

**OXFORD CAMBRIDGE AND RSA EXAMINATIONS**  
**GCSE**

**B711/01**

**GATEWAY SCIENCE**  
**SCIENCE B**

**Science modules B1, C1, P1**  
**(Foundation Tier)**

**MONDAY 19 MAY 2014: Afternoon**

**DURATION: 1 hour 15 minutes**  
**plus your additional time allowance**

**MODIFIED ENLARGED**

<b>Candidate forename</b>		<b>Candidate surname</b>	
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<b>Centre number</b>						<b>Candidate number</b>				
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**Candidates answer on the Question Paper.**  
**A calculator may be used for this paper.**

**OCR SUPPLIED MATERIALS:**

**Periodic Table**

**OTHER MATERIALS REQUIRED:**

**Pencil**

**Ruler (cm/mm)**

**READ INSTRUCTIONS OVERLEAF**

## **INSTRUCTIONS TO CANDIDATES**

**Write your name, centre number and candidate number in the boxes on the first page. 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).**

## **INFORMATION FOR CANDIDATES**

**The quality of written communication is assessed in questions marked with a pencil (.**

**A list of equations can be found on pages 4–5.**

**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.**

**Any blank pages are indicated.**

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## **EQUATIONS**

$$\text{energy} = \text{mass} \times \frac{\text{specific heat}}{\text{capacity}} \times \text{temperature change}$$

$$\text{energy} = \text{mass} \times \text{specific latent heat}$$

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

$$\text{wave speed} = \text{frequency} \times \text{wavelength}$$

$$\text{power} = \text{voltage} \times \text{current}$$

$$\text{energy supplied} = \text{power} \times \text{time}$$

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

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

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

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

**force = mass × acceleration**

**weight = mass × gravitational field strength**

**work done = force × distance**

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

**power = force × speed**

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

**momentum = mass × velocity**

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

**GPE = mgh**

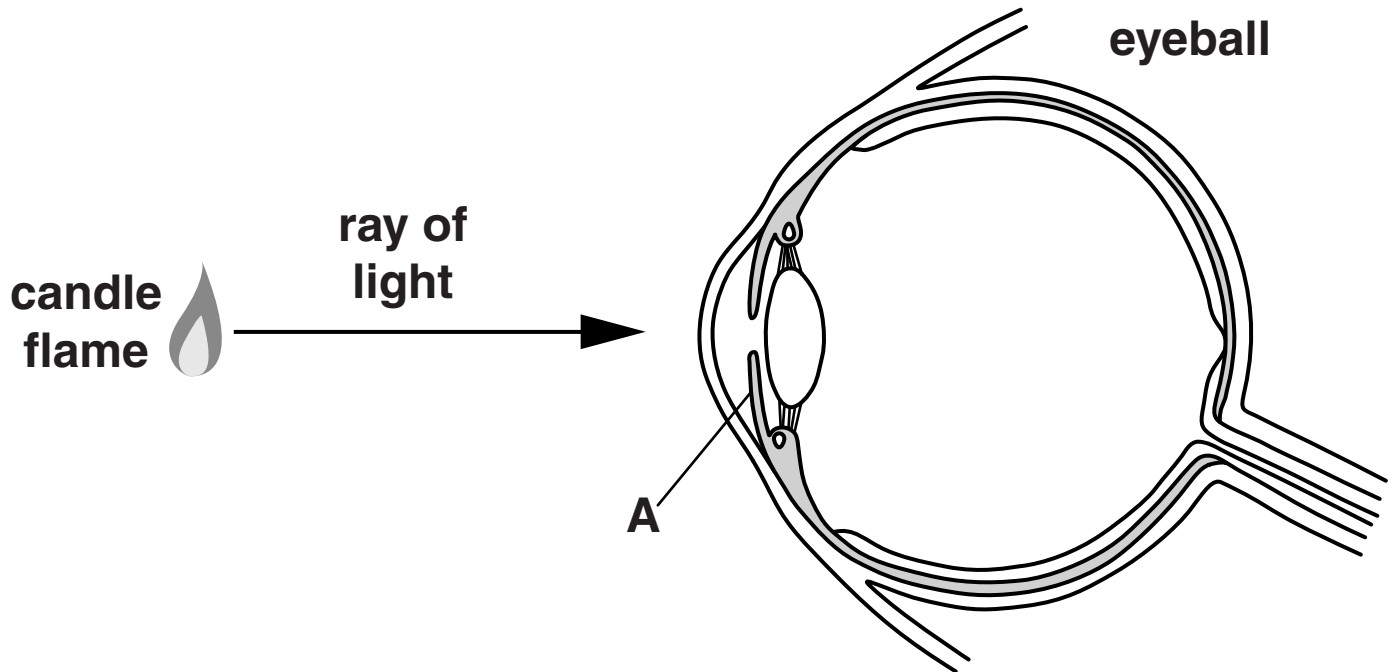
**mgh =  $\frac{1}{2}mv^2$**

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

**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 below.**

**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.**

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**[2]**

- (c) Tigers have binocular vision.**

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

**Suggest why.**

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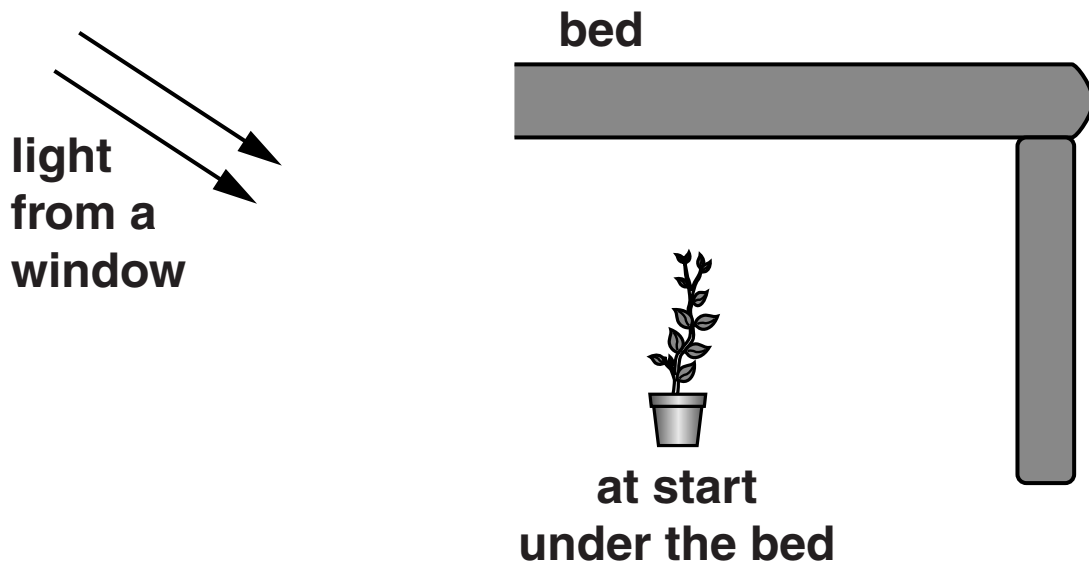
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**[1]**

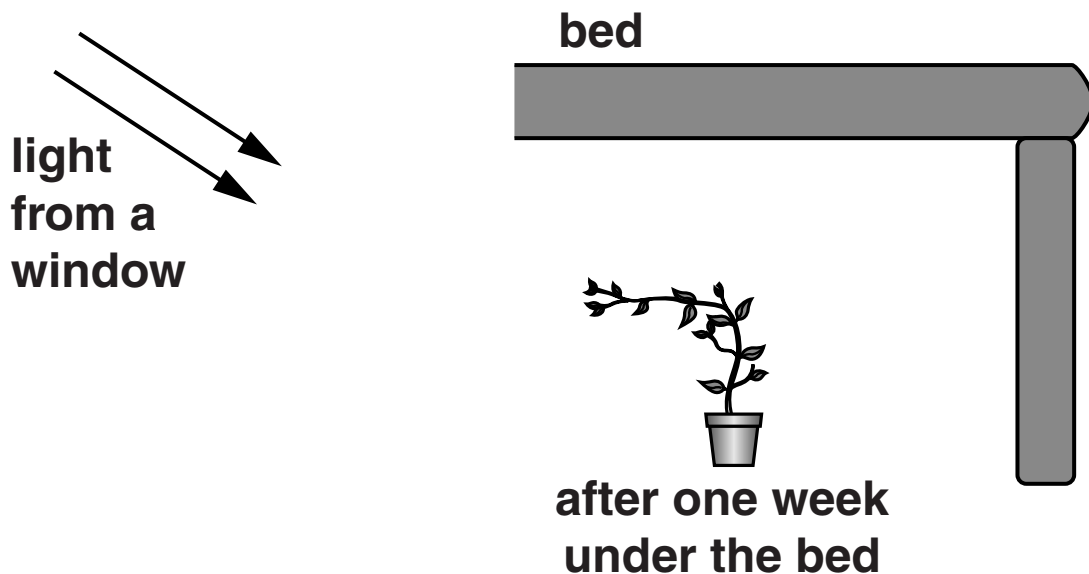
**[Total: 4]**

**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 below. It shows the plant after one week under the bed.**





**(i) Describe what happens to the plant.**

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**[2]**

**(ii) Chemicals in the plant control growth.**

**Write down the name of these chemicals.**

**Choose from the list below.**

**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.**

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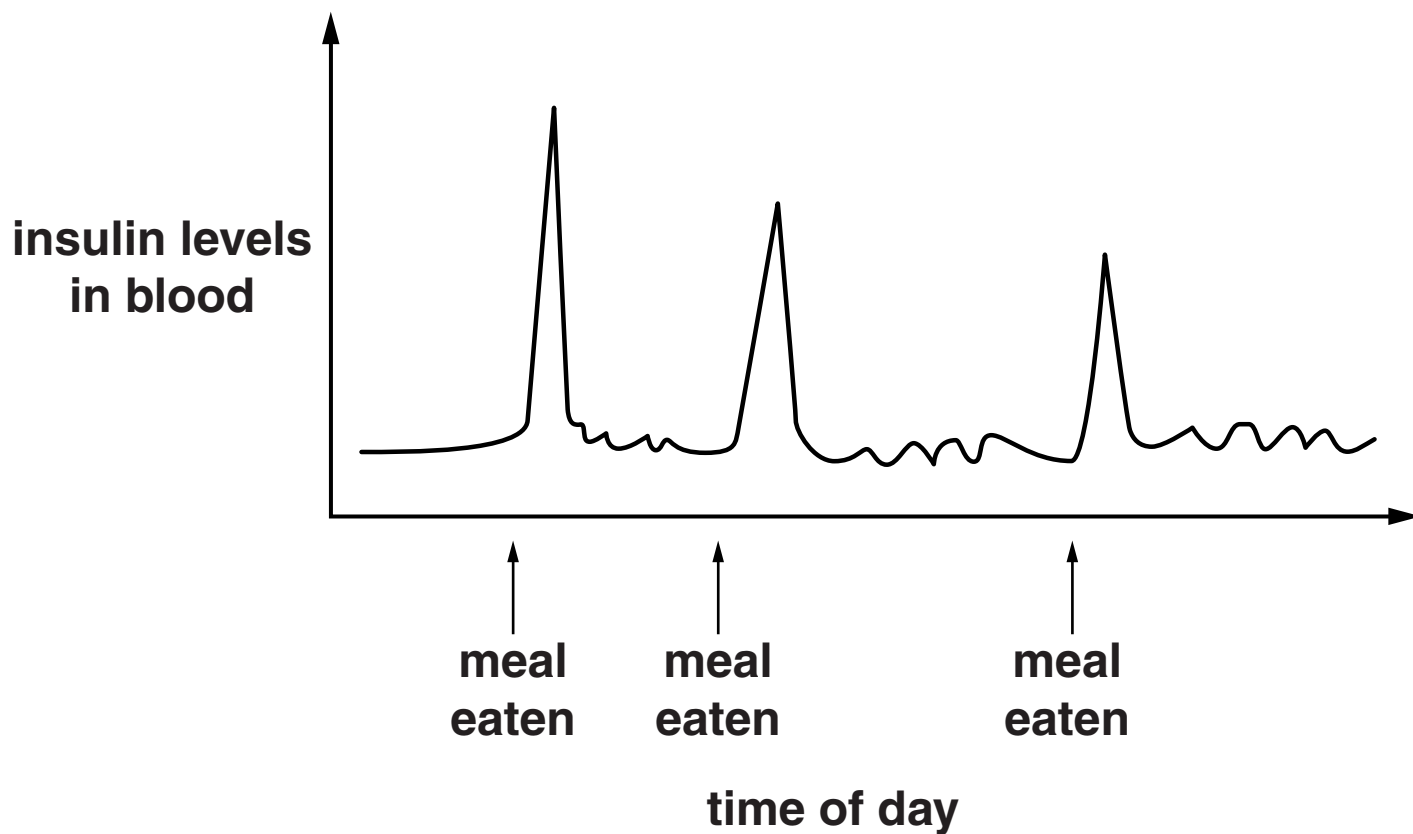
**[1]**

**[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]

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**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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**[2]**

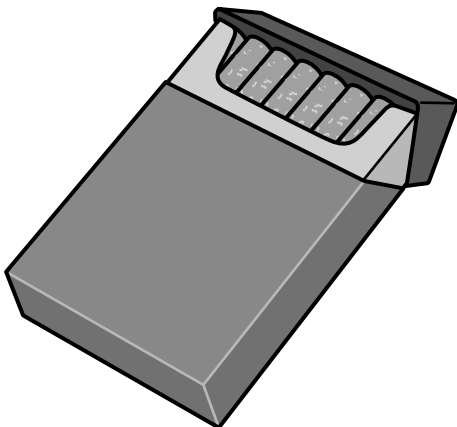
**(b) Look at the graph opposite.**

**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 as shown below.**

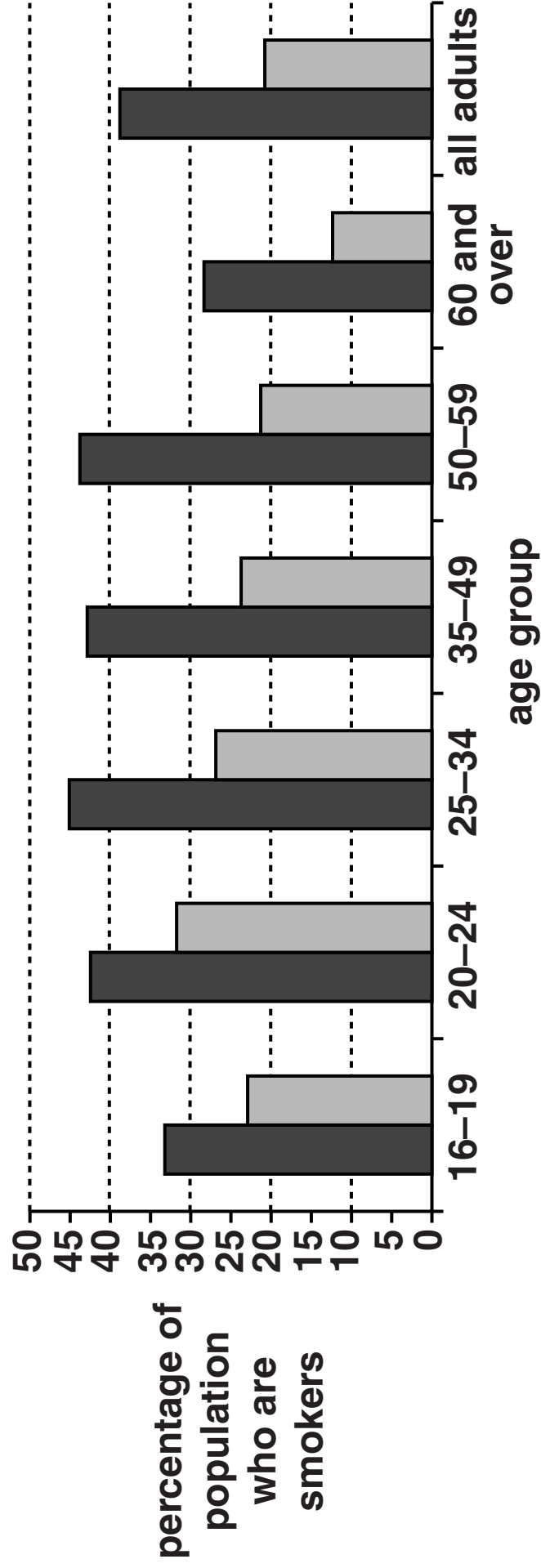
**1980**



**2008**



**KEY:**  
 ■ 1980  
 ■ 2008



**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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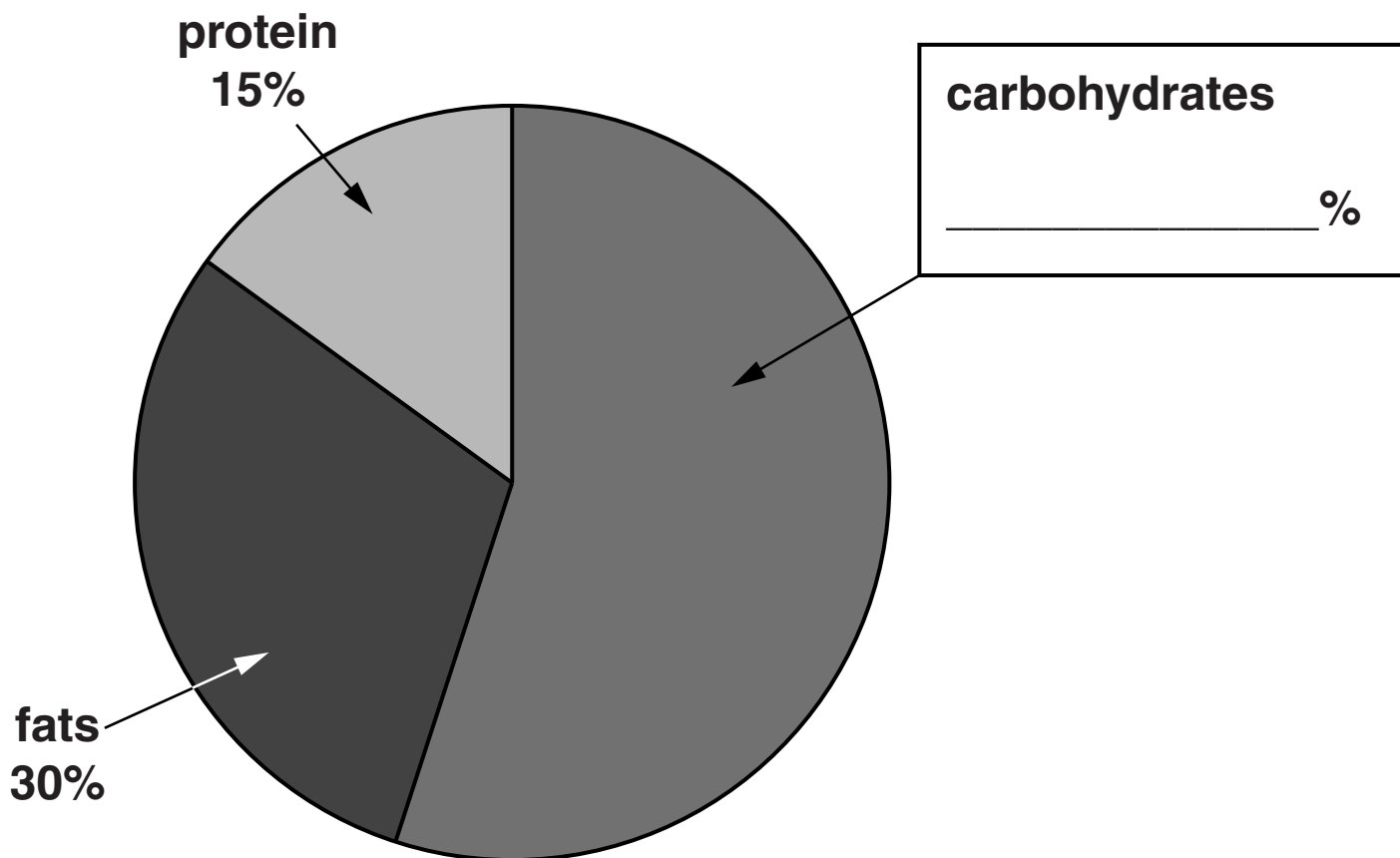
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**[6]**

**[Total: 8]**

**5 Look at the pie chart below.**

**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.**

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**[2]**

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

**Explain why.**

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**[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** 

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**2** 

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**[2]**

**[Total: 7]**



## **SECTION B – Module C1**

**6 This question is about paints.**

**(a) A company wants to make a mug.**

**There is no picture on the mug when it is cold but 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 below.**

**biodegradable**

**breathable**

**phosphorescent**

**thermochromic**

**answer \_\_\_\_\_ [1]**

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

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

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**Explain your choice.**

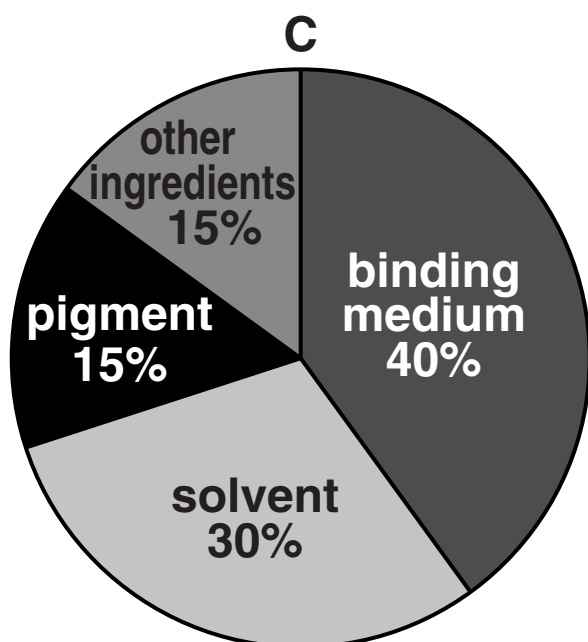
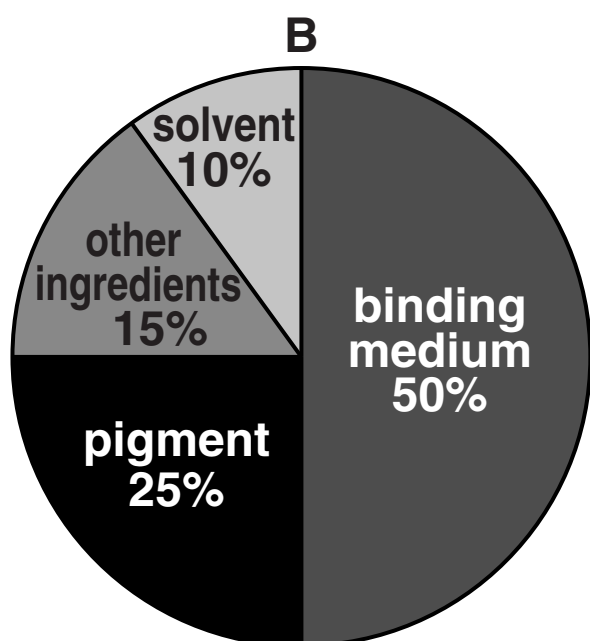
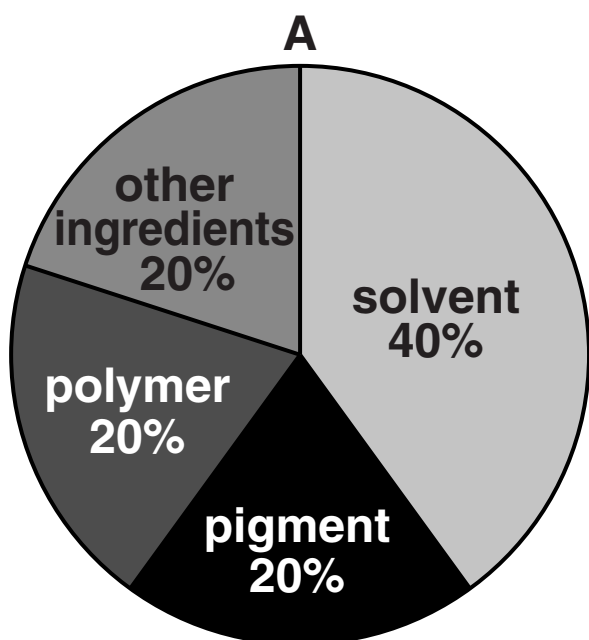
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**[2]**

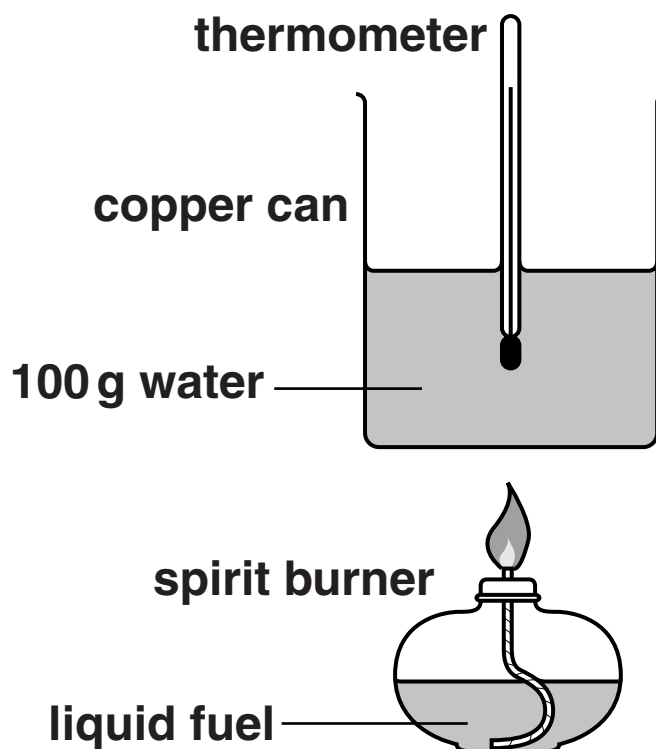
**[Total: 3]**



**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 below.**

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

**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]**

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**8 Harry is a mountain climber.**

**He wants to buy a new anorak.**

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

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

**Which material is most suitable for an anorak?**

**Explain your choice.**

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**[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.**

\_\_\_\_\_

\_\_\_\_\_

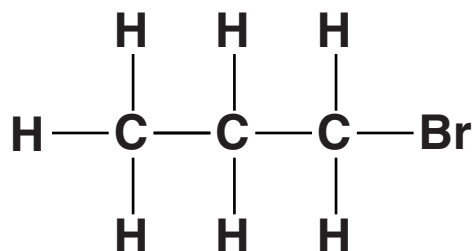
\_\_\_\_\_ **[2]**

**[Total: 5]**

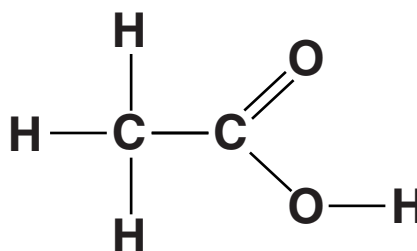
9 This question is about carbon compounds.

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

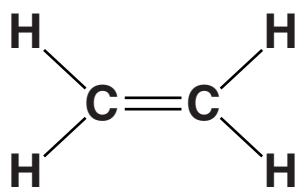
compound A



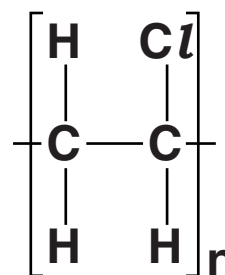
compound B



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?

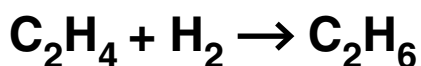
Choose from A, B, C or D.

answer \_\_\_\_\_ [1]

- (iv) Compound C has the molecular formula  $C_2H_4$ .

Compound C reacts with hydrogen,  $H_2$ .

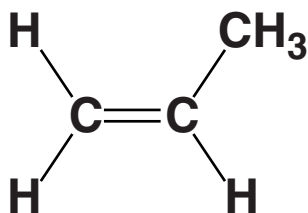
Look at the symbol equation for this reaction.



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]**

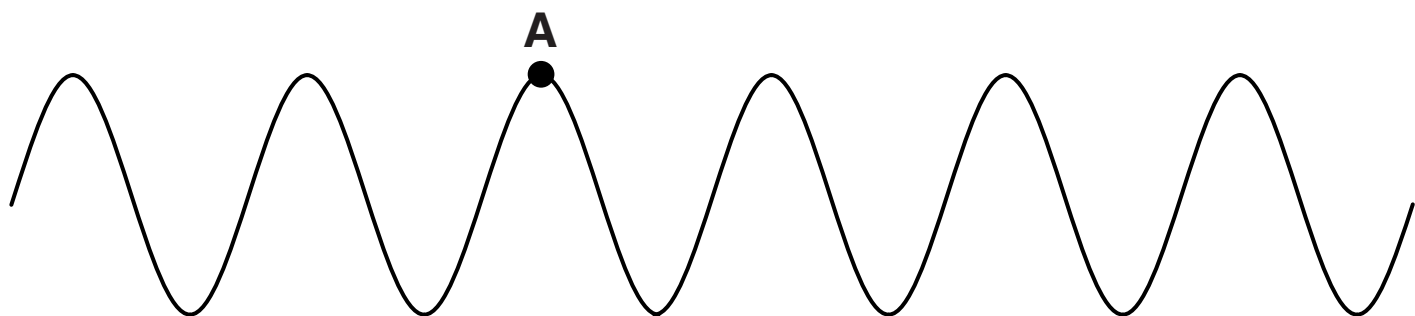
## SECTION C – Module P1

10 This question is about transverse waves.

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

Draw an arrow ( $\rightarrow$ ) from the crest at A to show the length of TWO wavelengths. [1]

direction of wave movement  $\rightarrow$



not to scale

(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.

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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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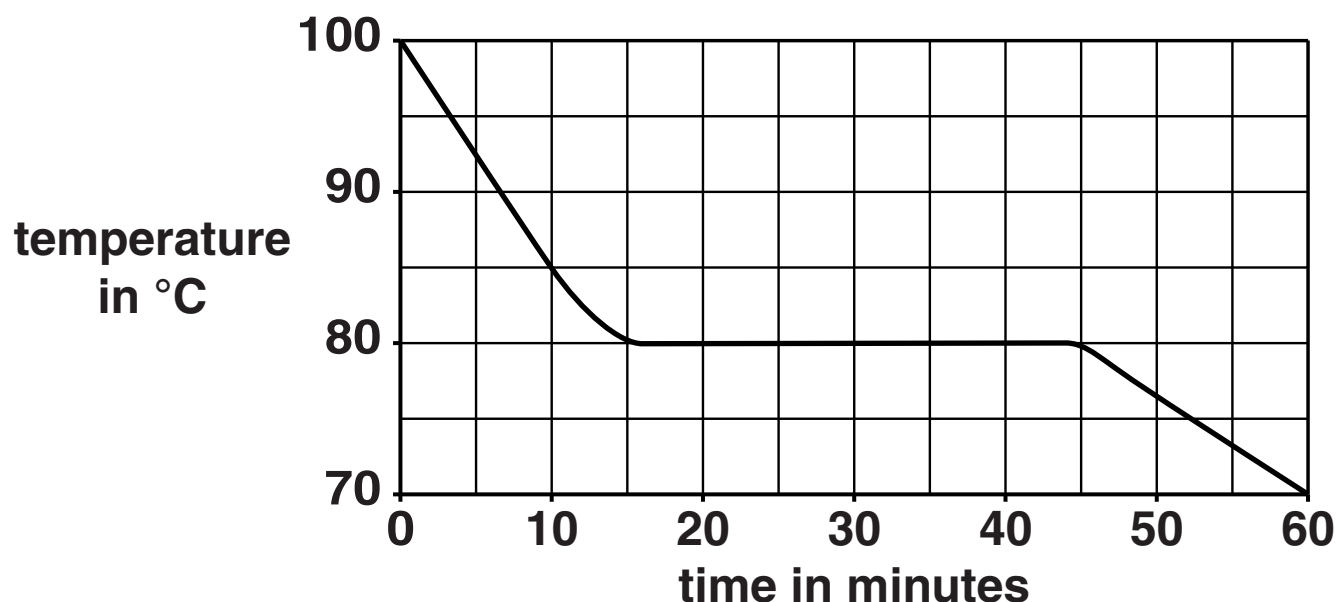
**[6]**

**[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**

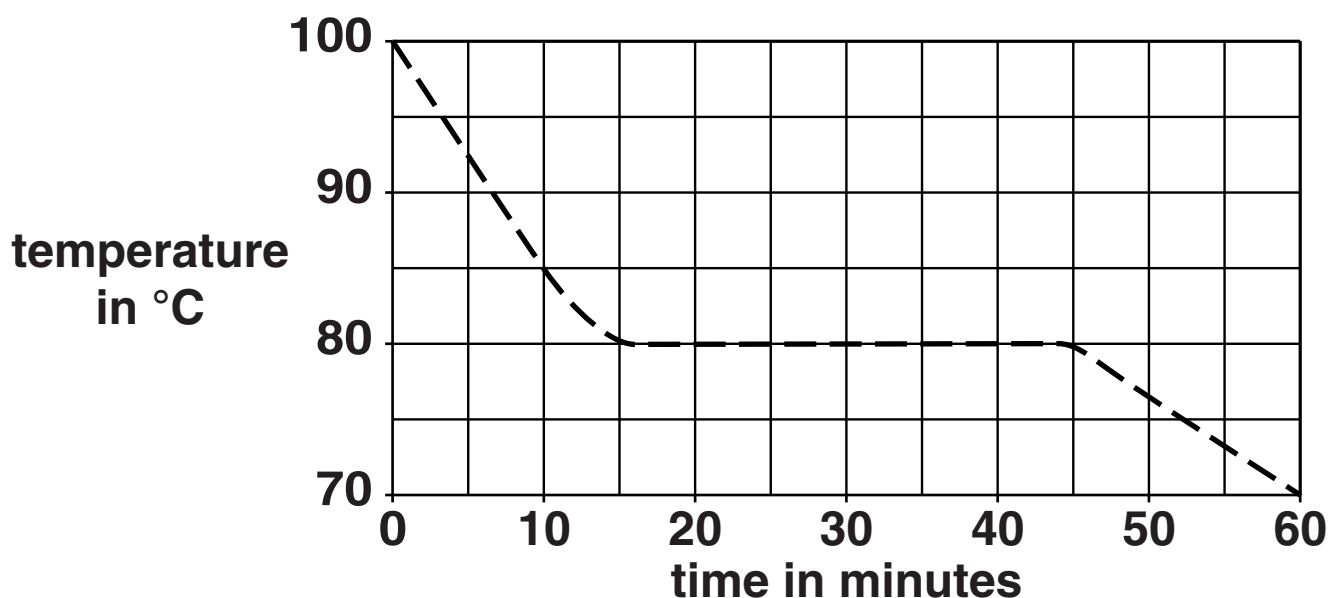
**temperature of \_\_\_\_\_°C. [1]**

**(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 the grid below, sketch the new graph to show how the same liquid cools in the fridge.

The original cooling graph is shown as a dashed line.



[2]

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

She puts bubble wrap around the beaker.

Bubble wrap has air in the bubbles.

Explain how bubble wrap reduces heat loss.

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[2]

[Total: 5]

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

**The PIR sensor is positioned just above the opening 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.**

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**[1]**

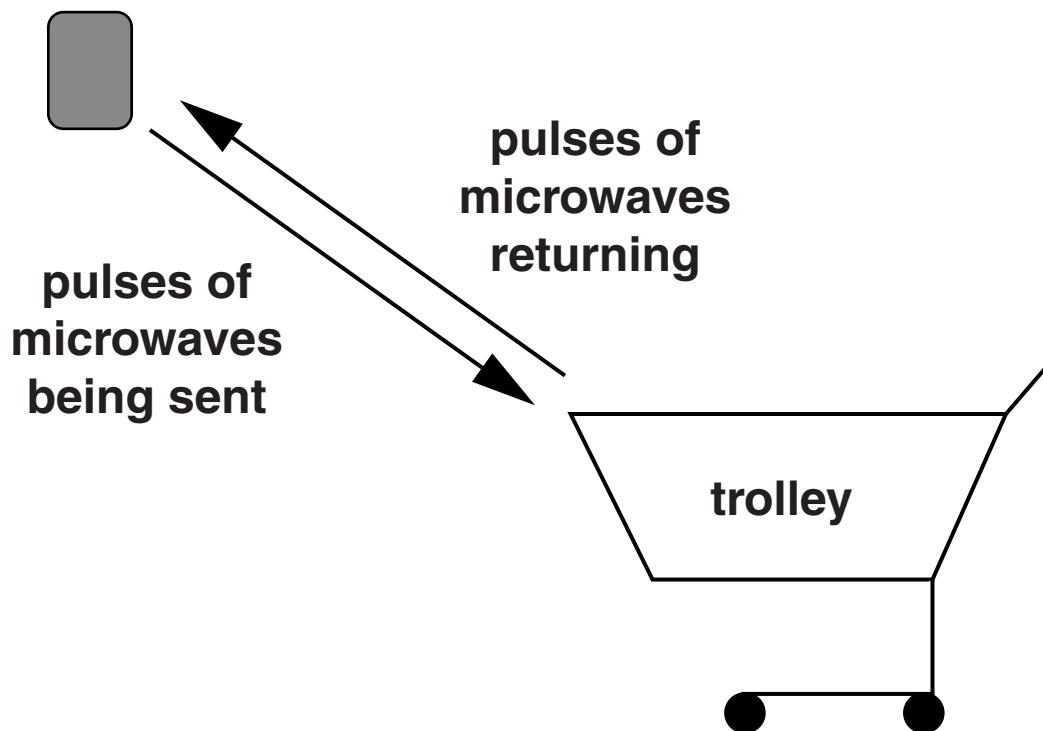
**(b) Many automatic doors use a different type of sensor.**

**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.**

**device above  
the door**



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

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[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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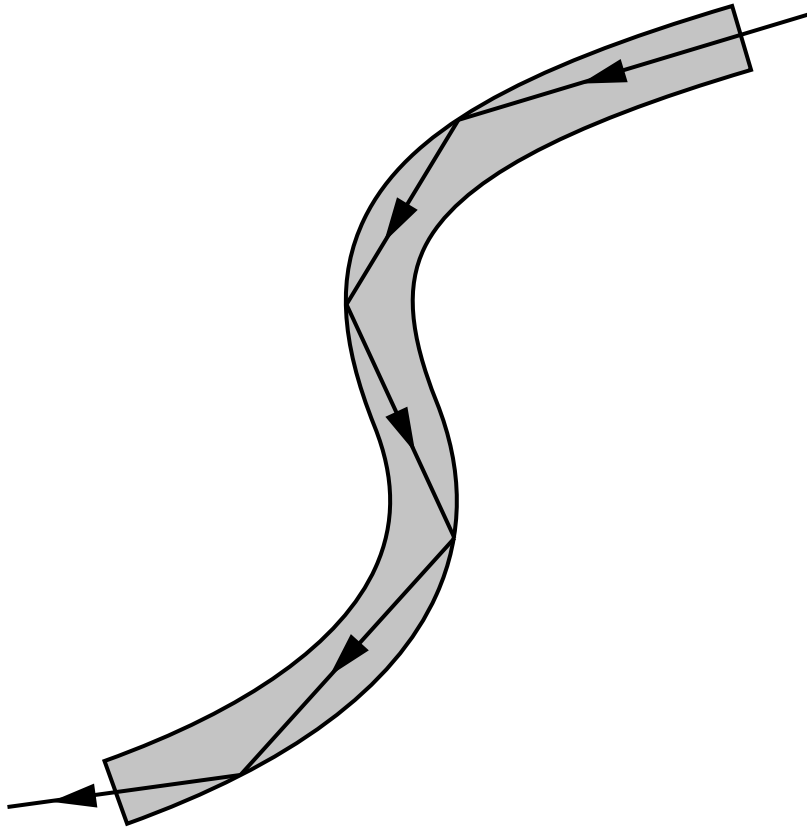
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[2]

**[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 below 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 above. [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.**

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_ [2]

**[Total: 3]**

**END OF QUESTION PAPER**

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