

**OXFORD CAMBRIDGE AND RSA EXAMINATIONS  
GCSE**

**B711/02**

**GATEWAY SCIENCE  
SCIENCE B**

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

**WEDNESDAY 20 MAY 2015: Afternoon**

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

**MODIFIED ENLARGED 24pt**

<b>Candidate forename</b>		<b>Candidate surname</b>	
-------------------------------	--	------------------------------	--

<b>Centre number</b>						<b>Candidate number</b>				
--------------------------	--	--	--	--	--	-----------------------------	--	--	--	--

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

**OCR SUPPLIED MATERIALS:**

**A copy of the 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.**

**BLANK PAGE**

## **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**

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

$$\text{GPE} = mgh$$

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

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

**Answer ALL the questions.**

**SECTION A – Module B1**

**1 Jake wants to find out how much protein he should eat each day.**

**He finds information from two different sources.**

**SOURCE 1**

**The table shows the amount of protein people of different ages should eat each day.**

<b>AGE GROUP</b>	<b>AMOUNT OF PROTEIN IN g</b>
<b>Infants</b>	<b>10</b>
<b>Teenage males</b>	<b>52</b>
<b>Teenage females</b>	<b>46</b>
<b>Adult males</b>	<b>56</b>
<b>Adult females</b>	<b>46</b>

**SOURCE 2**

**Your estimated average daily intake of protein can be calculated using the formula.**

$$\text{EAR in g} = 0.6 \times \text{body mass in kg}$$

**(EAR) Estimated Average Requirement**

**(a) Jake is a teenage male. He has a mass of 70 kg.**

**The amounts of protein recommended by Source 1 and Source 2 are different.**

**(i) Calculate Jake's EAR.**

**Use your calculation to decide which source recommends that Jake eats the MOST protein.**

---

---

**[2]**

**(ii) Suggest TWO reasons why the recommended amounts of protein are different.**

---

---

---

**[2]**

**(b) Jake's mum has the same mass as Jake.**

**This means they have the same EAR.**

**Jake needs to eat more protein each day than his mum to stay healthy.**

**Explain why their daily intake of protein should be different even though the EAR is the same.**

---

---

---

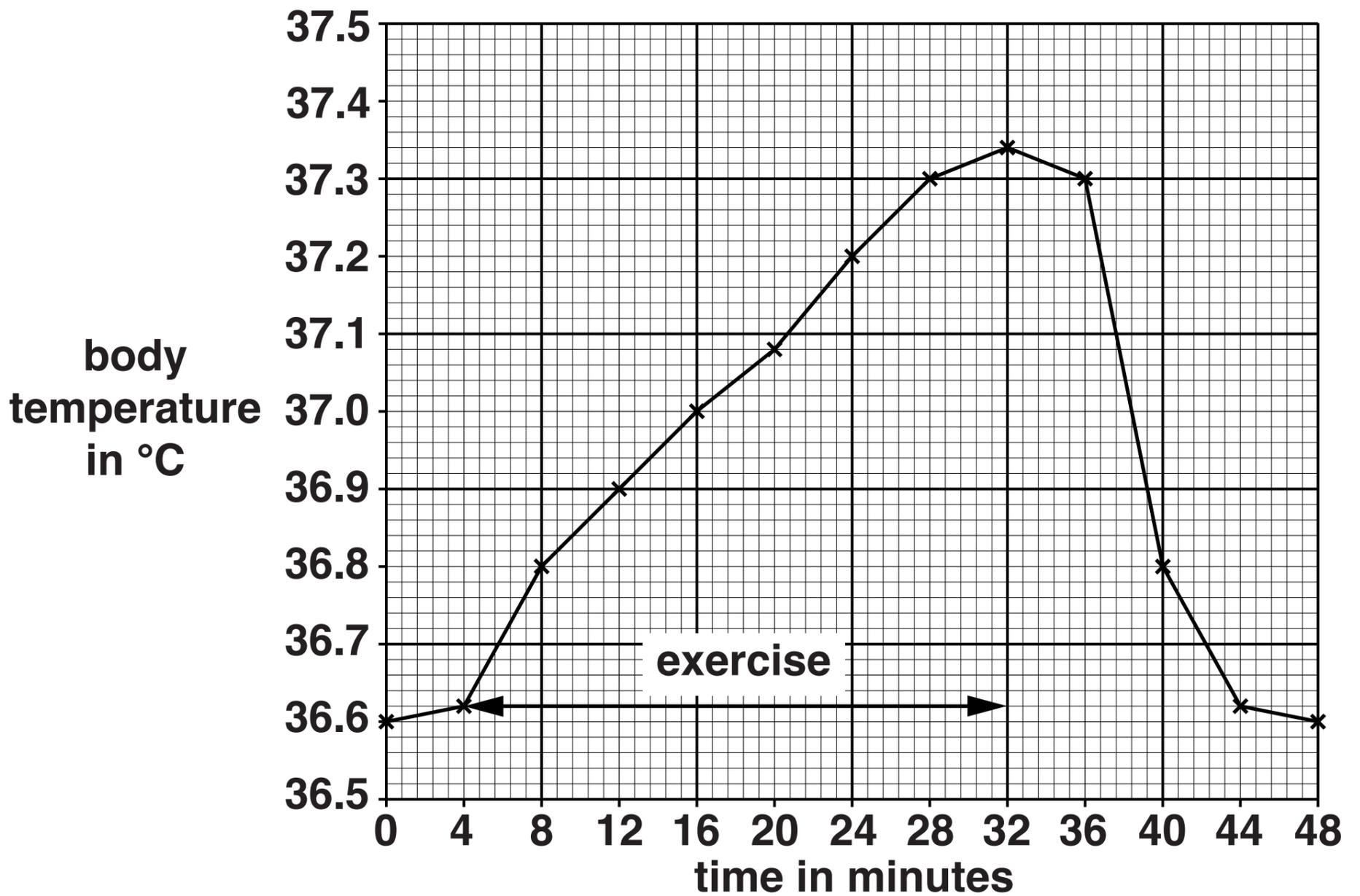
**[2]**

2 Jess and Neil investigate the effect of exercise on body temperature.

Jess measures Neil's body temperature every four minutes for 48 minutes.

Neil exercises for 28 minutes of this time.

The graph shows the change in Neil's body temperature.





**(b) People who don't exercise enough sometimes develop high blood pressure.**

**Write down ONE OTHER factor that could INCREASE blood pressure.**

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

**(c) Energy is needed for exercise.**

**Fats are one type of food that can provide energy for the body.**

**(i) Which TWO molecules are fats made up of?**

Put a **ring** around each correct answer.

**AMINO ACID**

**FATTY ACIDS**

**GLUCOSE**

**GLYCEROL**

**STARCH**

[1]

**(ii) Where and how are fats stored in the body?**

\_\_\_\_\_

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

**3 Read this information about multiple sclerosis and cannabis.**

**People with a medical condition called multiple sclerosis (MS) often have very painful symptoms.**

**A study of more than 600 MS patients has shown that taking cannabis can relieve some of the symptoms.**

**A scientist working on the trial says that the study has made NHS prescribing of cannabis-based drugs more likely.**

**In some countries, MS patients smoke cannabis mixed with tobacco. It is also possible to take cannabis without mixing it with tobacco. In other countries the possession of cannabis is illegal.**

**(a) Smoking cannabis mixed with tobacco has many risks.**

**The risks to MS patients smoking cannabis can be reduced by making cannabis a prescription drug.**

**Use the information to help you describe and explain one OTHER way the risks can be reduced.**

---

---

---

**[2]**

**(b) To make the study more reliable a BLIND TRIAL was used.**

**Describe how a blind trial would be done for this study.**

---

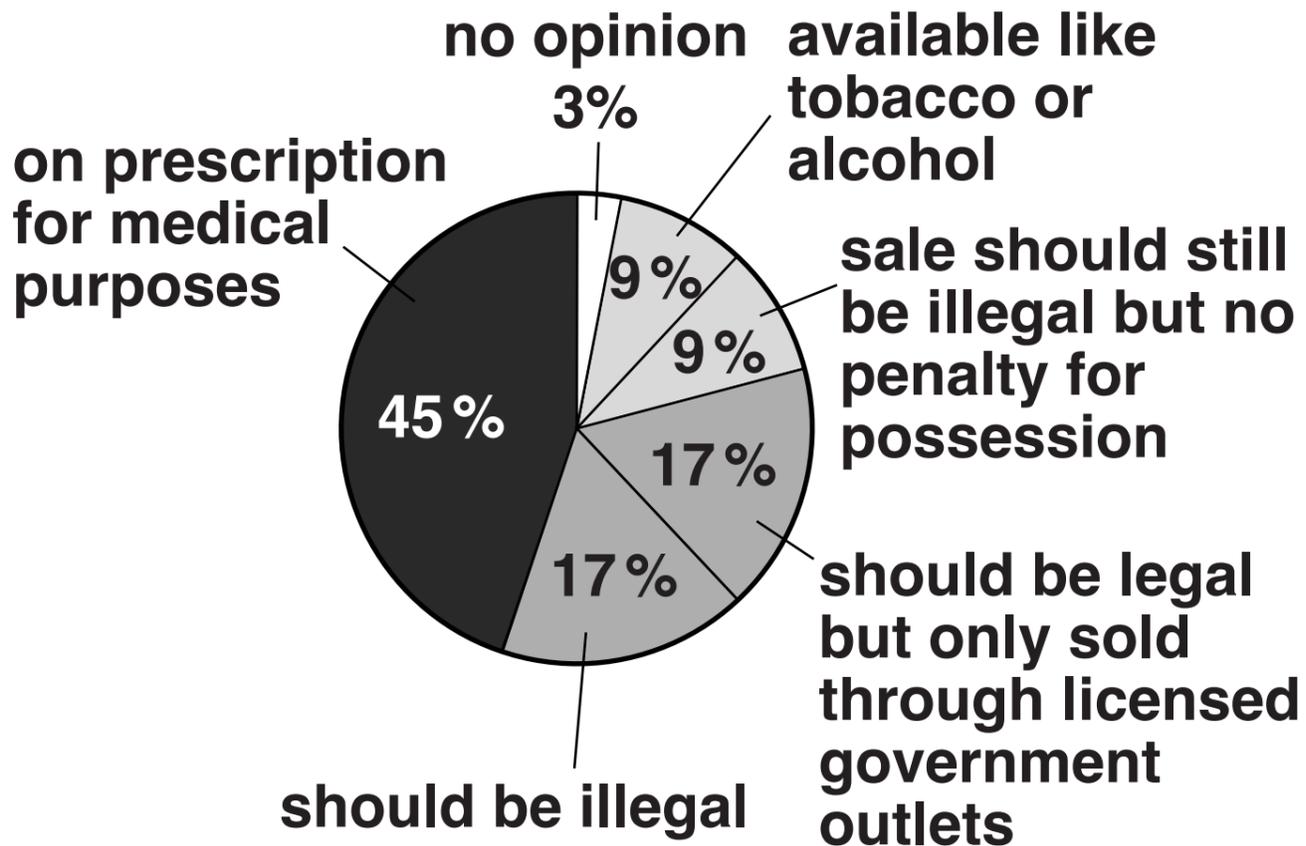
---

---

**[2]**

(c) Some people think cannabis should be made legal in the United Kingdom.

Look at the chart. It shows the results of an opinion poll about making cannabis legal.



Read these conclusions about the data.

Put a tick (✓) next to the TWO conclusions that match the data.

35% think you should be able to get cannabis on prescription.

26% think you should be able to buy cannabis without a prescription.

9% think you should be able to buy cannabis without a prescription from a licensed outlet.

26% think that the sale of cannabis should be illegal.

Less than 50% think cannabis should be made legal either with or without a prescription.

[2]

**4 This question is about genetics.**

**A scientist called Mendel studied the inheritance of characteristics in peas.**

**(a) Nalshed and Jill copy some of Mendel's experiments.**

**The table shows their experiments and some of their results.**

<b>Experiment</b>	<b>Description of experiment</b>	<b>Number of offspring</b>	<b>Offspring type</b>
<b>1</b>	<b>crossed tall plants with short plants</b>	<b>282</b>	<b>all tall</b>
<b>2</b>	<b>crossed the offspring from experiment 1 with each other</b>	<b>280</b>	<b>210 tall 70 short</b>
<b>3</b>	<b>crossed offspring from experiment 1 with short plants</b>	<b>260</b>	

**There were 260 offspring from EXPERIMENT 3.**

**Predict how many of these offspring from experiment 3 will be tall and how many will be short.**

**Use the letters T and t and a diagram to help you.**

**Number of tall offspring \_\_\_\_\_**

**Number of short offspring \_\_\_\_\_**

**[2]**

**(b) Mendel's work on inheritance was not recognised until after his death.**

**Scientists used papers Mendel had written to help them explain their own investigations.**

**Use these ideas to explain why it is important that Mendel published his work.**

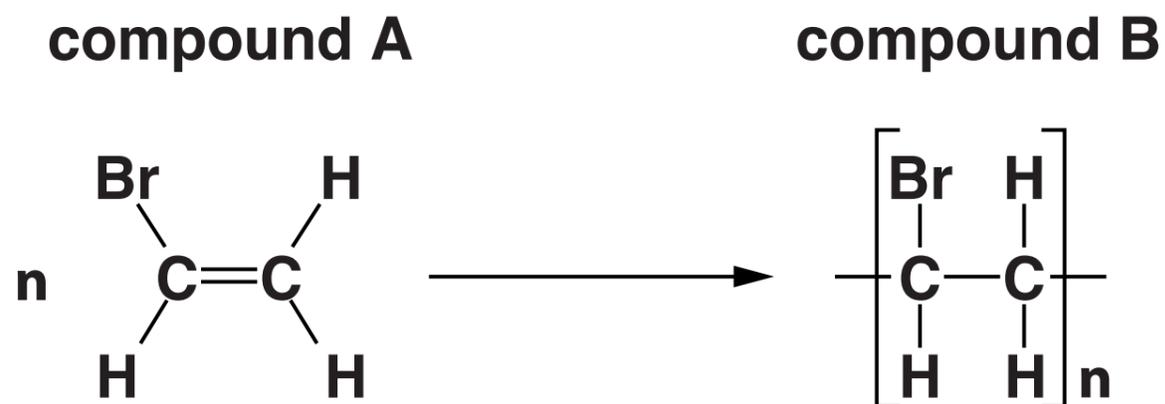
---

---

**[1]**

## SECTION B – Module C1

5 This question is about carbon compounds.



(a) Look at the displayed formula of compound A.

(i) Compound A is NOT a hydrocarbon.

Explain why.

\_\_\_\_\_

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

(ii) Write down the MOLECULAR FORMULA for compound A.

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

(b) Compound A is changed into compound B in a process called polymerisation.

Describe, including the conditions needed, the process of polymerisation.

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_ [3]

**(c) What type of compound is compound B?**

**Choose from the list.**

**ALKANE**

**ALKENE**

**DIBROMO**

**SATURATED**

**UNSATURATED**

---

[1]

**6 Louise buys a new bottle of perfume.**

**(a) The perfume contains a chemical called an ESTER.**

**Complete the WORD EQUATION for the reaction used to make an ester.**



**(b) Louise buys some nail varnish remover.**

**Her nail varnish remover contains an ester.**

**The ester is a solvent.**

**Louise's nail varnish remover dissolves nail varnish.**

**Water does not dissolve nail varnish.**

**Explain, using ideas about particles, why water will not dissolve nail varnish.**

---

---

---

---

[2]

**7 Duncan investigates the combustion of four different fuels.**

**He burns the same volume of fuel in each experiment.**

**Look at his results.**

<b>Fuel</b>	<b>Is carbon dioxide made?</b>	<b>Is carbon monoxide made?</b>	<b>Is soot made?</b>	<b>Energy given out in J</b>	<b>Cost per litre in £</b>
<b>A</b>	✓	✗	✗	<b>4200</b>	<b>6.00</b>
<b>B</b>	✓	✓	✗	<b>2900</b>	<b>4.00</b>
<b>C</b>	✗	✓	✓	<b>1100</b>	<b>1.30</b>
<b>D</b>	✓	✗	✗	<b>3800</b>	<b>3.00</b>

**(a) Which fuel would be best for Duncan to use to heat his house?**

**Use information from the table to explain your answer.**

---

---

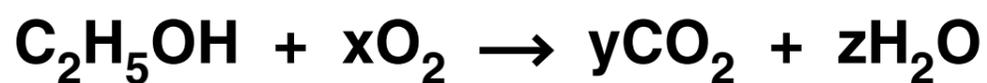
---

---

**[3]**

**(b) Fuel A is ethanol.**

**Look at this equation. It shows the complete combustion of ethanol.**



**What are the numbers x, y and z that balance this equation?**

**x = \_\_\_\_\_**

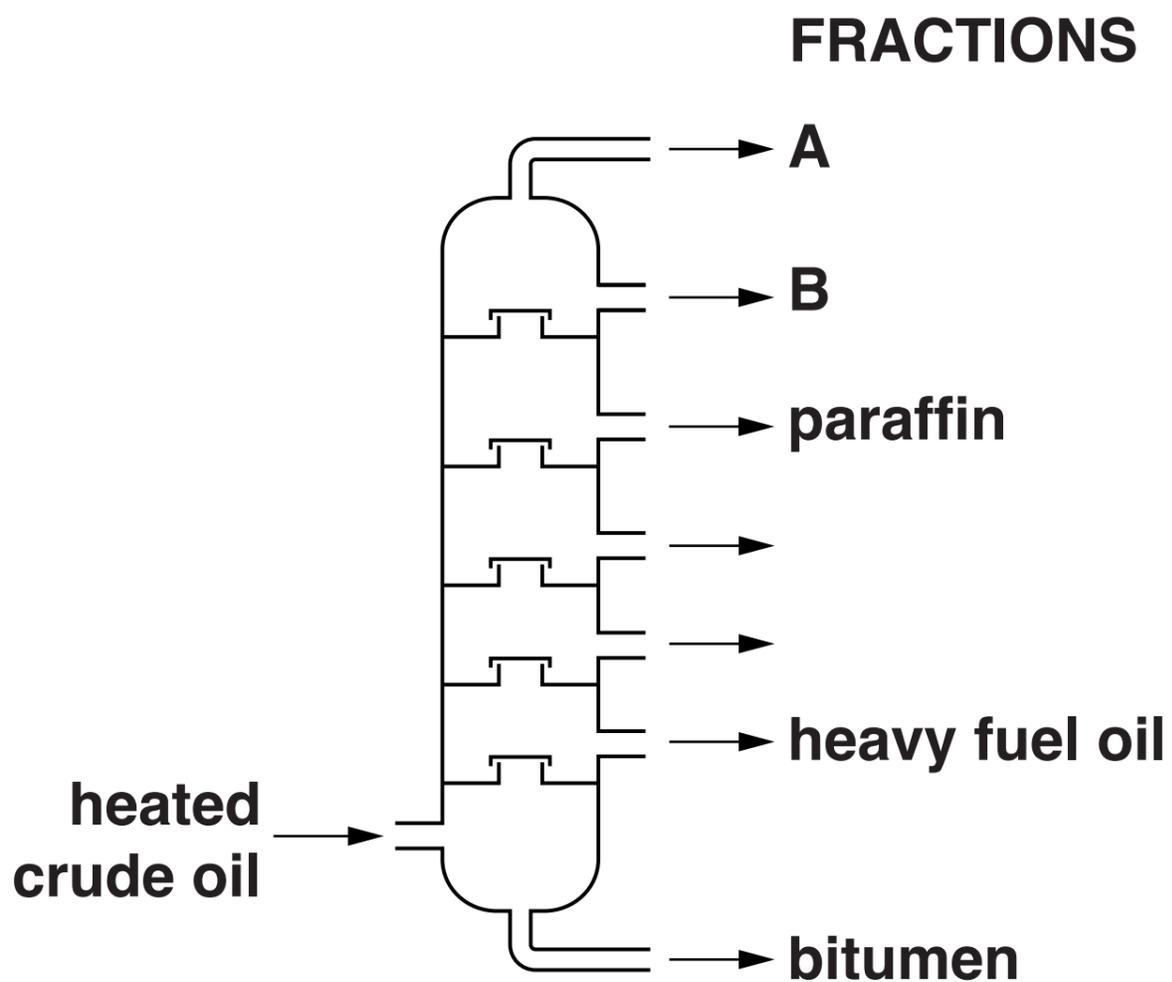
**y = \_\_\_\_\_**

**z = \_\_\_\_\_**

**[1]**

**8 This question is about crude oil.**

**Crude oil can be separated into useful substances called fractions.**



**(a) What are the names of the missing fractions A and B?**

**Choose your answers from the list.**

**DIESEL**

**HEATING OIL**

**LPG**

**METHANE**

**PETROL**

**Fraction A is \_\_\_\_\_**

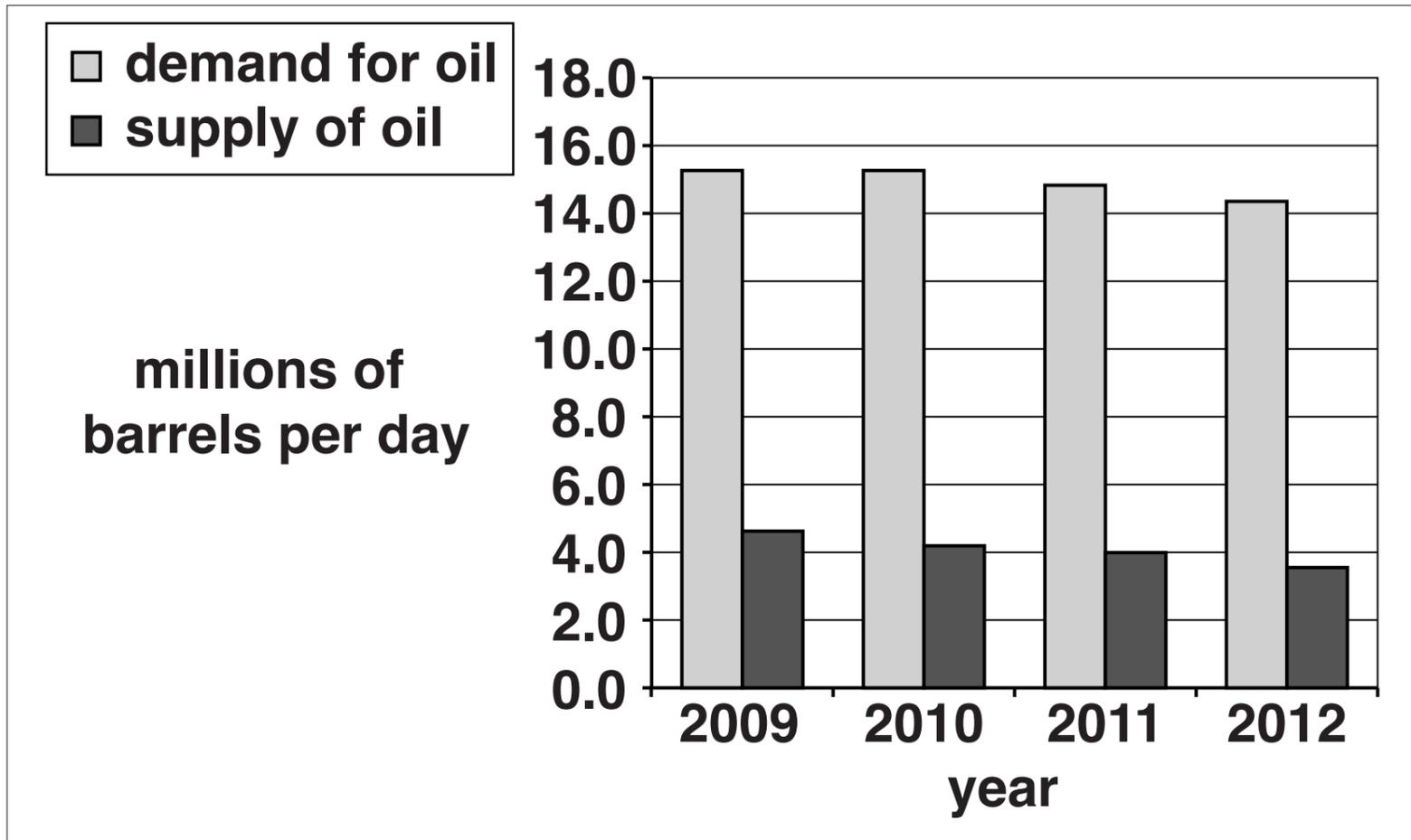
**Fraction B is \_\_\_\_\_**

**[1]**

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

**The graph shows the PRODUCTION of oil in Europe from 2009 to 2012.**

**It also shows the DEMAND for oil in Europe in the same period.**



**What trends can you deduce about the supply and demand of crude oil from 2009 to 2012?**

---

---

---

**[2]**

(c) Look at the information about two substances found in crude oil.

Molecular formula	<input type="text" value="C&lt;sub&gt;2&lt;/sub&gt;H&lt;sub&gt;6&lt;/sub&gt;"/>	→	<input type="text" value="C&lt;sub&gt;8&lt;/sub&gt;H&lt;sub&gt;18&lt;/sub&gt;"/>
Boiling point	<input type="text"/>	→	<input type="text"/>
Intermolecular forces	<input type="text"/>	→	<input type="text"/>

Complete the boxes to show how the **BOILING POINTS** and **INTERMOLECULAR FORCES** compare for these two substances.

Choose words from the list.

COVALENT

HIGH

IONIC

LOW

STRONG

WEAK

[2]

(d) Distillation of C<sub>8</sub>H<sub>18</sub> does not make individual carbon and hydrogen atoms.

Explain why.

---

---

[1]

**BLANK PAGE**

9 This question is about polymers A and B.

Look at the table.

It gives some information about polymers A and B.

	A	B
Density in g/cm <sup>3</sup>	0.91	0.97
Melting point in °C	80	270
Relative strength	11.8	31.4
Relative flexibility	flexible	rigid

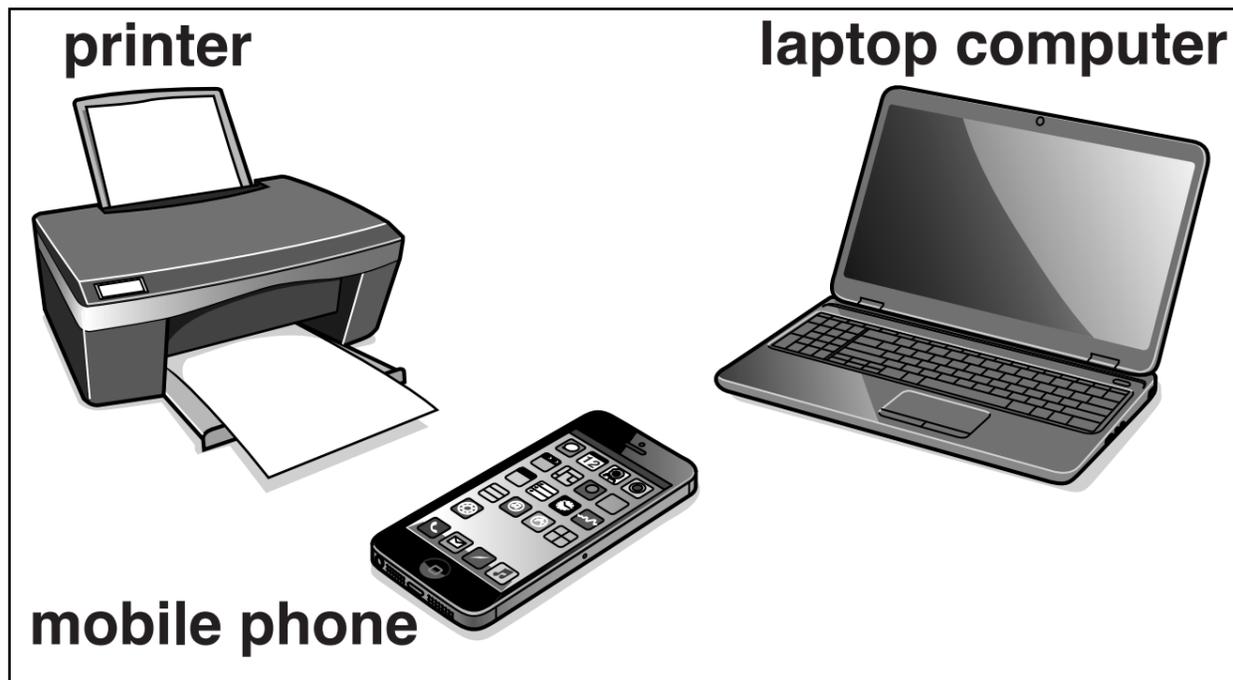




## SECTION C – Module P1

10 OCRA is an advertising company.

Here is a picture from one of their adverts.



The advert is about using wireless technology.

(a) Wireless technology allows these three devices to communicate with each other.

Describe why wireless communication does NOT always work for these devices.

---

---

---

---

[2]

**(b) The laptop computer has an INFRARED mouse.**



**Describe the TYPE of signals the infrared mouse uses and explain how the signals can be used to control different functions on the laptop computer.**

---

---

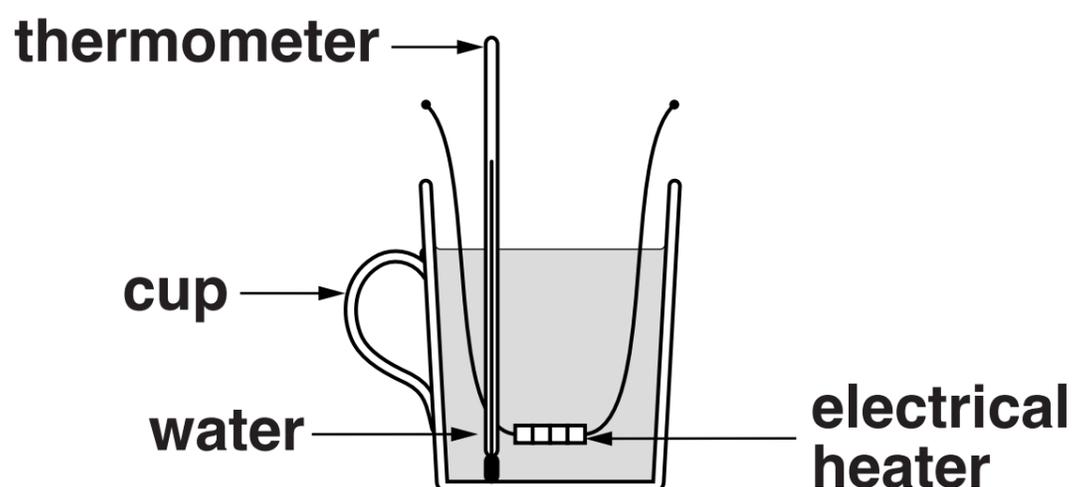
---

---

**[2]**

**11 Emily does an experiment to calculate the energy needed to change the temperature of water.**

**(a) Here is the apparatus she uses.**



**Emily does the experiment three times.**

**Each time she changes the temperature of the water by different amounts.**

**Look at her results.**

<b>Mass of water in kg</b>	<b>Initial temperature in °C</b>	<b>Final temperature in °C</b>	<b>Energy absorbed by water in J</b>	<b>Energy supplied by heater in J</b>
<b>0.2</b>	<b>20</b>	<b>55</b>	<b>29400</b>	<b>49000</b>
<b>0.2</b>	<b>20</b>	<b>35</b>	<b>12600</b>	<b>18000</b>
<b>0.2</b>	<b>20</b>		<b>8400</b>	<b>10000</b>



**(b) Emily thinks that her results will change if she insulates the cup.**

**(i) What things can Emily do to the cup to reduce heat loss by CONDUCTION and CONVECTION?**

**conduction can be reduced by: \_\_\_\_\_**

\_\_\_\_\_

**convection can be reduced by: \_\_\_\_\_**

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

**(ii) Emily measures how long it takes to increase the temperature of this water by 60 °C. This takes 5 minutes.**

**She repeats this experiment with the same mass of water in an insulated cup.**

**Suggest what effect this has on the time taken to heat the water by 60 °C.**

**Explain your answer.**

\_\_\_\_\_

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

**BLANK PAGE**

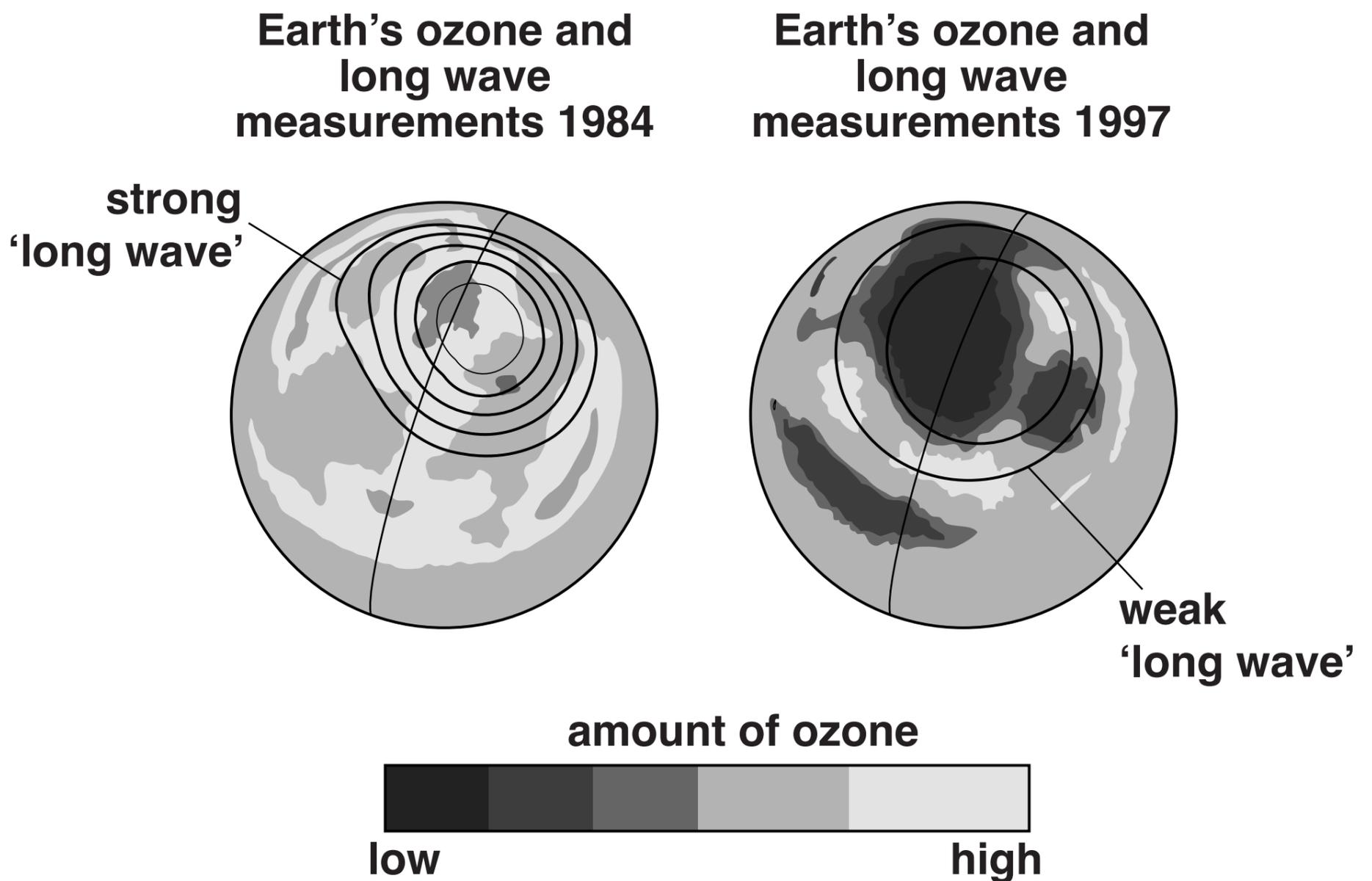
**12 Scientists have measured the amount of ozone in the upper atmosphere.**

**They have also measured the strength of 'long waves'.**

**'Long waves' are bands of energy found in the upper atmosphere.**

**They help to keep the temperature of the upper atmosphere constant.**

**Here are the ozone and long wave measurements for the years 1984 and 1997.**



**(a) Scientists believe that the strength of the ‘long waves’ and the amount of ozone in the upper atmosphere are linked.**

**Use the information to explain why scientists think there is a link.**

---

---

---

---

---

**[2]**

**(b) Pollution from CFCs has changed the size of the hole in the ozone layer over Antarctica.**

**Describe how CFCs have increased the potential danger to human health.**

---

---

---

---

**[2]**

**(c) In 2007 about 200 countries agreed to stop using CFCs completely by 2020.**

**(i) Why is an international agreement important?**

---

---

[1]

**(ii) Some other countries were given until 2030 to completely stop using CFCs.**

**Suggest why some countries have been given different time scales to stop using CFCs.**

---

---

[1]

**13 Microwaves and infrared radiation have different properties.**

**(a) Tick (✓) TWO correct statements about microwaves.**

**Microwaves penetrate about 10 cm into water.**

**Microwaves can be absorbed by body tissue.**

**Microwaves pass through glass but do NOT pass through plastic.**

**The kinetic energy of water increases when it absorbs microwaves.**

**Microwaves do NOT diffract at all.**

**Microwave communication is NOT affected by poor weather conditions.**

**[2]**

**(b) Tick (✓) ONE correct statement about infrared radiation.**

**Infrared radiation penetrates about 1 cm into food.**

**Infrared radiation is refracted by shiny surfaces.**

**Infrared radiation increases the kinetic energy of particles on the surface of food.**

**The energy of infrared radiation DOES NOT depend on the frequency.**

**[1]**

**(c) Infrared radiation can travel along an optical fibre.**

**Look at the table.**

**It shows some properties of materials A, B, C and D.**

<b>Material</b>	<b>Does total internal reflection happen?</b>	<b>Is Multiplexing possible?</b>	<b>Channel speed in bits per second</b>
<b>A</b>	<b>yes</b>	<b>yes</b>	<b><math>100 \times 10^9</math></b>
<b>B</b>	<b>no</b>	<b>yes</b>	<b><math>171 \times 10^9</math></b>
<b>C</b>	<b>yes</b>	<b>yes</b>	<b><math>146 \times 10^9</math></b>
<b>D</b>	<b>no</b>	<b>no</b>	<b><math>273 \times 10^9</math></b>

**The channel speed is the number of bits of information transferred per second.**

**Which material is the best for making optical fibres?**

**Choose from A B C D.**

\_\_\_\_\_

**Explain your answer.**

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

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

**END OF QUESTION PAPER**

**BLANK PAGE**

---

**OCR**  
Oxford Cambridge and RSA

**Copyright Information**

**OCR is committed to seeking permission to reproduce all third-party content that it uses in its assessment materials. OCR has attempted to identify and contact all copyright holders whose work is used in this paper. To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced in the OCR Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download from our public website ([www.ocr.org.uk](http://www.ocr.org.uk)) after the live examination series.**

**If OCR has unwittingly failed to correctly acknowledge or clear any third-party content in this assessment material, OCR will be happy to correct its mistake at the earliest possible opportunity.**

**For queries or further information please contact the Copyright Team, First Floor, 9 Hills Road, Cambridge CB2 1GE.**

**OCR is part of the Cambridge Assessment Group; Cambridge Assessment is the brand name of University of Cambridge Local Examinations Syndicate (UCLES), which is itself a department of the University of Cambridge.**

