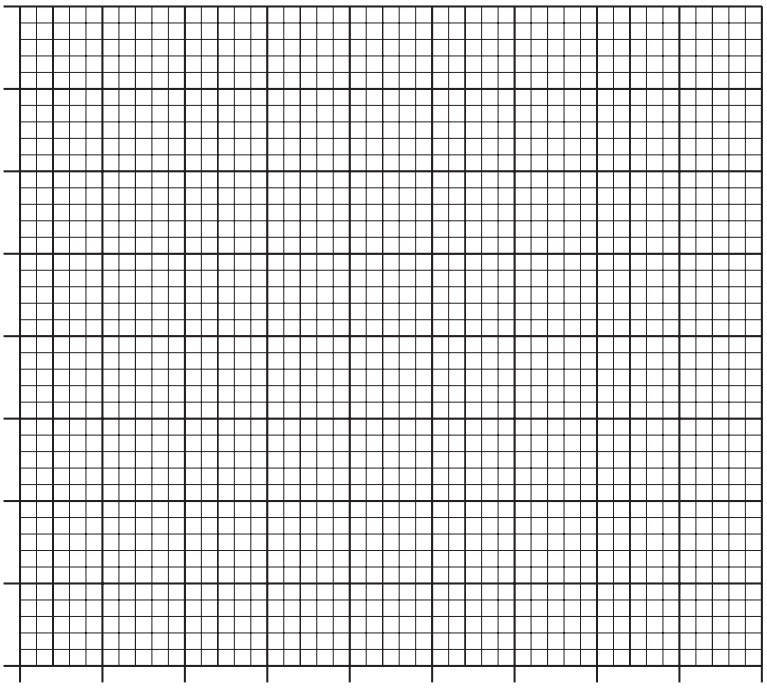
Marks | KU | PS

ADDITIONAL GRAPH PAPER FOR USE IN QUESTION 18(*a*)



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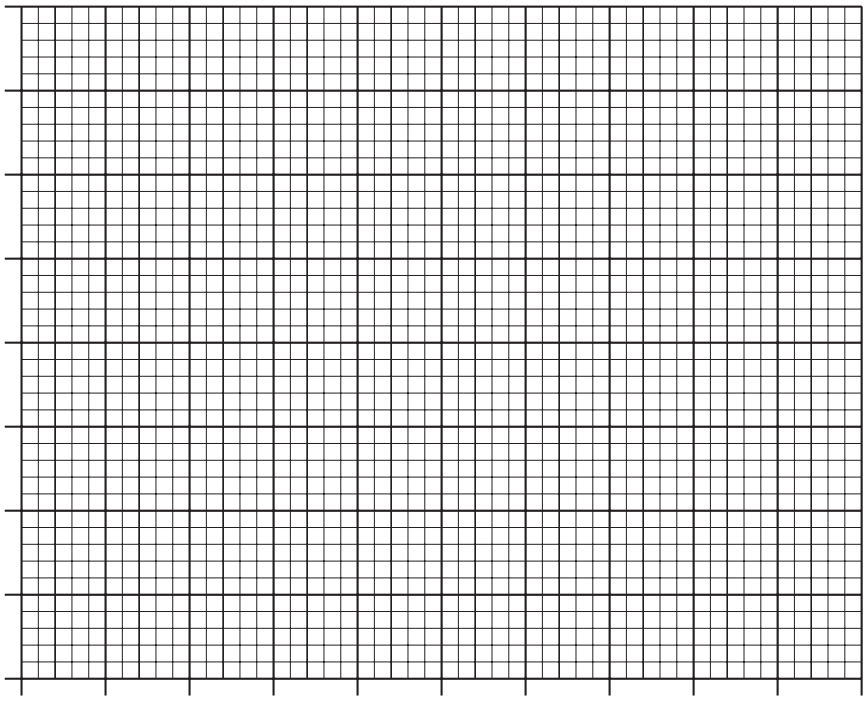
ADDITIONAL GRAPH PAPER FOR USE IN QUESTION 25(*a*)



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