OCR
Oxford Cambridge and RSA

F

Wednesday 24 May 2017 – Afternoon

GCSE GATEWAY SCIENCE
SCIENCE B

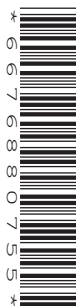**B711/01**   Science modules B1, C1, P1 (Foundation Tier)

Candidates answer on the Question Paper.
A calculator may be used for this paper.

OCR supplied materials:
None

Other materials required:
• Pencil
• Ruler (cm/mm)

Duration: 1 hour 15 minutes

Candidate forename		Candidate surname	

Centre number					Candidate number				

INSTRUCTIONS TO CANDIDATES

• Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
• Use black ink. HB pencil may be used for graphs and diagrams only.
• Answer **all** the questions.
• Read each question carefully. Make sure you know what you have to do before starting your answer.
• Write your answer to each question in the space provided. If additional space is required, you should use the lined page(s) at the end of this booklet. The question number(s) must be clearly shown.
• Do **not** write in the barcodes.

INFORMATION FOR CANDIDATES

• The quality of written communication is assessed in questions marked with a pencil (✐).
• A list of equations can be found on page 2.
• The Periodic Table can be found on the back page.
• The number of marks is given in brackets **[ ]** at the end of each question or part question.
• The total number of marks for this paper is **75**.
• This document consists of **28** pages. Any blank pages are indicated.

OCR is an exempt Charity

Turn over

2

EQUATIONS

energy = mass × specific heat capacity × temperature change

energy = mass × specific latent heat

$$\text{efficiency} = \frac{\text{useful energy output (× 100\%)}}{\text{total energy input}}$$

wave speed = frequency × wavelength

power = voltage × current

energy supplied = power × time

$$\text{average speed} = \frac{\text{distance}}{\text{time}}$$

distance = average speed × time

$$s = \frac{(u + v)}{2} \times t$$

$$\text{acceleration} = \frac{\text{change in speed}}{\text{time taken}}$$

force = mass × acceleration

weight = mass × gravitational field strength

work done = force × distance

$$\text{power} = \frac{\text{work done}}{\text{time}}$$

power = force × speed

$KE = \frac{1}{2}mv^2$

momentum = mass × velocity

$$\text{force} = \frac{\text{change in momentum}}{\text{time}}$$

GPE = mgh

$mgh = \frac{1}{2}mv^2$

$$\text{resistance} = \frac{\text{voltage}}{\text{current}}$$

3

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Question 1 begins on page 4

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4

Answer **all** the questions.

SECTION A – Module B1

1 **(a)** Cholera is an **infectious** disease.

What is the cause of cholera?

Put a tick (✓) in the box next to the correct answer.

bacteria ☐

fungi ☐

protozoa ☐

viruses ☐

[1]

(b) Cancer is a **non-infectious** disease.

(i) Describe the difference between infectious and non-infectious diseases.

....

.... **[1]**

(ii) Drugs used to treat cancer are often only available on prescription.

Write down **one** reason why some drugs are only available on prescription.

....

.... **[1]**

(iii) Look at the chart.

It shows the factors that cause cancer.
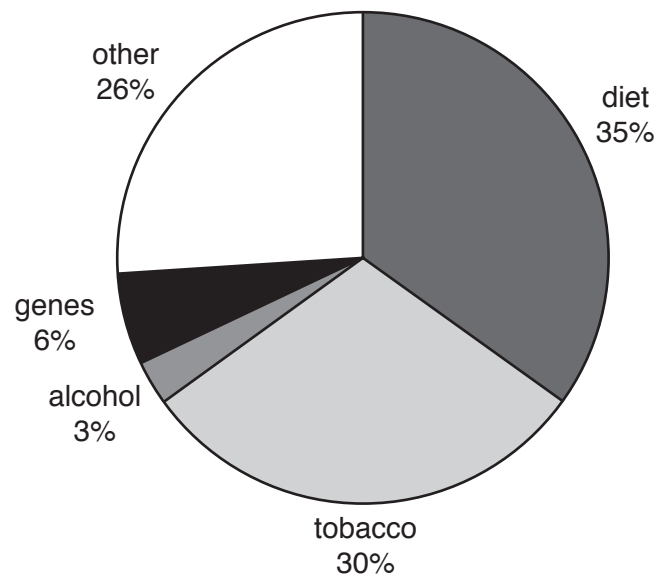
Write down **two** changes to a person's lifestyle that would **best** reduce their risk of getting cancer.

1 ....

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2 ....

....

[2]

2   Sam, Jan and Ann have different vision.

Look at the diagrams.

They show how light is focused when it enters their eyes.
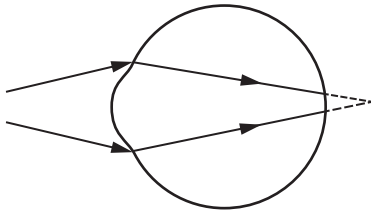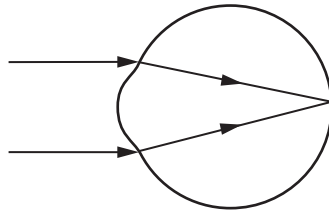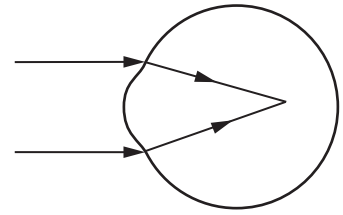
Sam   **Jan**   **Ann**

Jan's vision is normal.

Sam and **Ann** have different problems with their vision.

Describe the problems that Sam and Ann have with their vision.

Explain what could be wrong in their eyes to cause each of their problems.

The quality of written communication will be assessed in your answer to this question.

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.... **[6]**

7

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Question 3 begins on page 8

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3   (a)   The picture shows a plant growing on top of a table.

The plant is in a room with one window.

This window is the only light source.

| A | | B |

| D | | C |
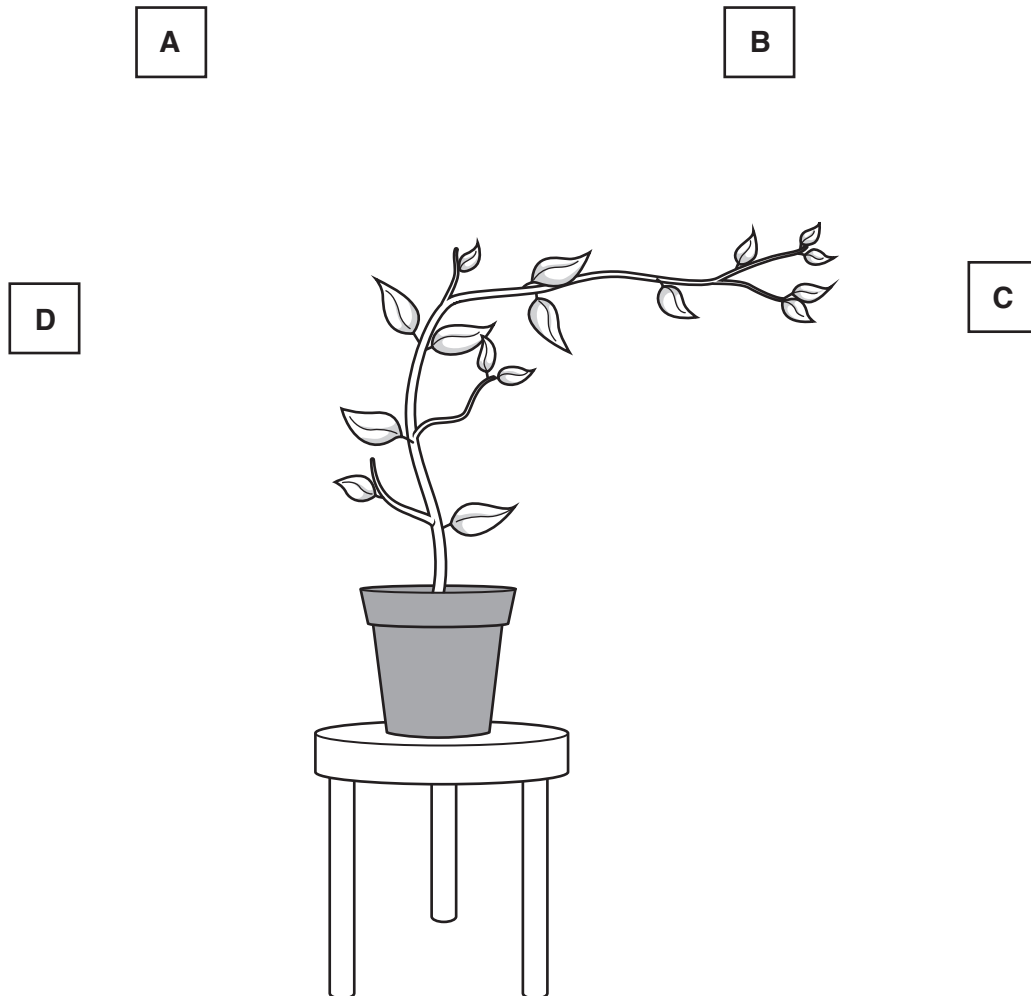
Write down the letter which shows the position of the window.

answer .... **[1]**

(b)   Jill wants to grow new plants from her favourite plant.

(i)   She knows that chemicals produced by plants can help speed up growth.

Write down the name of the **type** of chemical produced by plants that speeds up plant growth.

.... **[1]**

(ii) Jill takes cuttings from a plant.

She puts a white rooting powder on the cuttings.

compost

rooting powder

rooting powder
on cutting
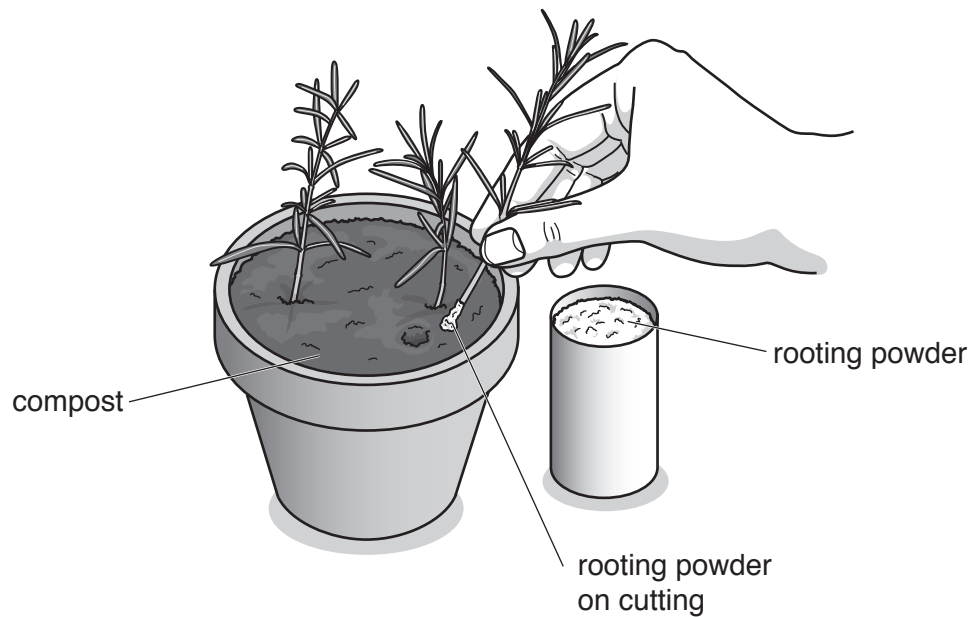
Jill then puts the cuttings into compost.

Jill uses 'Start-Root' rooting powder because she thinks it is the best.

Look at the table.

It shows the effects of different rooting powders on cuttings.

Rooting powder used	Mean number of roots per cutting after ten days	Mean root length after ten days in mm
none	7.6	22.1
Rootz-It	8.9	30.3
Roo-Ting	12.5	32.4
Start-Root	12.8	28.3

Is 'Start-Root' the best rooting powder?

Give reasons for your answer.

Use data from the table to support your answer.

....

....

.... **[2]**

4 Look at the table.

It shows information about the meat consumption per person in five countries.

| Country | Meat consumption per person in kg per year | | | |
| | Year | | | Mean |
	1960	1980	2002	
China	3.8	14.6	52.4	....
India	3.7	3.7	5.2	4.2
Kenya	18.6	17.4	14.3	16.8
UK	69.8	71.0	79.6	73.5
USA	89.2	108.1	124.8	107.4

(a) (i) Calculate the mean meat consumption per person in China for the years 1960, 1980 and 2002.

mean = ... kg per year **[1]**

(ii) In which country are people **most likely** to lack protein in their diet?

Explain your answer using data from the table.

....

....

.... **[2]**

(b) Write down **two** reasons why protein is needed in the diet.

....

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.... **[2]**

5 This question is about temperature control.

Tom is sledging in the snow.

Item removed due to third party copyright restrictions.

The outside temperature is 2 °C.

(a) Tom's body must have a temperature 35 °C higher than this outside temperature.

Explain why.

....

.... **[2]**

(b) Tom has an accident and needs first-aid.

His body can lose heat very quickly and this is dangerous.

Look at the guidance for first-aiders to help prevent injured people getting too cold.

• Wrap them in blankets.
• Get them to move around if possible.
• Give them warm sugary drinks or high energy foods, such as chocolate.
• Do **not** massage their limbs.

Write about how this guidance helps produce heat or keep heat in the body.

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.... **[3]**

Turn over

SECTION B – Module C1

6 (a) Nick is painting his kitchen.

One reason Nick paints his kitchen is to put a decorative coating on the walls.

Write down **one other** reason why Nick paints his kitchen.

.... **[1]**

(b) Nick uses **emulsion paint**.

Describe how emulsion paint dries.

....

.... **[1]**

(c) Nick also paints his granddaughter's bedroom.
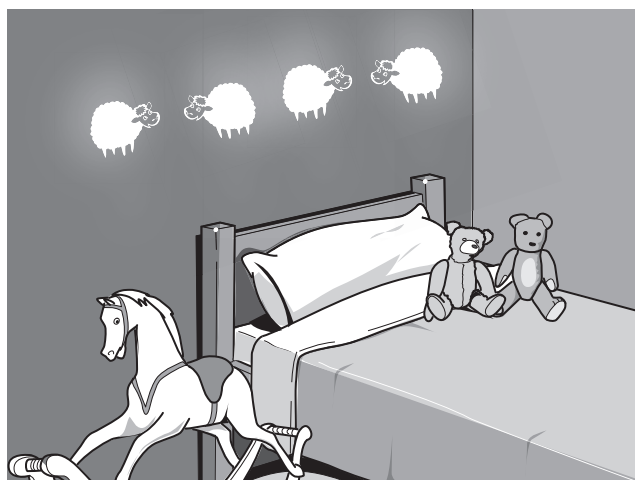
He wants a design to 'glow' on the walls at night when the room is dark.

What type of pigment should Nick's paint contain?

Choose from the list.

biodegradable

breathable

finite

phosphorescent

thermochromic

answer .... **[1]**

(d) Look at the pie charts showing the ingredients in three types of paint.

A

B

C
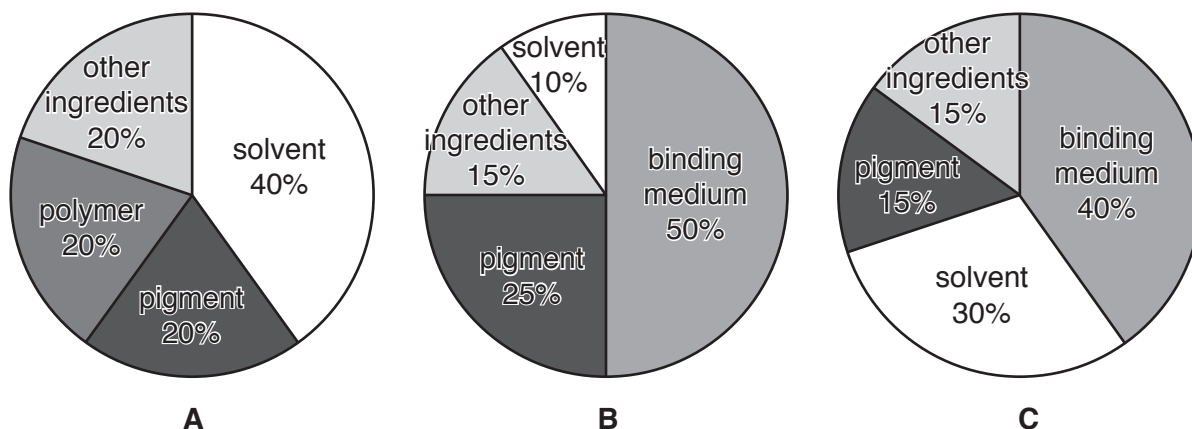
Which paint would you expect to stick most easily to the wall?

Explain your choice.

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.... **[2]**

7 Look at the information about five different fuels.

Fuel	Cost per litre in pence	Relative energy content per litre	Relative mass of carbon dioxide made per kJ
Butane	136.96	7.97	0.244
Gas oil	47.66	10.40	0.341
Kerosene	30.98	9.80	0.300
LPG	37.50	6.66	0.244
Propane	74.24	7.07	0.244

(a) Liz thinks that **gas oil** would be the best fuel to heat her house.

Is she right?

Use information from the table to explain your answer.

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.... **[2]**

(b) Write down **two other** factors, apart from those given in the table, which Liz needs to consider when choosing a fuel for her house.

....

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.... **[2]**

(c) Look at the **balanced symbol** equation for the combustion of propane.

$$C_3H_8 + 5O_2 \rightarrow 3CO_2 + 4H_2O$$
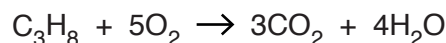
(i) Write down the **formula** for a **product** in this reaction.

.... **[1]**

(ii) Explain how you can tell that the equation is balanced.

....

.... **[1]**

15

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Question 8 begins on page 16

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8 Jamie wants to buy a new pair of walking boots.

(a) Look at the table. It gives information about three materials.

Material	Is it waterproof?	Is sweat absorbed?	Is it breathable?
A	yes	escapes through material	yes
B	yes	not absorbed	no
C	no	absorbed	no

Which material is most suitable for a pair of walking boots?

Explain your choice.

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.... **[2]**

(b) Material B is nylon. Look at the chemical formula for nylon.

$$-\left[\begin{array}{c} H \\ | \\ N \end{array} - (CH_2)_6 - \begin{array}{c} H \\ | \\ N \end{array} - \begin{array}{c} O \\ || \\ C \end{array} - (CH_2)_{10} - \begin{array}{c} O \\ || \\ C \end{array}\right]_n$$
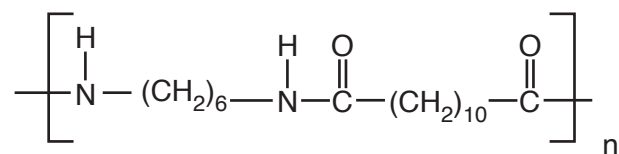
(i) How many **different elements** are in the chemical formula for nylon?

answer .... **[1]**

(ii) What type of compound is nylon?

Choose from the list.

alkene

hydrocarbon

monomer

polymer

saturated

answer .... **[1]**

9 Chemicals called **esters** can be used to make perfumes or used as solvents.

(a) Perfumes have a pleasant smell.

Perfumes must not be toxic.

Write down **two other** properties that perfumes must have.

....

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.... **[2]**

(b) Perfumes must be thoroughly tested before they can be sold.

In the past, perfumes were tested on animals.

Testing on animals is now banned in the EU.

Write about **two** different views that people have about testing perfumes on animals.

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.... **[2]**

(c) Kevin investigates five different solvents.

He wants to find the best solvent for removing a grease stain from his school blazer.

Solvent	How easily does it evaporate? (10 = good, 1 = poor)	How effective is it at dissolving grease? (10 = good, 1 = poor)	Is it toxic?	Is it flammable?
A	8.0	1.6	✓	✓
B	5.6	4.5	✓	✓
C	7.8	4.2	✗	✓
D	10.0	4.5	✗	✗
E	6.8	5.1	✓	✓

Explain what is meant by a solvent.

Explain which solvent would be best for Kevin to use to remove the grease from his blazer.

Use information from the table to help you.

The quality of written communication will be assessed in your answer to this question.

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.... **[6]**

Turn over

20

SECTION C – Module P1

10 There are seven types of electromagnetic wave.

radio waves	wave **A**	infrared	wave **B**	ultraviolet	X-rays	gamma rays

    (a) Wave **A** is used in mobile phone communication.

       Write down the name of this **type** of electromagnetic wave.

       .... **[1]**

    (b) Wave **B** can travel along optical fibres by reflection.

       Write down the name of this **type** of electromagnetic wave.

       .... **[1]**

    (c) A radio wave has a frequency of 3 000 000 Hz.

       It has a wavelength of 100 m.

      (i) Calculate the speed of this radio wave.

            answer .... m/s.   **[2]**

      (ii) Complete the sentences about wave **A**.

            Choose from

                 higher than   **lower than**   **the same as**

            The frequency of wave **A** is .... the radio wave.

            The speed of wave **A** is .... the radio wave.   **[2]**

(d) Three features **X**, **Y** and **Z** of an electromagnetic wave are shown in the diagram.
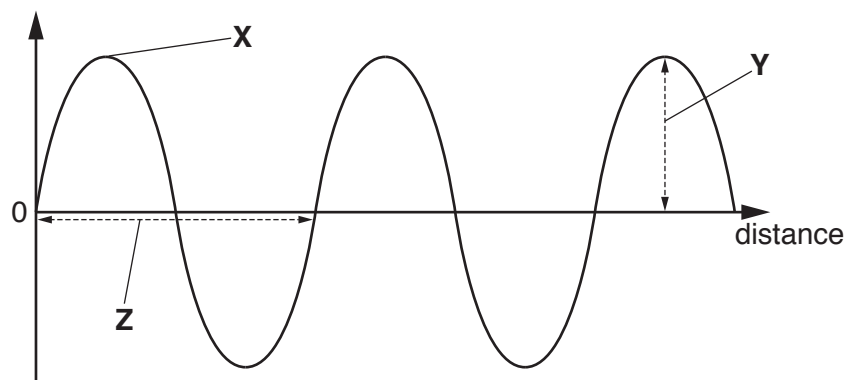
Write down the names of the three features **and** describe feature **Z**.

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.... **[3]**

Turn over

11 Paloma wants to insulate her house.

She finds information about different types of insulation.

Type of insulation	Cost to fit in £	Money saved each year in £	Payback time in years
Double glazing	3000	....	20
Cavity wall insulation	600	100	6
Draught-proofing	25	50	0.5
Loft insulation	200	100	....

(a) (i) Calculate the money saved each year for double glazing.

answer £ .... **[1]**

(ii) Calculate the payback time for loft insulation.

answer .... years **[1]**

(b) Paloma has up to £600 to spend on insulation.

She has two options.

Option **1**   Fit only cavity wall insulation.

Option **2**   Fit draught proofing **and** loft insulation.

Use the information in the table to suggest which option is best.

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.... **[2]**

(c) Cavity wall insulation is made of foam.

Explain why it is important that foam must contain air.

....

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.... **[2]**
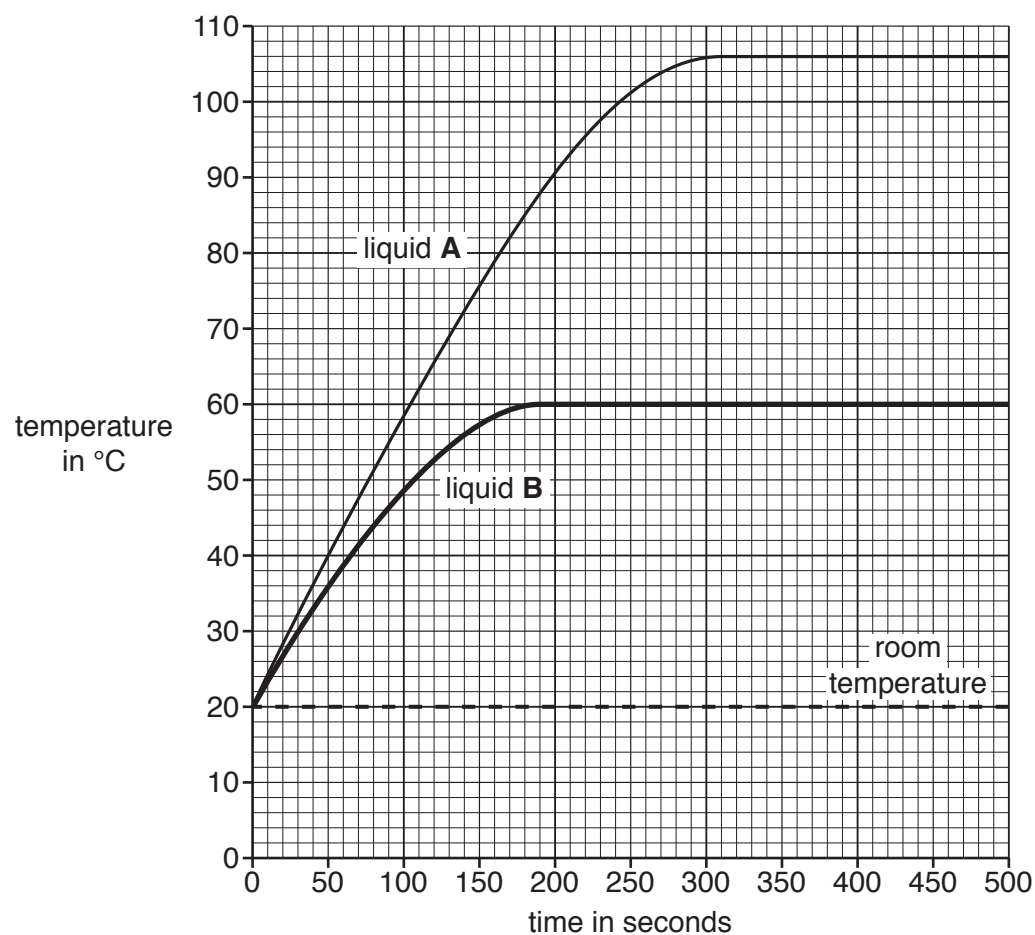
23

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Question 12 begins on page 24

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12 Eddie heats liquid **A** and records the temperature for 8 minutes every 50 seconds.

He then heats the same mass of liquid **B** and records the temperature for 8 minutes every 50 seconds.

Look at his results.

25

Eddie makes the conclusion that both liquids boiled during the experiment.

Describe and explain the shapes of the lines for liquid **A** and liquid **B**.

Use this information to write down the boiling point of liquid **A** and the boiling point of liquid **B**.

🖉 *The quality of written communication will be assessed in your answer to this question.*

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.... **[6]**

Turn over

13 Infrared radiation is used in TV remote controls and in sensors.

(a) TV remote controls use flashes of infrared radiation.

These flashes of infrared radiation can be shown in a model.

0   0   1   0   0   1   0
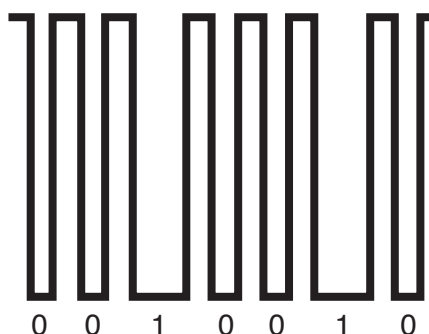
(i) What type of signal is shown in the model?

Choose from

analogue   automatic   continuous   digital

answer .... **[1]**

(ii) Use the model to describe the difference between 0 (off) and 1 (on).

....

....

.... **[2]**

(b) One type of infrared sensor detects human movement.

This sensor does **not** detect a book falling off a desk.

Put a tick (✓) next to the **best** explanation about how this infrared sensor works.

It detects energy. ☐

It detects large objects. ☐

It detects things that are the shape of humans. ☐

It detects things that move long distances. ☐

[1]

END OF QUESTION PAPER

ADDITIONAL ANSWER SPACE

If additional space is required, you should use the following lined page(s). The question number(s) must be clearly shown in the margin(s).

The Periodic Table of the Elements

Key

relative atomic mass	
atomic symbol	
name	
atomic (proton) number	

			1 H hydrogen 1							

Group 1	Group 2										Group 3	Group 4	Group 5	Group 6	Group 7	Group 0
																4 **He** helium 2
7 **Li** lithium 3	9 **Be** beryllium 4										11 **B** boron 5	12 **C** carbon 6	14 **N** nitrogen 7	16 **O** oxygen 8	19 **F** fluorine 9	20 **Ne** neon 10
23 **Na** sodium 11	24 **Mg** magnesium 12										27 **Al** aluminium 13	28 **Si** silicon 14	31 **P** phosphorus 15	32 **S** sulfur 16	35.5 **Cl** chlorine 17	40 **Ar** argon 18
39 **K** potassium 19	40 **Ca** calcium 20	45 **Sc** scandium 21	48 **Ti** titanium 22	51 **V** vanadium 23	52 **Cr** chromium 24	55 **Mn** manganese 25	56 **Fe** iron 26	59 **Co** cobalt 27	59 **Ni** nickel 28	63.5 **Cu** copper 29	65 **Zn** zinc 30	70 **Ga** gallium 31	73 **Ge** germanium 32	75 **As** arsenic 33	79 **Se** selenium 34	80 **Br** bromine 35	84 **Kr** krypton 36
85 **Rb** rubidium 37	88 **Sr** strontium 38	89 **Y** yttrium 39	91 **Zr** zirconium 40	93 **Nb** niobium 41	96 **Mo** molybdenum 42	[98] **Tc** technetium 43	101 **Ru** ruthenium 44	103 **Rh** rhodium 45	106 **Pd** palladium 46	108 **Ag** silver 47	112 **Cd** cadmium 48	115 **In** indium 49	119 **Sn** tin 50	122 **Sb** antimony 51	128 **Te** tellurium 52	127 **I** iodine 53	131 **Xe** xenon 54
133 **Cs** caesium 55	137 **Ba** barium 56	139 **La*** lanthanum 57	178 **Hf** hafnium 72	181 **Ta** tantalum 73	184 **W** tungsten 74	186 **Re** rhenium 75	190 **Os** osmium 76	192 **Ir** iridium 77	195 **Pt** platinum 78	197 **Au** gold 79	201 **Hg** mercury 80	204 **Tl** thallium 81	207 **Pb** lead 82	209 **Bi** bismuth 83	[209] **Po** polonium 84	[210] **At** astatine 85	[222] **Rn** radon 86
[223] **Fr** francium 87	[226] **Ra** radium 88	[227] **Ac*** actinium 89	[261] **Rf** rutherfordium 104	[262] **Db** dubnium 105	[266] **Sg** seaborgium 106	[264] **Bh** bohrium 107	[277] **Hs** hassium 108	[268] **Mt** meitnerium 109	[271] **Ds** darmstadtium 110	[272] **Rg** roentgenium 111						

Elements with atomic numbers 112-116 have been reported but not fully authenticated

The lanthanoids (atomic numbers 58-71) and the actinoids (atomic numbers 90-103) have been omitted.

The relative atomic masses of copper and chlorine have not been rounded to the nearest whole number.