OCR
Oxford Cambridge and RSA

F

Friday 3 November 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

* B 7 1 1 0 1 *

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.

EQUATIONS

energy = mass × specific heat capacity × temperature change

energy = mass × specific latent heat

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

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

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

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

Answer **all** the questions.

SECTION A – Module B1

1 Sharon needs to wear glasses to see into the distance clearly.

(a) What problem does Sharon have with her eyes?

Put a (ring) around the correct answer.

binocular vision

long-sightedness

monocular vision

red-green colour blindness

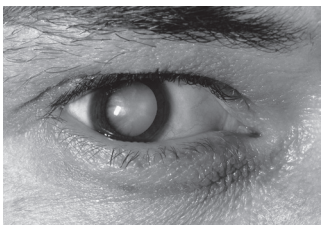
short-sightedness **[1]**

(b) What causes the problem Sharon has with her eyes?

.....

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

(c) Sharon's grandfather has a problem with his right eye.



The lens in the right eye has become cloudy.

This condition is called a cataract.

Suggest and explain how the cataract will affect the sight in his right eye.

.....

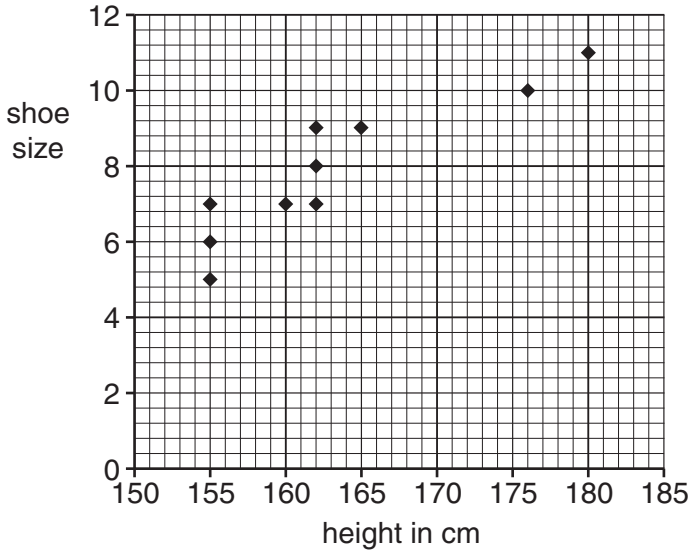
.....

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

2 Celia and Martin investigate variation.

They record the height and shoe size of ten friends.

They then plot the results as a scatter graph.



Write about the data in the graph.

Include ideas about:

- reasons why the friends have different heights and shoe sizes
- any patterns in the data
- how valid the data are and how the investigation could be improved.

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

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..... **[6]**

3 Look at the map of the world. It shows the parts of the world where people can catch malaria.

Key:

no malaria

malaria present

(a) In which part of the world is there **no** malaria?

Choose from the list.

Africa **Asia** **Australia** **South America**

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

(b) The climate becomes colder the further you get from the equator.

Is there a link between climate and malaria?

Use the map to help explain your answer.

.....

.....

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

(c) Describe how malaria passes from one person to another.

.....

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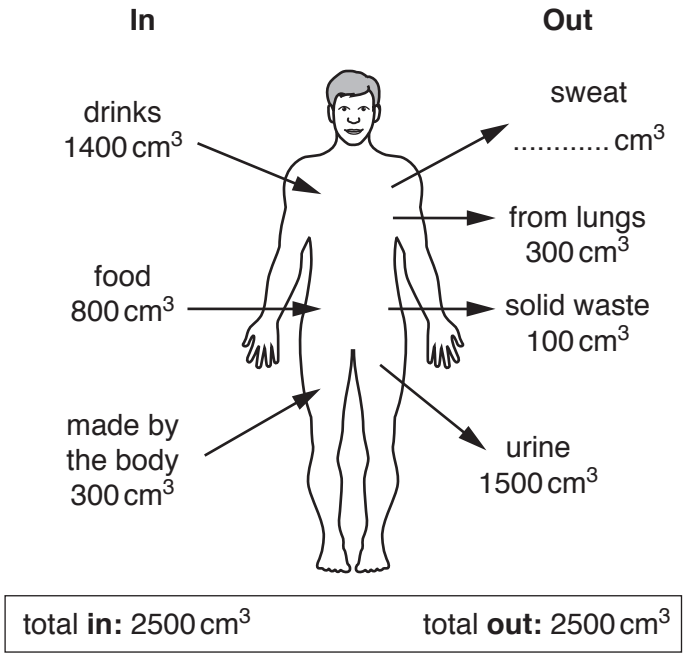
..... **[2]**

4 Look at the diagram. It shows how much water one person takes in and loses in one day.



(a) The body needs to maintain steady levels of water.

Calculate the amount of water lost by sweat.

..... cm^3 **[1]**

(b) Sweating helps the body to lose heat.

Write down **two** different ways in which the body **gains** heat.

.....

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

(c) The body also needs to control the amount of sugar in the blood.

To do this the body makes a hormone called insulin.

(i) Which organ of the body makes insulin?

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

(ii) Some people have a condition that means they cannot make insulin.

Write down the name of this condition.

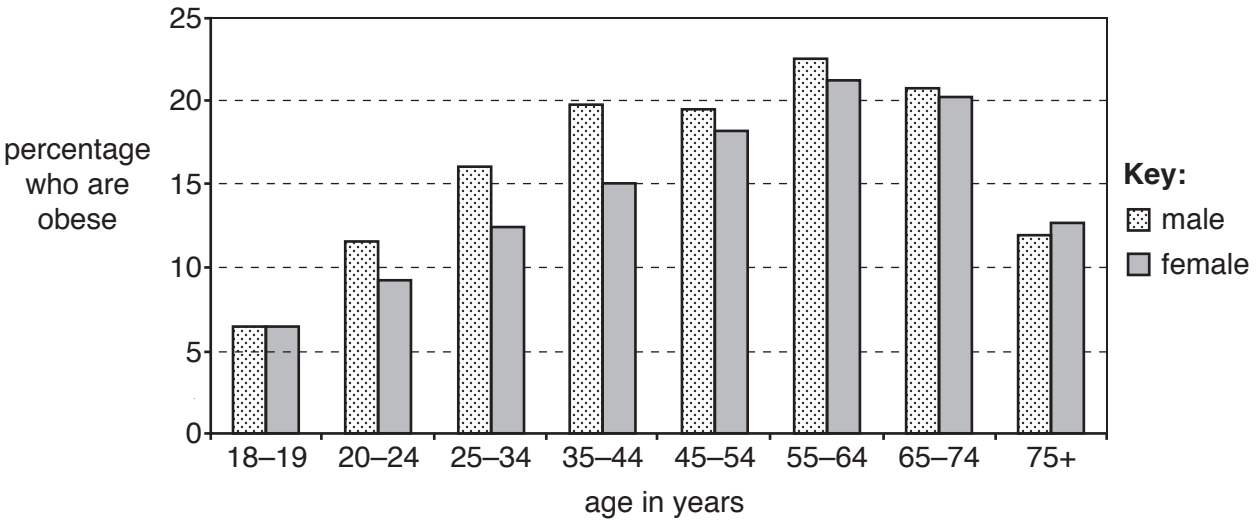
..... **[1]**

5 Janet does some research on obesity.

Obesity is a condition where a person is very overweight.

She finds this graph on the internet.

It shows the percentage of the population that are obese in one country.



(a) Janet makes this conclusion about the data in the graph.

> The 75+ age group is the only age group where there is a larger percentage of obese females than obese males.

Write down **two** other conclusions from the data.

.....

.....

.....

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

(b) Obesity has been linked to some health risks such as heart disease.

Write down **one other** health risk that is linked to obesity.

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

(c) Janet looks at the food labels for two 'ready meals'.

meal **A**

Per pack provides....

286	2.0 g	8.0 g	3.6 g	1.5 g
Calories	Sugar	Fat	Saturated Fat	Salt
14%	2.2%	11%	18%	25%

of your guideline daily amount

meal **B**

Per pack provides....

495	2.0 g	18.3 g	9.2 g	2.0 g
Calories	Sugar	Fat	Saturated Fat	Salt
25%	2.2%	26%	46%	33%

of your guideline daily amount

Meal **A** would be better for somebody who is obese.

Suggest **two** reasons why.

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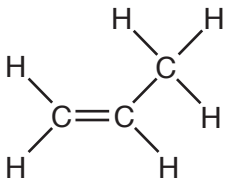
..... **[2]**

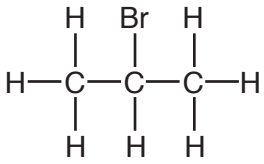
SECTION B – Module C1

6 This question is about carbon compounds.

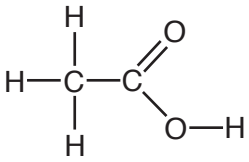
Look at the displayed formulas of some compounds.



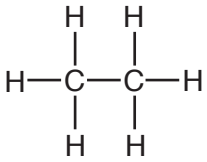
compound **A**



compound **B**



compound **C**



compound **D**

(a) Choose a compound that is a **hydrocarbon**.

.....

Explain your answer.

.....

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

(b) Look at the displayed formula of compound **C**.

How many **different elements** are in compound **C**?

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

(c) Compound **A** is propene.

Many propene molecules react together to make a **polymer**.

(i) Write down the **name** of the polymer.

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

(ii) Many polymers are non-biodegradable.

Write about **two** ways of disposing of polymers.

.....

.....

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

7 Trevor drives a car with a diesel engine.

Julie drives a car with a petrol engine.

Look at the table.

It gives information about the two different car engines.

	Pollutant made in g/km		
	Carbon dioxide	**Carbon monoxide**	**Oxides of nitrogen**
Petrol engine	148	265	8
Diesel engine	94	172	139

(a) Trevor says that his **diesel** engine causes less pollution than Julie's petrol engine.

Is he correct?

Explain your answer. Use information from the table.

.....

.....

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

(b) In a car engine petrol reacts with oxygen.

Carbon dioxide and water are made.

Write a **word equation** for this reaction.

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

(c) **Carbon monoxide** is also made in a car engine.

Suggest why.

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

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8 Mary bakes a cake.

She uses baking powder to help her cake to rise.

Baking powder contains sodium hydrogencarbonate.

Look at the word equation for the decomposition of sodium hydrogencarbonate.

sodium hydrogencarbonate → sodium carbonate + carbon dioxide + water

(a) How does baking powder help Mary's cake to rise?

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

(b) Look at the symbol equation for the decomposition of sodium hydrogencarbonate.

..... $NaHCO_3 \rightarrow Na_2CO_3 + CO_2 + H_2O$

Balance the symbol equation by putting a number on the dotted line. **[1]**

(c) Mary stores her cake in a plastic box.

Look at the table. It gives information about different plastics.

Plastic	Is it biodegradable?	Is it toxic?	Stiff or flexible?	Melting point
A	yes	yes	flexible	high
B	no	no	stiff	high
C	yes	no	flexible	low
D	no	yes	stiff	high

Which plastic would be best for making the box for Mary's cake?

.....

Explain your answer.

.....

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

(d) Paul heats four substances.

Look at his results table.

Substance	Appearance before heating	Appearance during heating	Appearance after leaving to cool
E	pink solid	brown solid	brown solid
F	colourless liquid	white solid	white solid
G	colourless solid	colourless liquid	colourless solid
H	dark yellow liquid	pale yellow solid	pale yellow solid

Which substance does **not** undergo a chemical change when heated?

.....

Explain your answer.

.....

.....

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

9 This question is about crude oil.

Crude oil is found under the seabed.

Oil rigs pump crude oil to the surface of the sea.

(a) Pumping oil from under the seabed to the surface can cause environmental problems.

Write about **two** of these problems.

.....

.....

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

(b) Fractional distillation separates crude oil into useful products (fractions).

Put ticks (✓) next to the **two** useful fractions that are made by fractional distillation of crude oil.

bitumen	☐
bromine water	☐
paraffin	☐
pigment	☐
poly(ethene)	☐

[1]

(c) Look at the table.

It gives information about some of the fractions that are made from crude oil.

Fraction	Number of carbon atoms in a molecule	Percentage found in North Sea crude oil (supply)	Percentage required for use (demand)
LPG	1 – 5	2	4
petrol	5 – 10	8	22
naphtha	8 – 12	10	5
kerosene	16 – 24	14	8
fuel oil	20 – 27	21	23
residue	45	45	38

Crude oil contains too much of some fractions and not enough of others.

An oil refinery uses **cracking** to match the supply of crude oil fractions to their demand.

Write about cracking, including the conditions used.

Use information in the table to decide and explain which fractions should be cracked.

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

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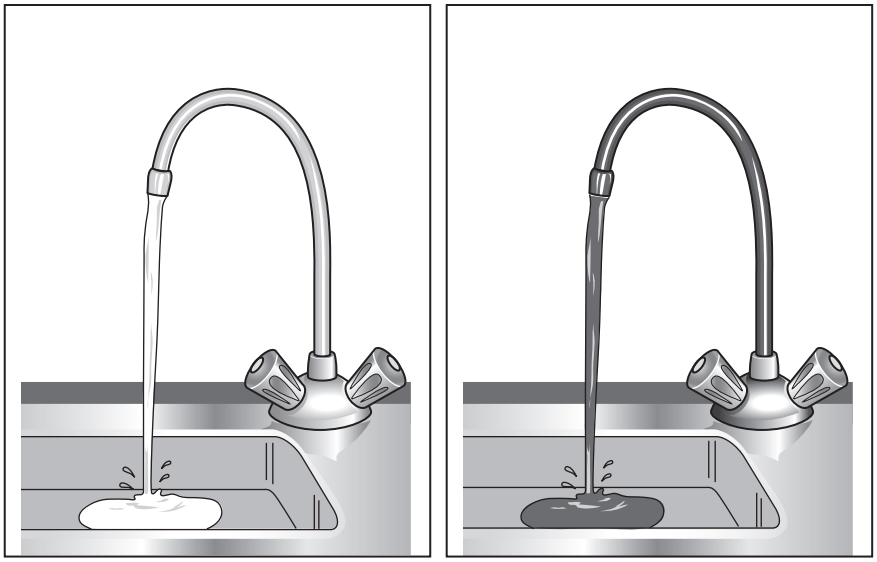
..... **[6]**

SECTION C – Module P1

10 Nina uses a thermal camera to take pictures of the sink and tap in her kitchen.



A **B**

(a) The water from the tap in picture **A** is at a different temperature to the water in picture **B**.

Which picture shows the water at the **lower** temperature?

.....

Explain your answer.

.....

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

(b) The water hits the bottom of the sink.

Energy is transferred when the water hits the sink.

Look at picture **A**. In which direction is energy transferred and what happens to the temperature of the sink as a result?

.....

.....

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

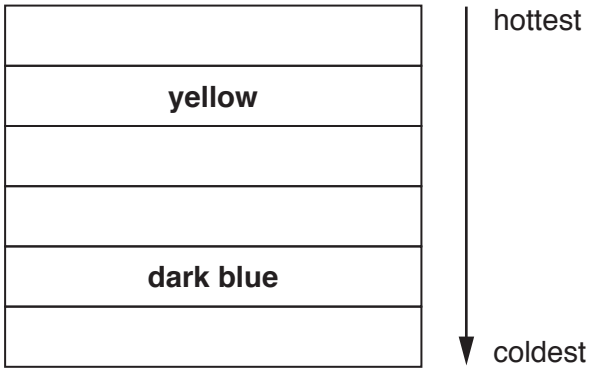
(c) Nina's pictures are in shades of black, white and grey.

Thermograms usually have the colours listed below.

black **dark blue** **purple** **red** **white** **yellow**

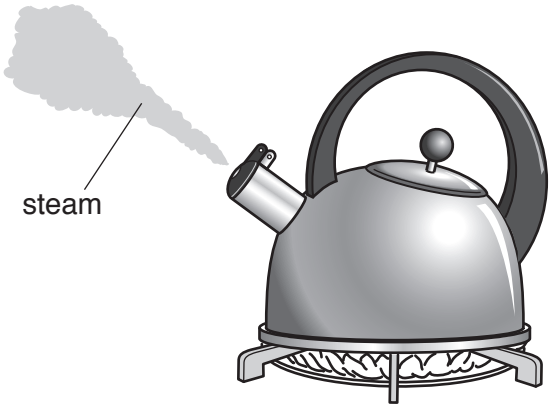
Put these thermogram colours in order of hottest to coldest.

Two have been done for you.



[1]

(d) Nina boils some water in her kettle.



The temperature of the steam is 100 °C.

What is the temperature of the boiling water?

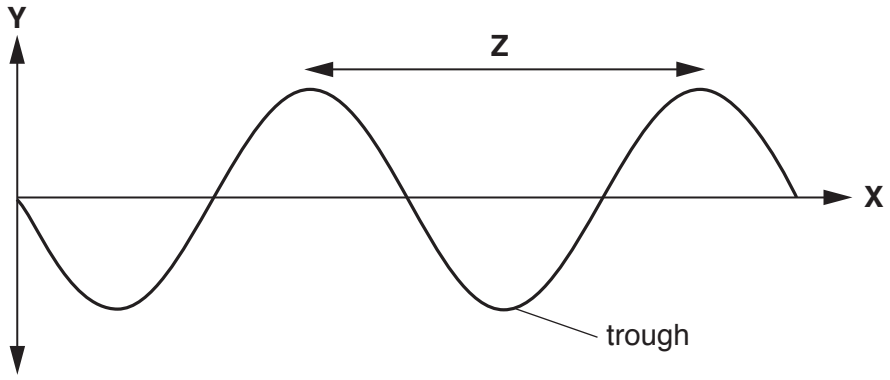
Choose the best answer from

94 °C **96 °C** **98 °C** **100 °C** **104 °C**

answer ..... °C **[1]**

11 The electromagnetic spectrum is made up of transverse waves.

Look at the diagram of a transverse wave.



(a) Tick (✓) the **three** correct sentences about the wave in the diagram.

Z is the wavelength of the wave.	☐
The wave has an amplitude.	☐
The axis labelled **X** is distance.	☐
The axis labelled **Y** is time.	☐

[1]

(b) Microwaves are part of the electromagnetic spectrum.

(i) A microwave has a wavelength of 0.5 m.

It has a frequency of 600 000 000 Hz.

Calculate the wave speed.

.....

.....

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

(ii) The wave speed of all electromagnetic waves in a vacuum is the same.

The wavelength of the microwave is **doubled**.

What happens to the frequency?

Choose from

doubled

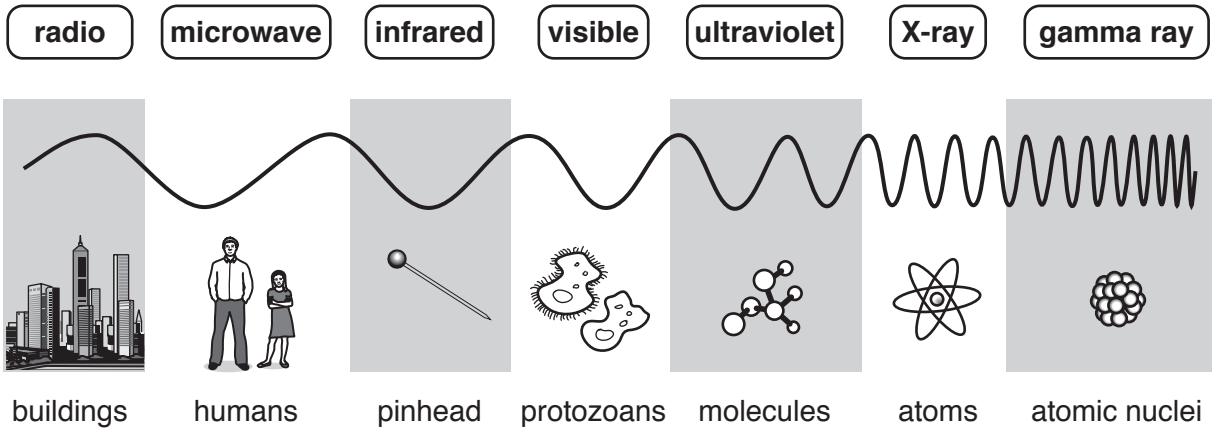
halved

increases by 2 m

stays the same

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

(c) Amrit finds some information on the internet about electromagnetic waves.

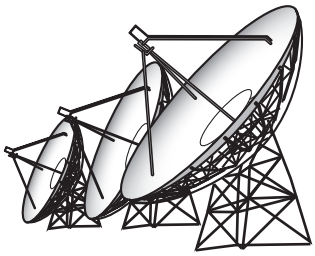


(i) The wavelength of a radio wave is about the same size as a building (50 m).

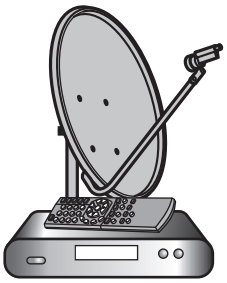
Use the diagram to estimate the wavelength of an infrared wave.

My estimate of the wavelength of an infrared wave is ..... unit ..... **[1]**

(ii) Amrit also finds pictures of communication receivers.



radio dish
diameter = 30 m



microwave dish
diameter = 10 cm

human retina eye cell
diameter = 0.0001 mm

Describe how the size of the receiver is related to the waves it receives.

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

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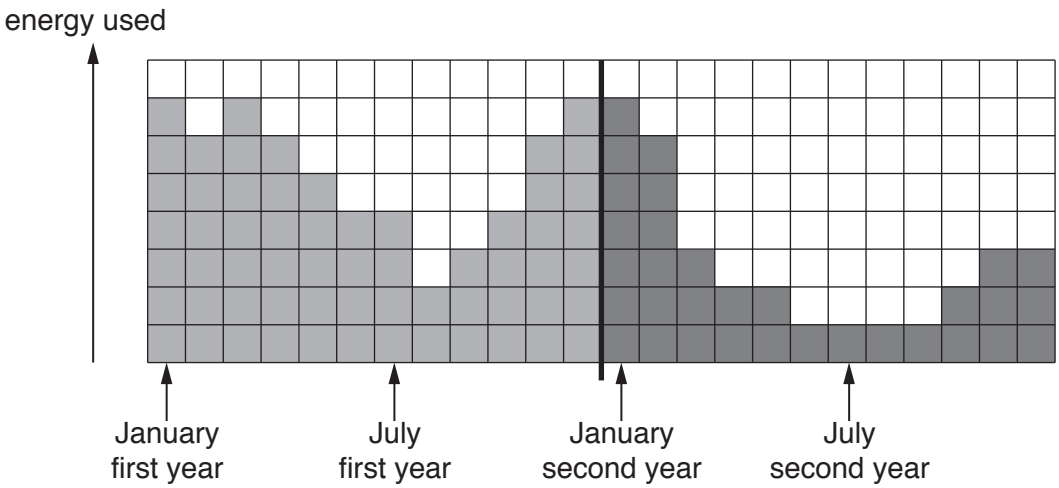
12 George has an energy report for his home.

(a) He looks at the total amount of energy he used each month for two years.



George added insulation to his house during the second year.

Describe the pattern in energy use over the two years.

Suggest when the insulation was fitted **and** explain why adding insulation to the house changes the amount of energy used.

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

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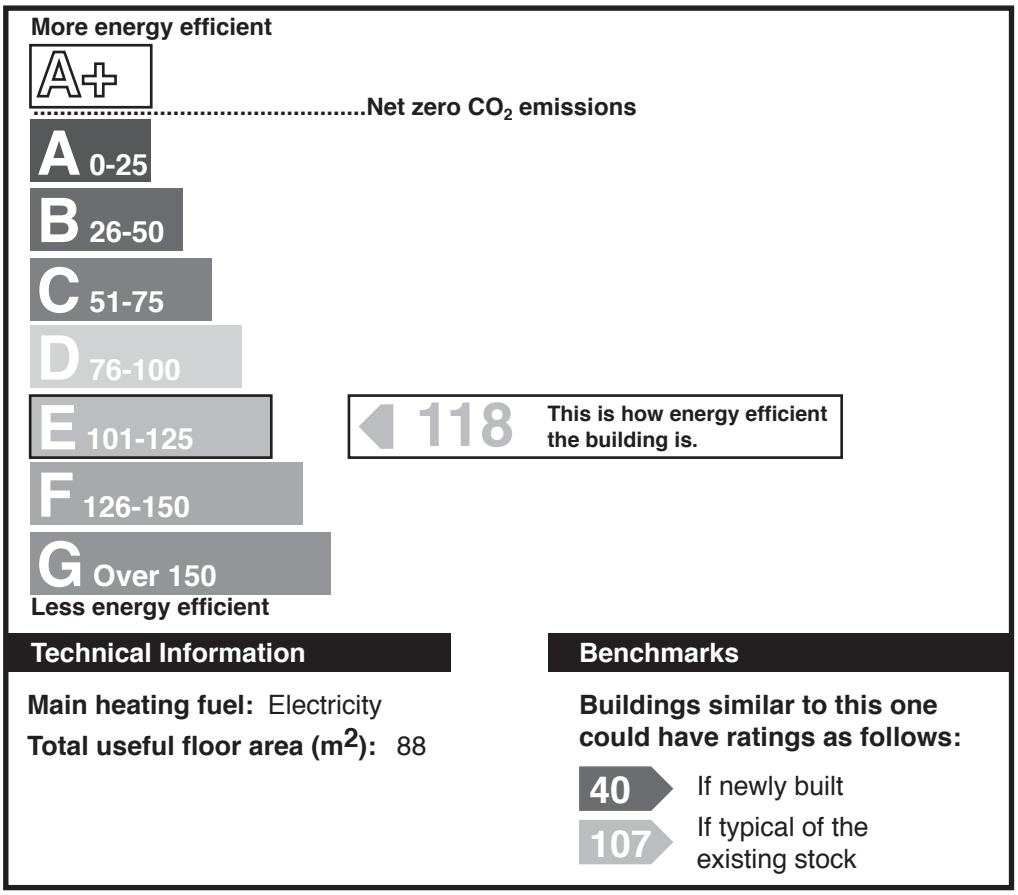
..... **[6]**

(b) Energy performance certificates contain different information.



Write down which parts of the certificate are **claims** and which parts are **scientific evidence.**

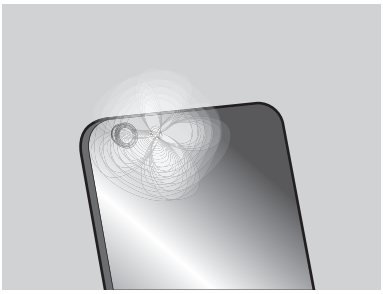
.....

.....

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

13 Light has many uses.

(a) Nicola has a torch on her mobile phone.



She can use the light from the torch to communicate with her friend at the other end of the school hall.

What does Nicola's friend need to know in order to understand the light message?

Choose from

the brightness of the light

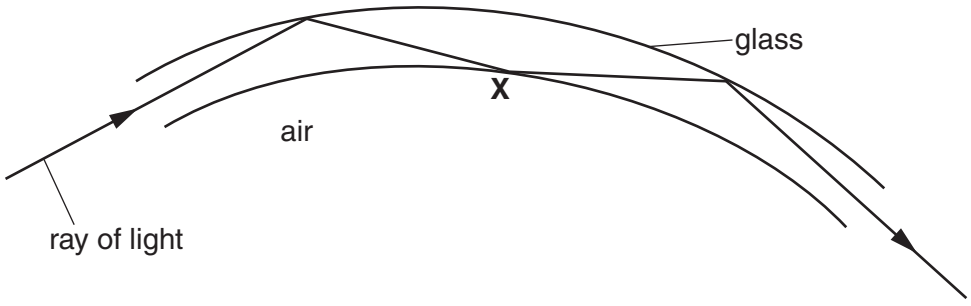
the code of the flashing light

the colour of the light

the intensity of the flashing light

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

(b) Optical fibres use light.

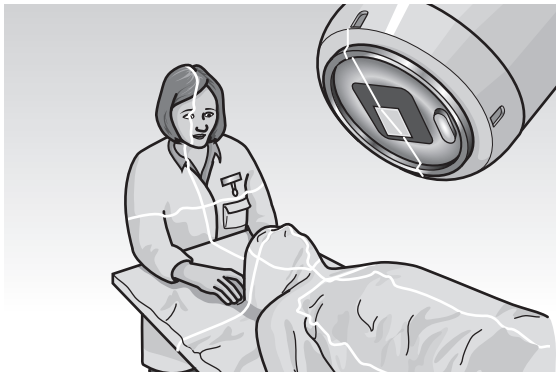


What is happening to the light at **X**?

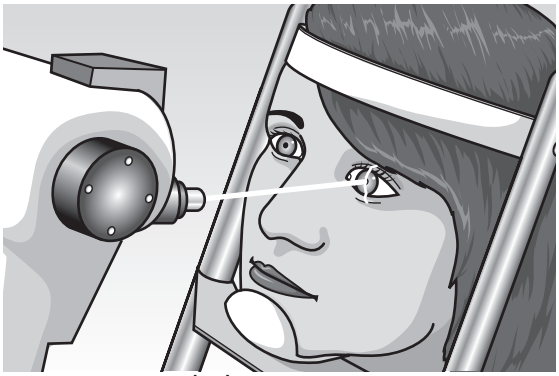
.....

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

(c) Lasers are used when preparing for surgery and during surgery.



preparing for surgery



during surgery

What properties of laser light allow it to be used for these treatments?

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

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

1	2											3	4	5	6	7	0
							1 **H** hydrogen 1										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						

Key

relative atomic mass
atomic symbol
name
atomic (proton) number

**** 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.