

Monday 19 May 2014 – 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	
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Centre number							Candidate number				
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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. Additional paper may be used if necessary but you must clearly show your candidate number, centre number and question number(s).
- Do **not** write in the bar codes.

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

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

wave speed = frequency × wavelength

power = voltage × current

energy supplied = power × time

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

distance = average speed × time

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

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

force = mass × acceleration

weight = mass × gravitational field strength

work done = force × distance

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

power = force × speed

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

momentum = mass × velocity

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

GPE = mgh

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

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

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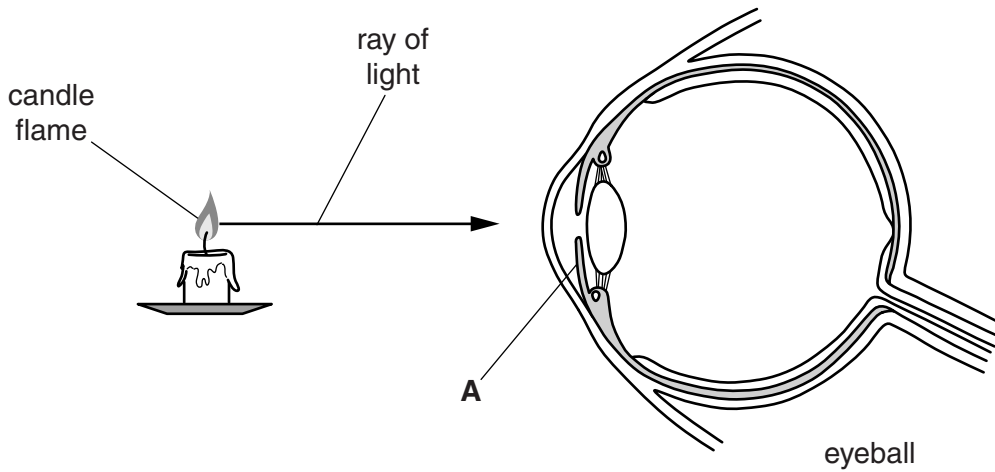
Question 1 begins on page 4

PLEASE DO NOT WRITE ON THIS PAGE

Answer **all** the questions.

SECTION A – Module B1

1 Look at the diagram.



(a) Write down the name of part **A**.

Choose from the list.

- cornea iris lens pupil**

answer [1]

(b) The flame can be seen because rays of light enter the eye and travel to the back of the eyeball.

Describe what happens to the light rays as they travel to the back of the eyeball.

Include the parts of the eye in your answer.

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

(c) Look at the picture of a tiger.



Tigers have binocular vision.

Binocular vision is an advantage when the tiger **hunts**.

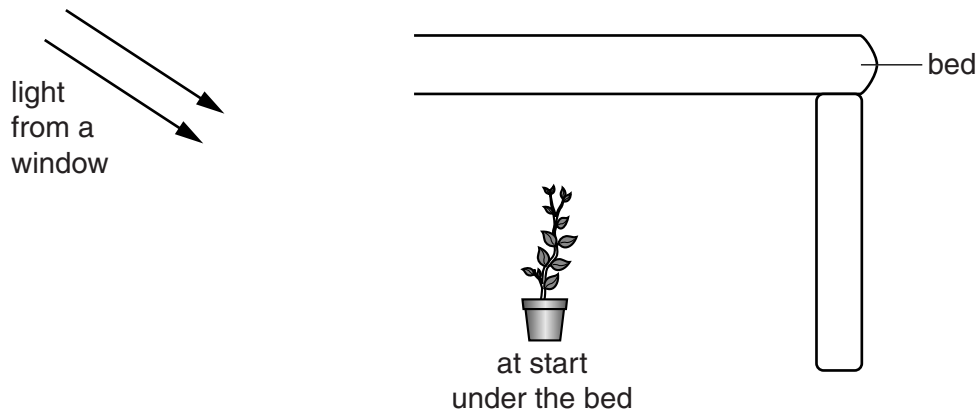
Suggest why.

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..... [1]

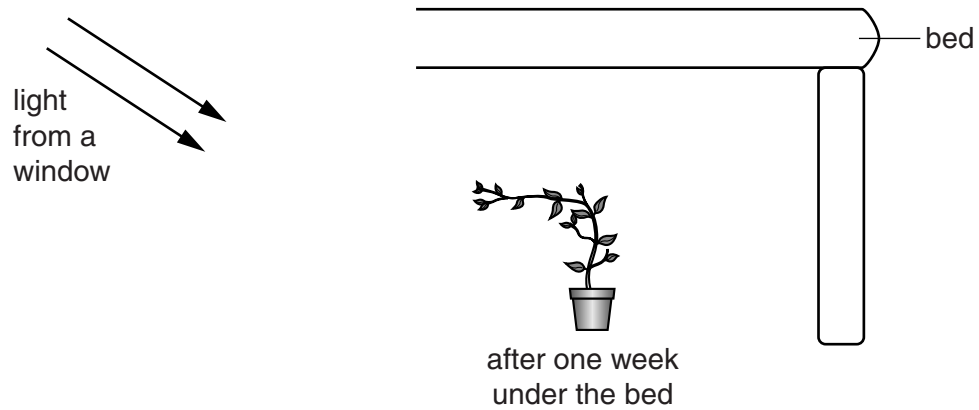
[Total: 4]

2 Katie buys her mum a plant for her birthday.

She puts the plant under her bed to hide it from her mum.



(a) Look at the diagram. It shows the plant after one week under the bed.



(i) Describe what happens to the plant.

.....

 [2]

(ii) Chemicals in the plant control growth.

Write down the name of these chemicals.

Choose from the list.

- antibodies hormones sugars weedkillers**

answer..... [1]

(b) The roots of the plant will be growing down into the soil due to gravity.

Write down the name of this response.

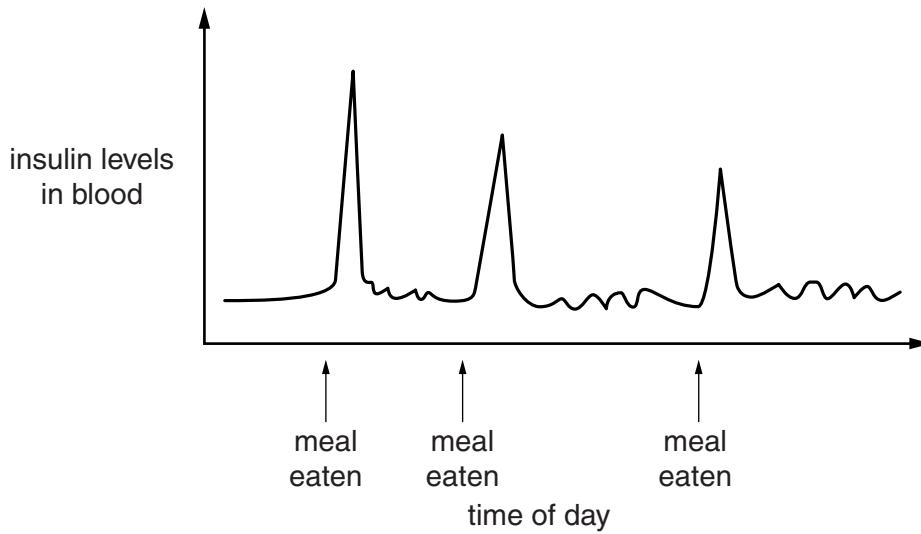
..... [1]

[Total: 4]

3 Insulin is a hormone found in the human body.

Look at the graph.

It shows how insulin levels change in a day.



Explain the patterns in the graph.

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..... [2]

[Total: 2]

4 This question is about smoking.

(a) People who smoke often have high blood pressure.

Explain how smoking causes high blood pressure.

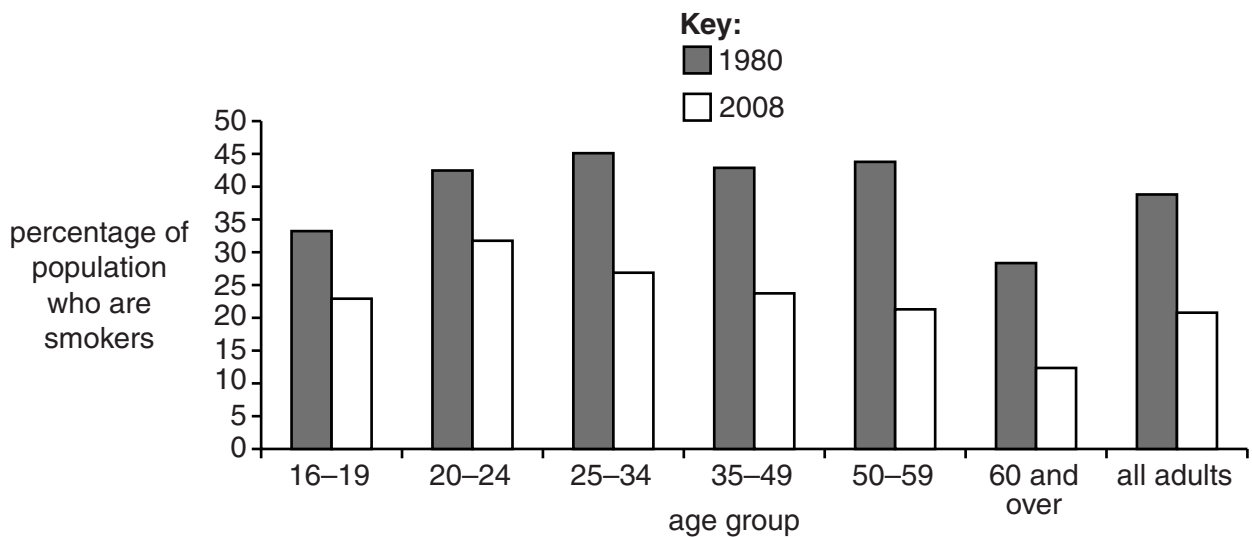
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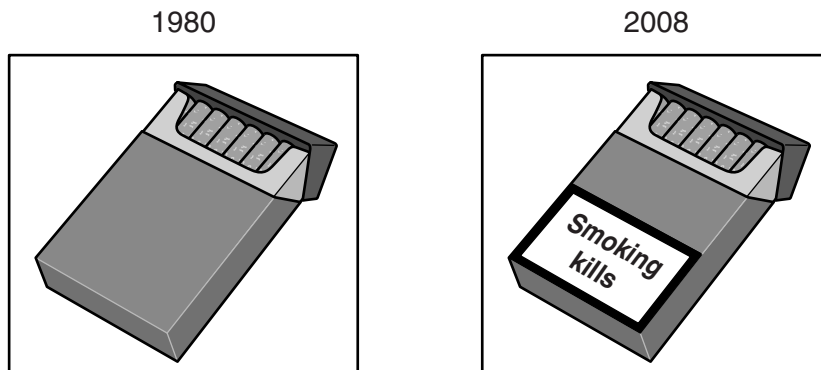
(b) Look at the graph.

It shows the percentage of smokers for different age groups in 1980 and 2008.



The number of people smoking in 1980 is very different to the number in 2008.

The outside of a cigarette packet has also changed.



Describe the patterns in the graph.

Suggest reasons why the number of smokers has changed.



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

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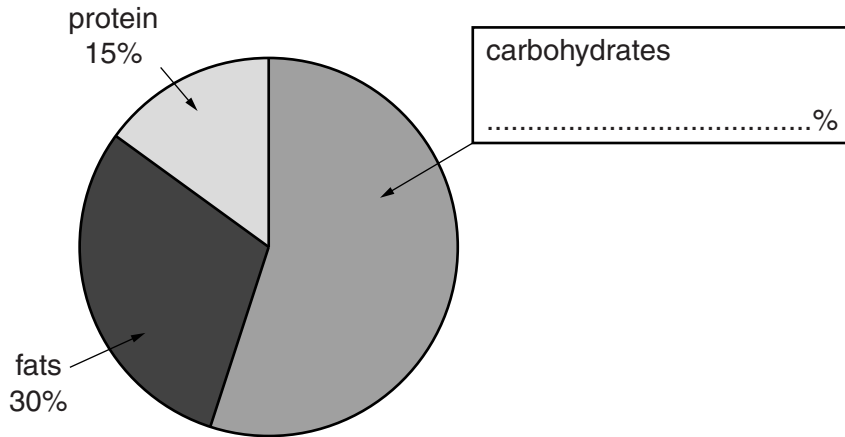
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..... [6]

[Total: 8]

5 Look at the pie chart.

It shows the percentage intake for the three main parts of a balanced diet.



(a) Complete the label on the pie chart to show the percentage of carbohydrates. [1]

(b) The diet is for an adult.

A pie chart for a teenager would be different.

Explain how and why it would be different.

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

(c) A high percentage of fats in the diet could be unhealthy.

Explain why.

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

(d) Most athletes eat special diets to help them improve their performance.

Some athletes also use **stimulants**.

Many people think athletes should **not** take stimulants.

Suggest two reasons why.

1

.....

2

..... [2]

[Total: 7]

SECTION B – Module C1

6 This question is about paints.

(a) A company wants to make a mug.

A picture will appear on the mug when a hot drink is poured into it.



What type of pigment should the company use?

Choose from the list.

biodegradable

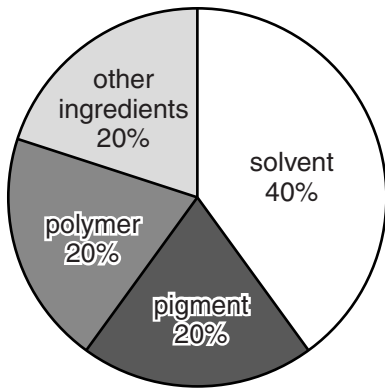
breathable

phosphorescent

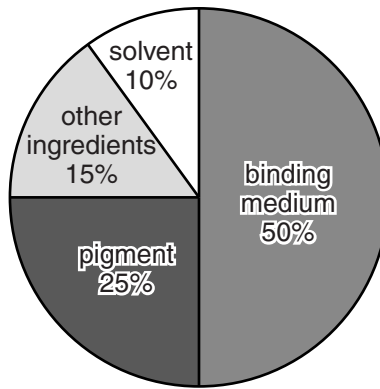
thermochromic

answer [1]

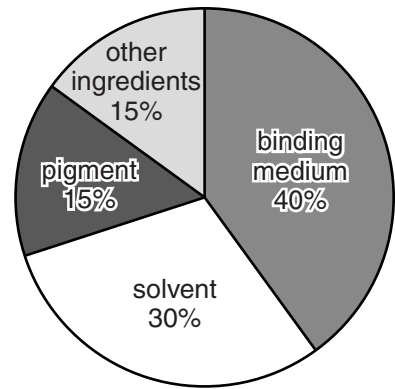
(b) Look at the pie charts showing the ingredients in three types of paint.



A



B



C

Which paint would you expect to spread most easily on a wall?

.....

Explain your choice.

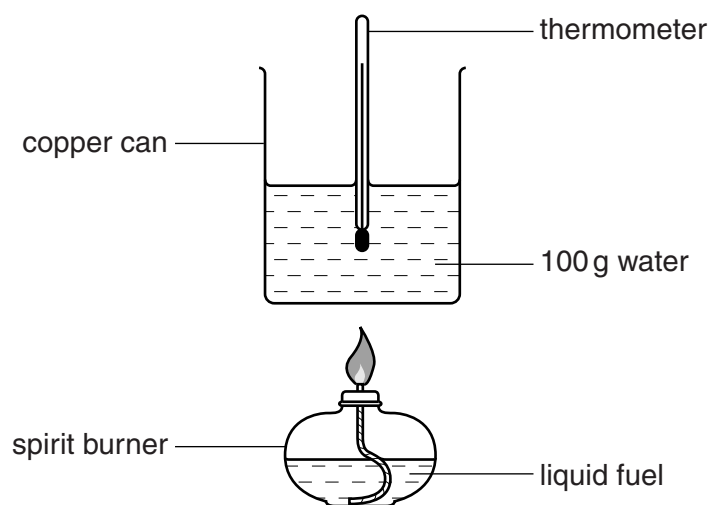
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..... [2]

[Total: 3]

7 This question is about fuels.

Michelle investigates two fuels, ethanol and butanol.

The diagram shows the apparatus she uses.



(a) Ethanol burns in oxygen.

Carbon dioxide and water are made.

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

..... [1]

(b) Michelle notices that butanol burns with a yellow flame.

A black solid forms on the outside of the copper can.

(i) What is the name of the black solid?

..... [1]

(ii) Michelle thinks that **incomplete** combustion is happening.

Write about two **disadvantages** of incomplete combustion.

.....

 [2]

(c) Michelle measures:

- the mass of fuel burned
- the temperature of the water at the start and at the end of the experiment.

Look at her results.

Fuel	Temperature at start in °C	Temperature at end in °C	Mass of fuel burned in grams	Cost of fuel burned in pence
ethanol	25	45	0.5	1.0
butanol	20	40	1.0	4.0

Michelle thinks that **butanol** is the better fuel for heating the water.

Is she right?

.....

Use information from the table to explain your answer.

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

[Total: 6]

8 Harry is a mountain climber.
He wants to buy a new anorak.



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

Material	Is it waterproof?	Is sweat absorbed?	Is it breathable?
cotton	no	absorbed	no
nylon	yes	not absorbed	no
Gore-Tex®	yes	escapes through material	yes

Which material is most suitable for an anorak?

Explain your choice.

.....

.....

..... [2]

(b) (i) Gore-Tex® material is made from a **non-biodegradable** polymer.

What is meant by non-biodegradable?

..... [1]

(ii) Write about two ways that non-biodegradable polymers can be disposed of.

.....

.....

..... [2]

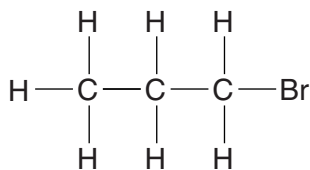
[Total: 5]

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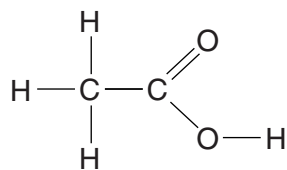
Question 9 begins on page 18
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9 This question is about carbon compounds.

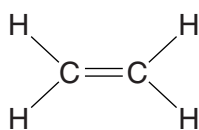
(a) Look at the displayed formulas of some compounds.



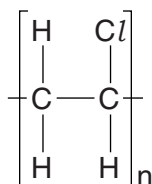
compound **A**



compound **B**



compound **C**



compound **D**

(i) Which compound is a **hydrocarbon**?

Choose from **A**, **B**, **C** or **D**.

answer.....

[1]

(ii) Look at the displayed formula for compound **B**.

Complete the table to show the number of each type of atom in compound **B**.

Atom	Number
C
H
O

[2]

(iii) Which compound will decolourise bromine water?

Choose from **A**, **B**, **C** or **D**.

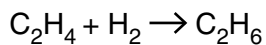
answer.....

[1]

(iv) Compound **C** has the molecular formula C_2H_4 .

Compound **C** reacts with hydrogen, H_2 .

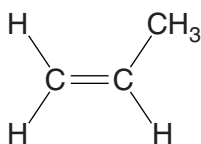
Look at the symbol equation for this reaction.



Write down the **formula** for a **reactant** in this reaction.

..... [1]

(b) Look at the displayed formula of **propene**.



Propene molecules can react together to make a **polymer**.

Write about what happens when propene molecules react together.

Include in your answer a description of the reaction, the name of the polymer made and the conditions needed.



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

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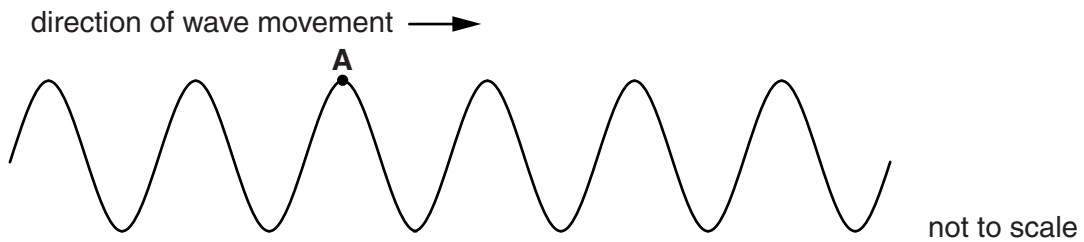
..... [6]

[Total: 11]

SECTION C – Module P1

10 This question is about transverse waves.

(a) Look at the diagram of a water wave.



Draw an arrow (→) from the crest at **A** to show the length of **two** wavelengths. [1]

(b) (i) The frequency of the water wave is 1.5 Hz.

The length of **two** complete waves is 4.0 cm.

Calculate the speed of the water wave.

.....

.....

.....

Speed of wave cm/s [2]

(ii) The frequency of the water wave **doubles**.

The wavelength stays the same.

What happens to the speed of this water wave?

.....

..... [1]

(c) Radio waves and visible light are both electromagnetic waves.

They travel in a vacuum.

Do radio waves travel faster than visible light in a vacuum?

.....

Explain your answer.

.....

..... [1]

[Total: 5]

11 Anton and Ben like to sunbathe.

Anton has **fair** skin. His skin burns after 5 minutes without sunscreen.

Ben has **dark** skin. His skin burns after 20 minutes without sunscreen.

Anton and Ben want to sunbathe for 180 minutes. They do not want their skin to burn.

They have two different sunscreens.

Name of sunscreen	Sun Protection Factor (SPF)
Bronzer	15
Toptan	45

They choose one of the sunscreens and apply it only once before sunbathing.

Ben can use either Bronzer or Toptan

Anton must use Toptan

Explain why Ben can use either Bronzer or Toptan, but Anton must use Toptan.

Use information about the sunscreens and their skin types in your answer.



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

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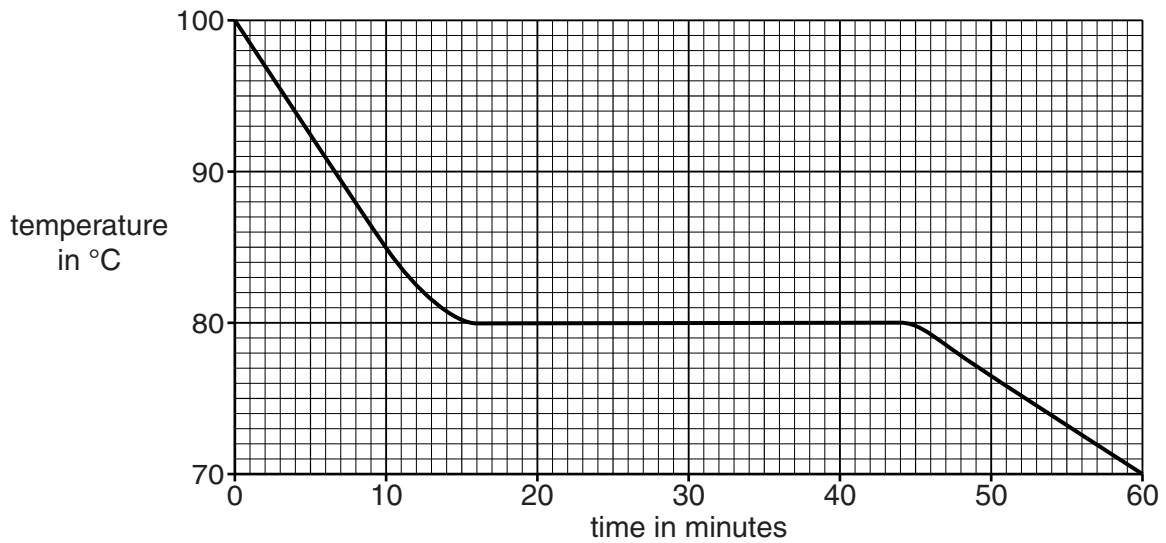
..... [6]

[Total: 6]

12 Melissa has a hot liquid in a beaker.

She measures the temperature of the liquid as it cools.

Look at the graph of her results.



(a) Complete the sentence.

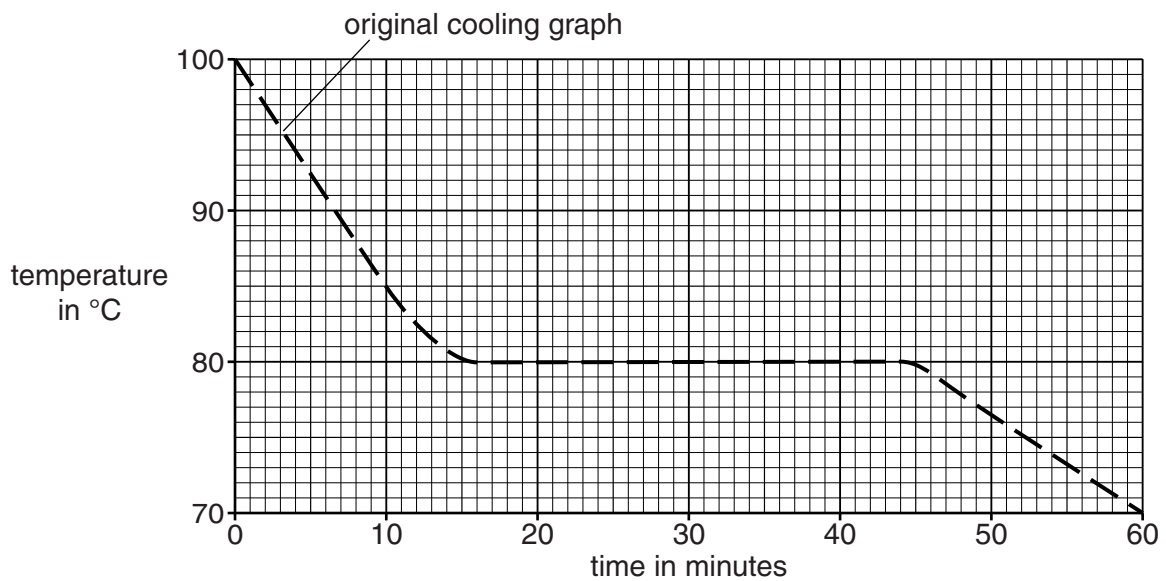
The liquid changes to a solid (freezes) at a temperature of°C.

[1]

(b) Melissa heats up the same beaker of liquid until it reaches 100°C.

She puts it in a fridge. It is much **colder** in a fridge.

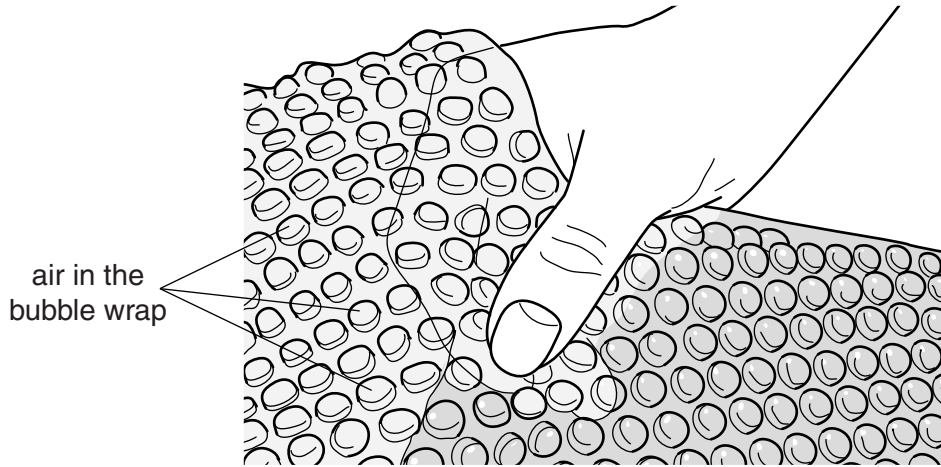
On this grid, sketch the new graph to show how the same liquid cools in the fridge.



[2]

(c) Melissa wants to reduce heat loss from the beaker.

She puts bubble wrap around the beaker.



Explain how bubble wrap reduces heat loss.

.....

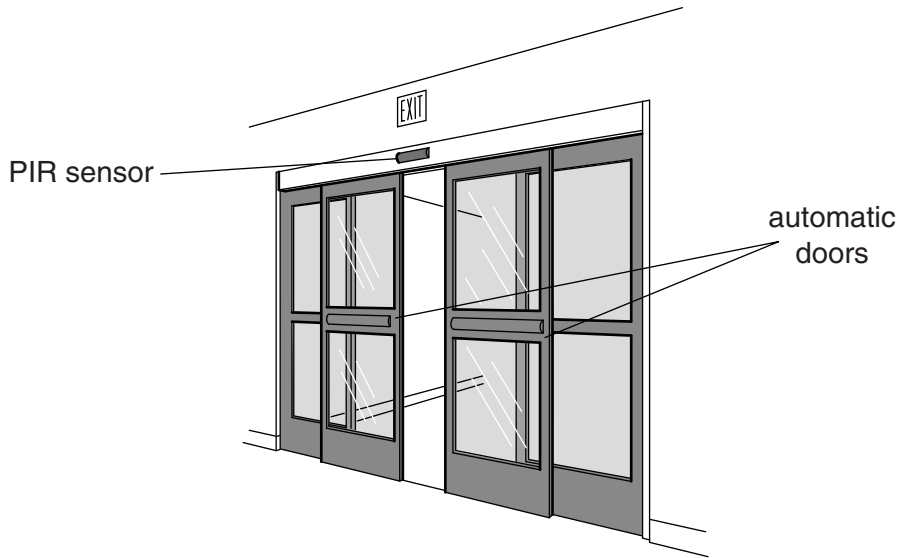
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..... [2]

[Total: 5]

13 Passive infrared (PIR) sensors are used for automatic doors.



(a) (i) Describe how a PIR sensor works to open the doors.

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..... [2]

(ii) Sanjay fits automatic doors.

He makes sure the sensor points at the correct angle before he fixes it above the doors.

Suggest why it is important to set the sensor at the correct angle.

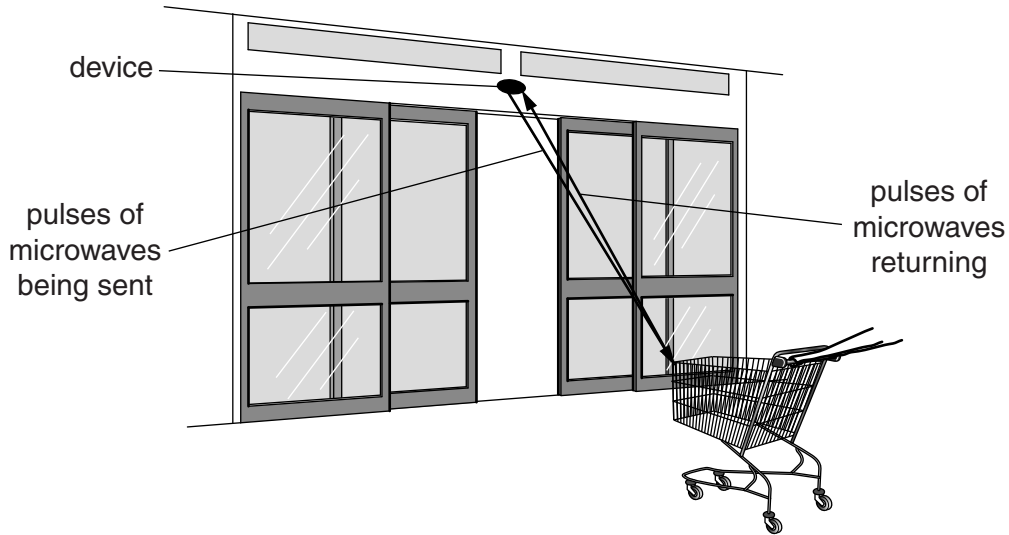
.....
..... [1]

(b) Many automatic doors use a different type of sensor.

This sensor uses microwaves instead of infrared radiation.

The device above the doors sends out pulses of microwaves.

The device measures the time it takes for each pulse to return.



(i) Describe what happens to the pulses of microwaves as a person walks towards the doors.

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

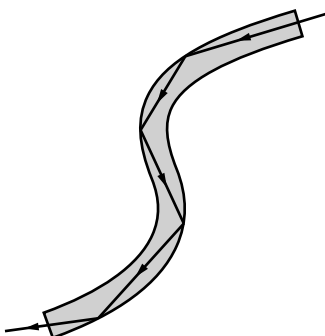
(ii) Some people are concerned about pulses of microwaves being used for automatic doors. Scientists do many tests to find out if microwaves are dangerous.

They publish the results of these tests so other scientists can see them.
Write down **two** reasons why it is important for other scientists to see these results.
.....
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..... [2]

[Total: 6]

14 Optical fibres are used for communication.

Light travels along an optical fibre by reflecting from the sides of the fibre.



Signals can travel along optical fibres for long distances.

The signal strength decreases as the light travels along the optical fibre.

The table shows how the percentage loss in signal strength depends on the wavelength of the light used.

Wavelength of light in nm	Percentage loss in signal strength per km
900	65%
1100
1300	55%
1500	53%
1700	51%

(a) Estimate the missing percentage and write your answer in the table.

[1]

(b) A TV company sends signals down a long optical fibre.

Which would be the best wavelength to use? Choose from the table.

..... nm

Explain your answer.

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

[Total: 3]

END OF QUESTION PAPER



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The Periodic Table of the Elements

	1	2	3	4	5	6	7	0										
	7 Li lithium 3	9 Be beryllium 4	11 Na sodium 11	12 Mg magnesium 12	13 Al aluminium 13	14 Si silicon 14	15 P phosphorus 15	16 S sulfur 16	17 Cl chlorine 17	18 Ar argon 18								
	19 K potassium 19	20 Ca calcium 20	21 Sc scandium 21	22 Ti titanium 22	23 V vanadium 23	24 Cr chromium 24	25 Mn manganese 25	26 Fe iron 26	27 Co cobalt 27	28 Ni nickel 28	29 Cu copper 29	30 Zn zinc 30	31 Ga gallium 31	32 Ge germanium 32	33 As arsenic 33	34 Se selenium 34	35 Br bromine 35	36 Kr krypton 36
	37 Rb rubidium 37	38 Sr strontium 38	39 Y yttrium 39	40 Zr zirconium 40	41 Nb niobium 41	42 Mo molybdenum 42	43 Tc technetium [98]	44 Ru ruthenium 44	45 Rh rhodium 45	46 Pd palladium 46	47 Ag silver 47	48 Cd cadmium 48	49 In indium 49	50 Sn tin 50	51 Sb antimony 51	52 Te tellurium 52	53 I iodine 53	54 Xe xenon 54
	55 Cs caesium 55	56 Ba barium 56	57 La* lanthanum 57	72 Hf hafnium 72	73 Ta tantalum 73	74 W tungsten 74	75 Re rhenium 75	76 Os osmium 76	77 Ir iridium 77	78 Pt platinum 78	79 Au gold 79	80 Hg mercury 80	81 Tl thallium 81	82 Pb lead 82	83 Bi bismuth 83	84 Po polonium 84	85 At astatine 85	86 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						

1	H
	hydrogen
	1

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.