

**OXFORD CAMBRIDGE AND RSA EXAMINATIONS**

**GCSE**

**B711/02**

**GATEWAY SCIENCE  
SCIENCE B**

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

**WEDNESDAY 25 MAY 2016 – 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:**

**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. 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.**

## **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**

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

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

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

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

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

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

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

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

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

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

$$\text{force} = \text{mass} \times \text{acceleration}$$

$$\text{weight} = \text{mass} \times \text{gravitational field strength}$$

$$\text{work done} = \text{force} \times \text{distance}$$

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

$$\text{power} = \text{force} \times \text{speed}$$

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

$$\text{momentum} = \text{mass} \times \text{velocity}$$

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

$$\text{GPE} = mgh$$

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

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

**Answer ALL the questions.**

**SECTION A – Module B1**

**1 Jim is a 14 year old boy who has Type 1 diabetes.**

**(a) Jim needs medical treatment to control his condition.**

**He injects insulin into his body.**

**Describe how insulin travels around the body.**

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

**(b) The more carbohydrate Jim eats, the more insulin he needs.**

**Explain why.**

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

**(c) Describe where and how carbohydrates are stored in the body.**

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

**(d) Jim thinks he inherited diabetes.**

**Inherited characteristics are controlled by genes.**

**Cystic fibrosis is another inherited disorder.**

**Cystic fibrosis is caused by a recessive allele.**

**Complete the table below to describe the phenotypes of different individuals.**

<b>Genotype</b>	<b>Phenotype</b>
<b>FF</b>	
<b>Ff</b>	
<b>ff</b>	

**[2]**

**[TOTAL: 7]**

**2 This question is about alcohol.**

- (a) Explain why alcohol slows down transmission along nerve pathways.**

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**[3]**

- (b) Women are advised to drink no more than 14 UNITS of alcohol each week.**

**Look at the table.**

<b>DRINK</b>	<b>AMOUNT</b>	<b>UNITS OF ALCOHOL</b>
<b>beer</b>	<b>one pint</b>	<b>2.3</b>
<b>gin and tonic</b>	<b>one measure</b>	<b>1.0</b>
<b>cider</b>	<b>one pint</b>	<b>2.6</b>
<b>wine</b>	<b>one glass</b>	<b>3.0</b>
<b>whisky</b>	<b>one measure</b>	<b>1.0</b>



**Connie writes down all the alcoholic drink she has in one week.**

**Monday - one glass of wine**

**Tuesday - none**

**Wednesday - none**

**Thursday - two glasses of wine**

**Friday - two glasses of wine, one measure of whisky**

**Saturday - two gin and tonics**

**Sunday - one glass of wine**

**Connie has drunk more than the advised amount.**

**Calculate by how much she is over the advised amount.**

**answer \_\_\_\_\_ units**

**[2]**

**(c) Connie is concerned about drinking alcohol.**

**She researches the effects of alcohol and finds this graph opposite.**

**It shows the relative risk of having an accident if you drink alcohol and drive.**

**Connie writes down some conclusions about the graph.**

**Put a tick (✓) next to TWO conclusions that best match the graph.**

**20–29 year olds reduce the relative risk of an accident by 30 if they have blood alcohol level of 50 mg/100ml instead of 80 mg/100 ml.**

☐

**Only those aged 18–19 will have an accident with a blood alcohol level of 10 mg/100 ml.**

☐

**People over 30 are 20 times better drivers than people in other age groups.**

☐

**People with a blood alcohol level of 150 mg/100ml are at least 200 times more likely to have an accident than people with no alcohol in their blood.**

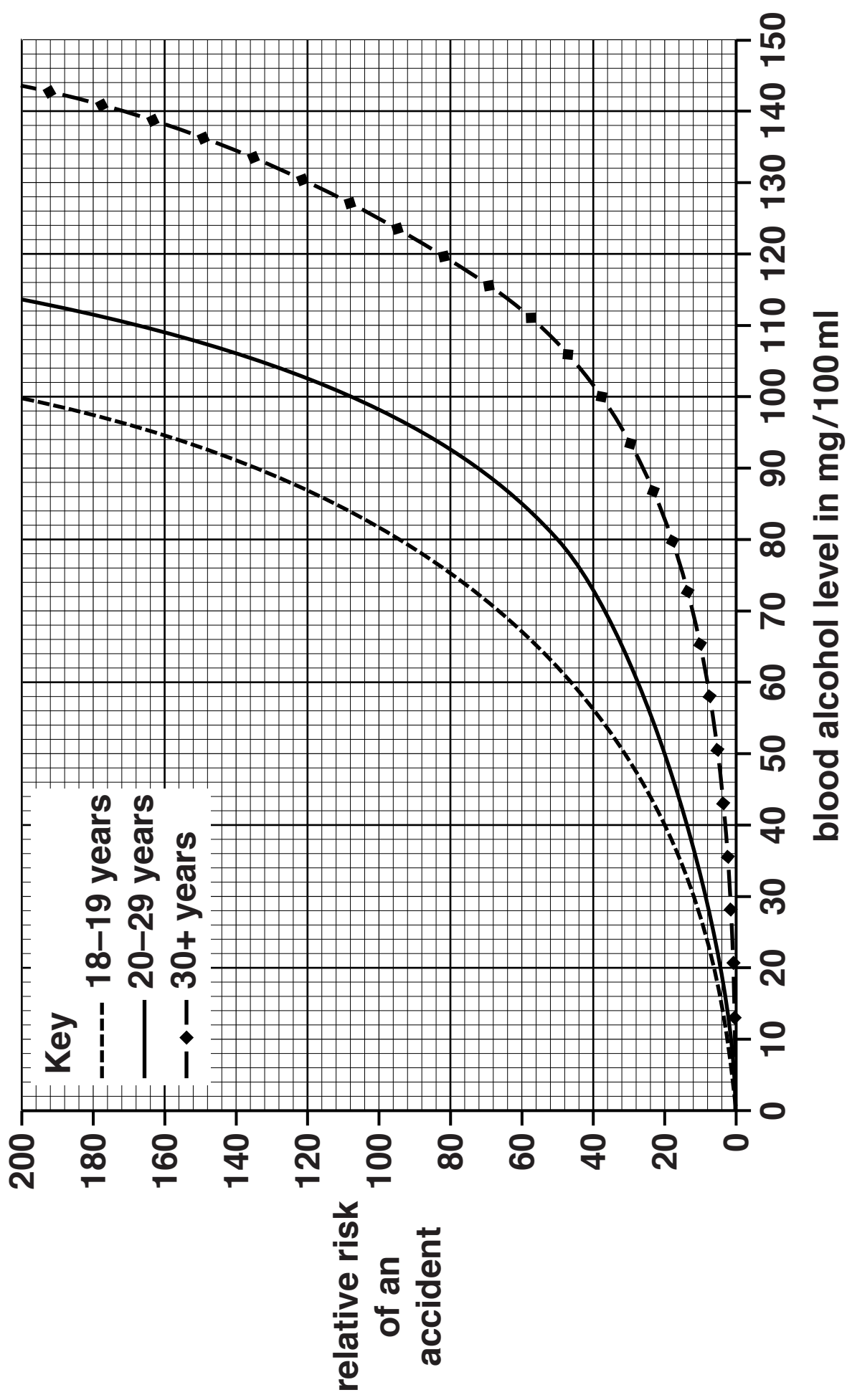
☐

**The lower the blood alcohol level the more likely you are to have an accident.**

☐

**[2]**

**[TOTAL: 7]**



- 3 Polio is an illness caused by a virus.  
In 1988 a campaign started to rid the world of polio.  
The campaign wanted to vaccinate children all over  
the world.**

**Look at the graph opposite. It shows the number of  
polio cases in the world from 1984 to 2004.**

**Explain how vaccinations work and use the data to  
conclude if the campaign was successful or not.**



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

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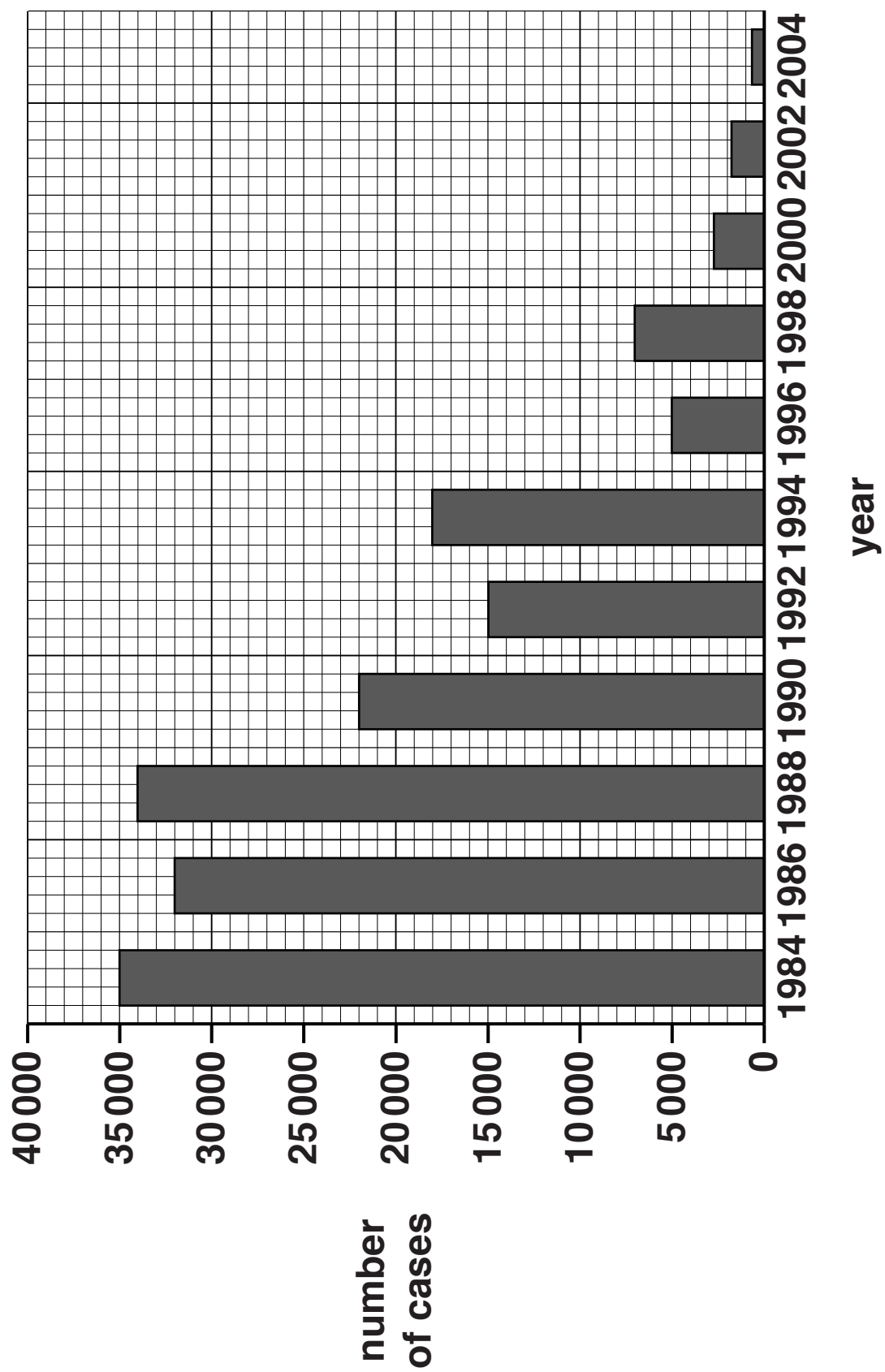
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**[6]**

**[TOTAL: 6]**



**4 Benny is cooking his tea.**

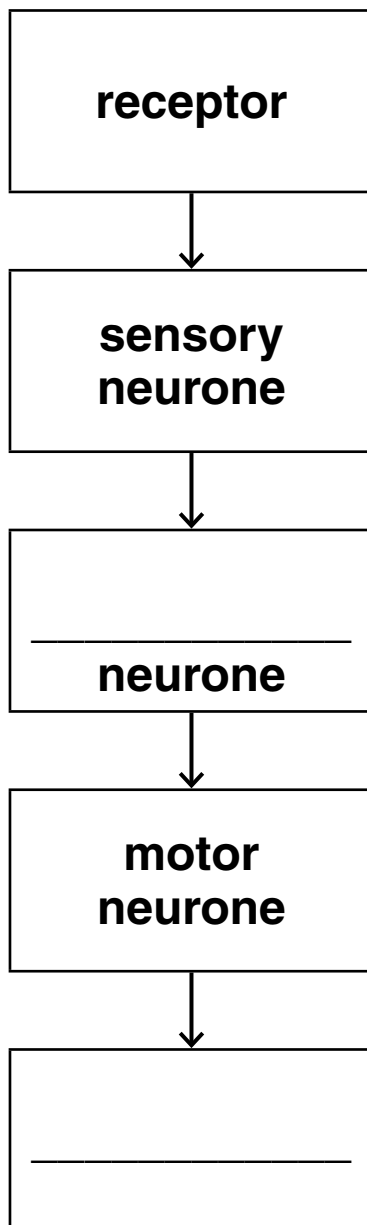
**He lifts a hot plate of food.**

**The plate is too hot to hold.**

**Benny drops the plate.**

**(a) Benny's response to the hot plate is a reflex action.**

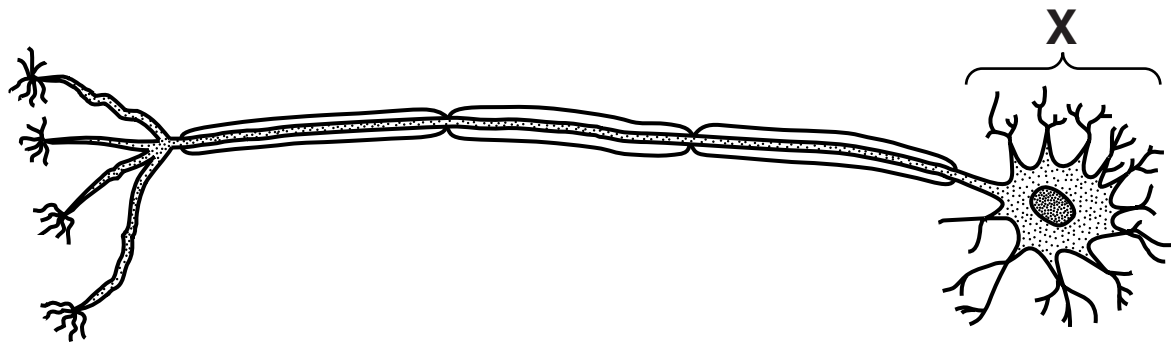
**Finish the flow chart below to show the path taken by the impulse that causes the reflex.**



**[2]**

**(b) Motor neurones are part of Benny's nervous system.**

**Look at the diagram below of a motor neurone.**



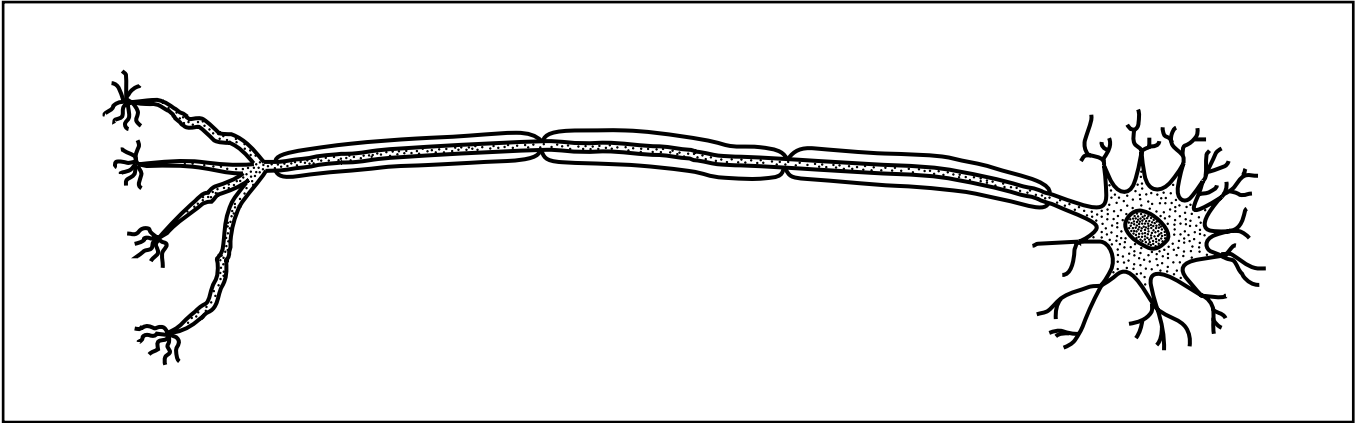
**Write down the name of part X.**

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

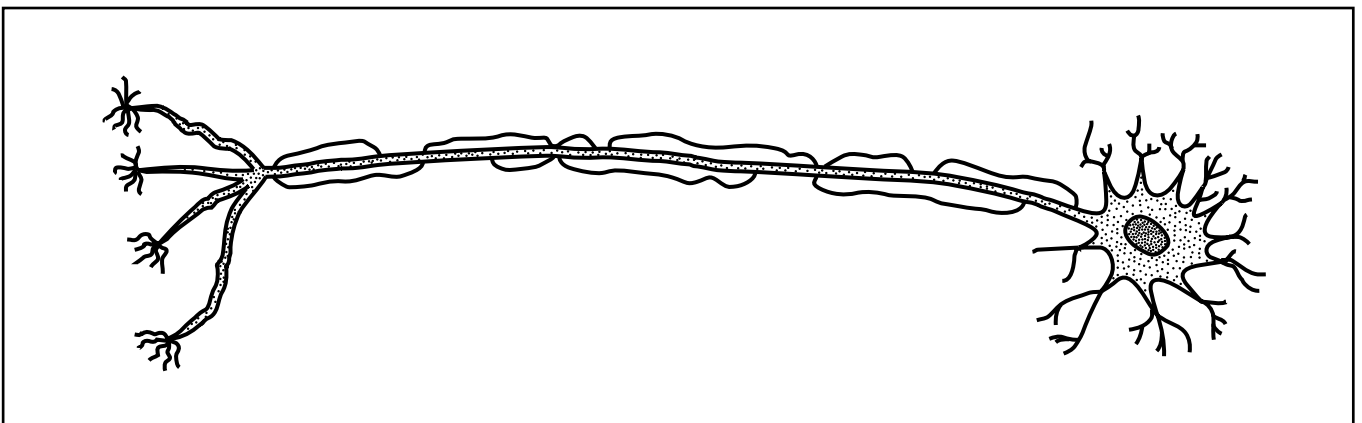
**(c) Sometimes neurones can be damaged.**

**Look at the pictures of an undamaged and a damaged neurone.**

**undamaged neurone**



**damaged neurone**



**How would the damage affect the transmission of impulses?**

**Explain your answer.**

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

**[TOTAL: 5]**

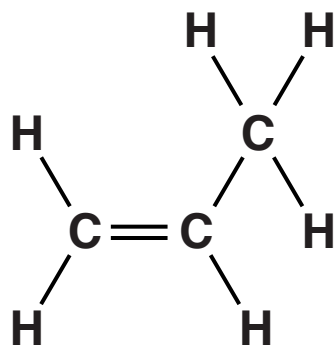


## SECTION B – Module C1

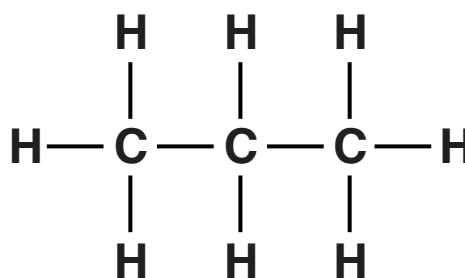
5 This question is about carbon compounds.

Look at the displayed formulas.

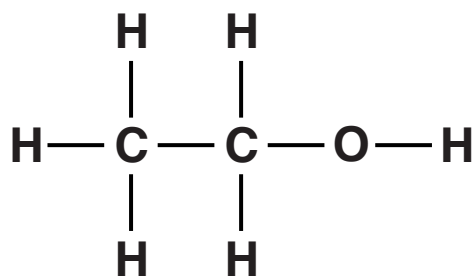
Compound A



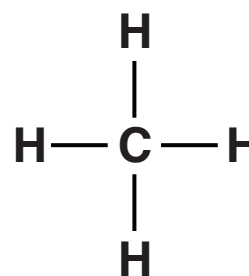
Compound B



Compound C



Compound D



(a) Which compound is NOT a hydrocarbon?

Explain your answer.

\_\_\_\_\_

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

(b) What is the MOLECULAR FORMULA of compound C?

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

**(c) Compound A is an UNSATURATED compound.**

**Explain why.**

\_\_\_\_\_

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

**(d) Molecules of compound A can join together to make a polymer.**

**Draw the DISPLAYED FORMULA of the polymer made.**

**[1]**

**[TOTAL: 5]**

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

**Crude oil is a fossil fuel.**

**(a) Fossil fuels are FINITE resources and are NON-RENEWABLE.**

**Explain what is meant by finite AND non-renewable.**

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[2]

- (b) Crude oil is often transported in large ships called oil tankers.**



**This could cause ENVIRONMENTAL PROBLEMS.**

**Explain TWO of these environmental problems.**

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**[2]**

- (c) Crude oil is separated into useful fractions by fractional distillation.

Look at the table below. It shows information about some of the fractions separated from crude oil.

FRACTION	PERCENTAGE SUPPLY IN CRUDE OIL	PERCENTAGE DEMAND FROM CUSTOMERS
LPG	2	4
petrol	15	27
diesel	14	21
paraffin	14	9
heating oil	14	14
fuel oil and bitumen	36	25

There is not enough petrol to meet the demand for it.

- (i) Write down the names of TWO other fractions where the supply does not meet the demand from customers.

\_\_\_\_\_ and  
\_\_\_\_\_

[1]

- (ii) Explain how an oil refinery matches the supply of PETROL with the demand for it.

Use information from the table on page 21 to help you.

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[2]

[TOTAL: 7]

**7 This question is about fuels.**

**(a) Butane,  $\text{C}_4\text{H}_{10}$ , burns in oxygen,  $\text{O}_2$ .**

**Carbon dioxide and water are made.**

**Write a BALANCED SYMBOL equation for this combustion reaction.**

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

**(b) Some carbon monoxide is made when petrol burns in a car engine.**

**A catalytic converter changes carbon monoxide into another gas.**

**What is the name of this gas?**

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

- (c) Look at the information on page 25 about some fuels.**

**Richard wants to use methane to heat a new factory.**

**Edward suggests using coal instead of methane.**

**Evaluate the advantages and disadvantages of these two fuels and suggest which would be the more sensible choice to heat the factory.**

**Use the information from the table on page 25 to help you.**



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

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**[6]**

**[TOTAL: 9]**



<b>FUEL</b>	<b>STATE AT ROOM TEMPERATURE</b>	<b>AVAILABILITY</b>	<b>ENERGY RELEASED IN kJ/g</b>	<b>CARBON DIOXIDE RELEASED (0=LOW, 5=HIGH)</b>	<b>COST OF 1 kg IN £</b>
<b>COAL</b>	solid	good	33	3.7	0.3
<b>METHANE</b>	gas	good	56	2.8	1.3

**8 Helen has bought a new bottle of perfume.**

**(a) Draw a straight line to join each PROPERTY OF HELEN'S PERFUME to the most important REASON.**

**Draw only THREE lines.**

**PROPERTY  
OF HELEN'S  
PERFUME**

**REASON**

**insoluble in  
water**

**so the perfume  
cannot be washed  
off easily**

**does not react  
with water**

**so Helen is not  
poisoned**

**non-irritant**

**so Helen can put  
the perfume directly  
onto her skin**

**so that the perfume  
does not react with  
perspiration**

**[2]**

**(b) Helen's friends are able to smell her perfume because it is VOLATILE (evaporates easily).**

**Explain, using ideas about particles, why Helen's perfume evaporates easily.**

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**[2]**

**[TOTAL: 4]**

## **SECTION C – Module P1**

**9 This question is about waves.**

**(a) Look at the list.**

**It shows waves from the electromagnetic spectrum.**

**infrared**

**radio**

**ultraviolet**

**visible**

**X-rays**

**Complete the sentences using words from the list.**

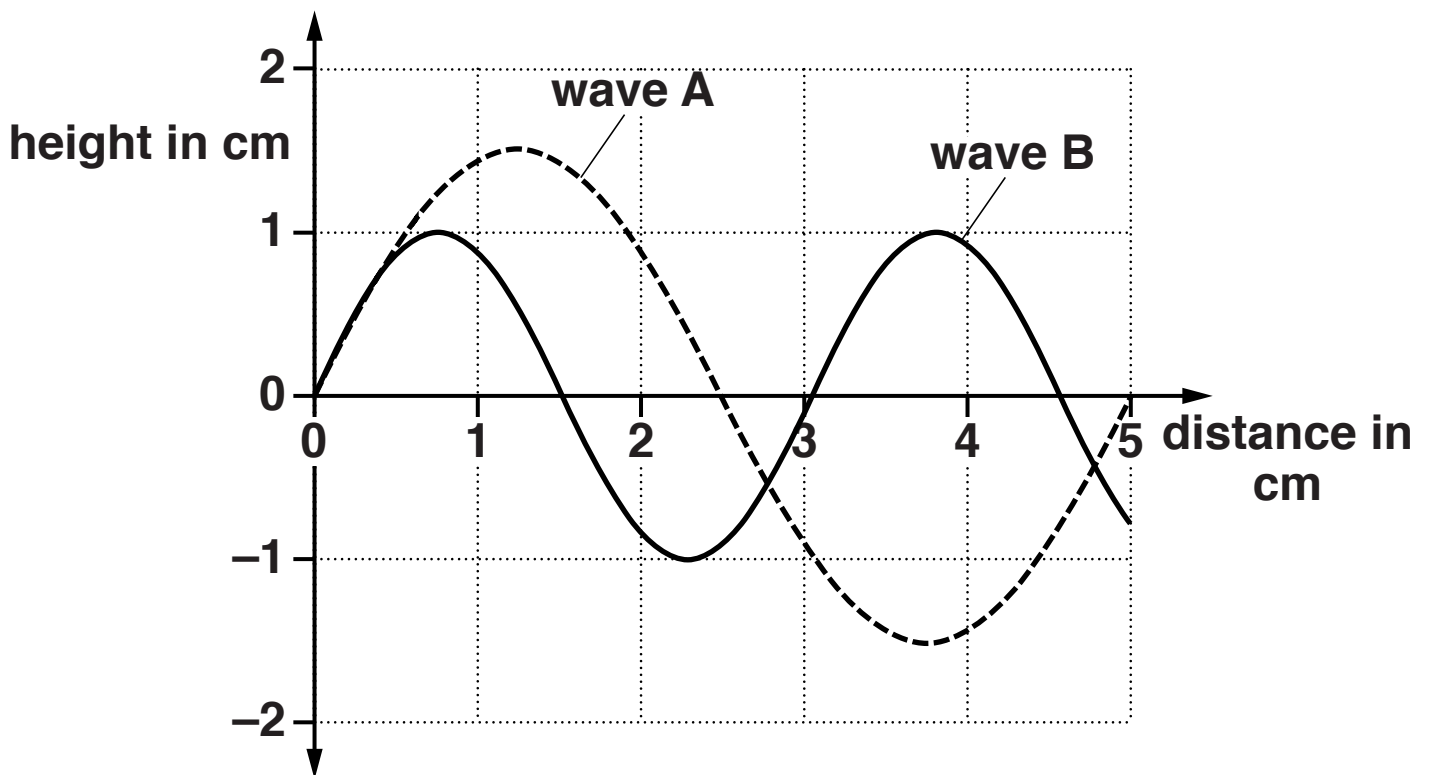
**(i) The wave that is reflected by shiny surfaces and can heat the surface of food is**

\_\_\_\_\_ . **[1]**

**(ii) The wave with the greatest wavelength is**

\_\_\_\_\_ . **[1]**

(b) Look at the diagram below of two transverse waves.



What is the **DIFFERENCE** in wavelength between wave A and wave B?

\_\_\_\_\_

Difference in wavelength \_\_\_\_\_ cm [1]

**(c) Mobile phones use microwave signals.**

**There is not much diffraction of microwave signals around large buildings.**

**This causes signal loss.**

**One way a mobile phone company can reduce the problem is to boost the signal.**

**Suggest TWO other ways a mobile phone company can reduce the problem of signal loss.**

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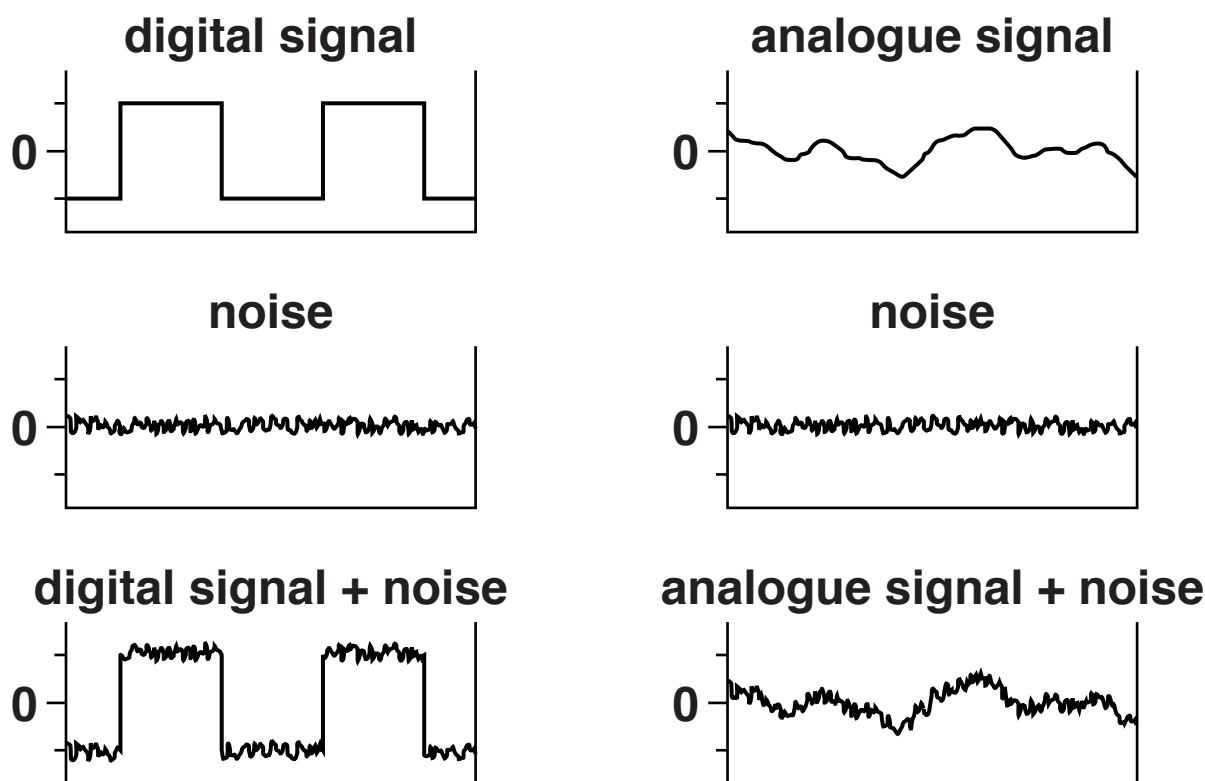
**[2]**

**[TOTAL: 5]**

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**10 This question is about digital and analogue signals.**

**Look at the information showing what happens to the signals when noise is added to them.**



**Use the diagrams to explain why it is easier to remove noise from digital signals and how the properties of digital signals played a part in the switching from analogue to digital TV broadcasts.**

**[6]**



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

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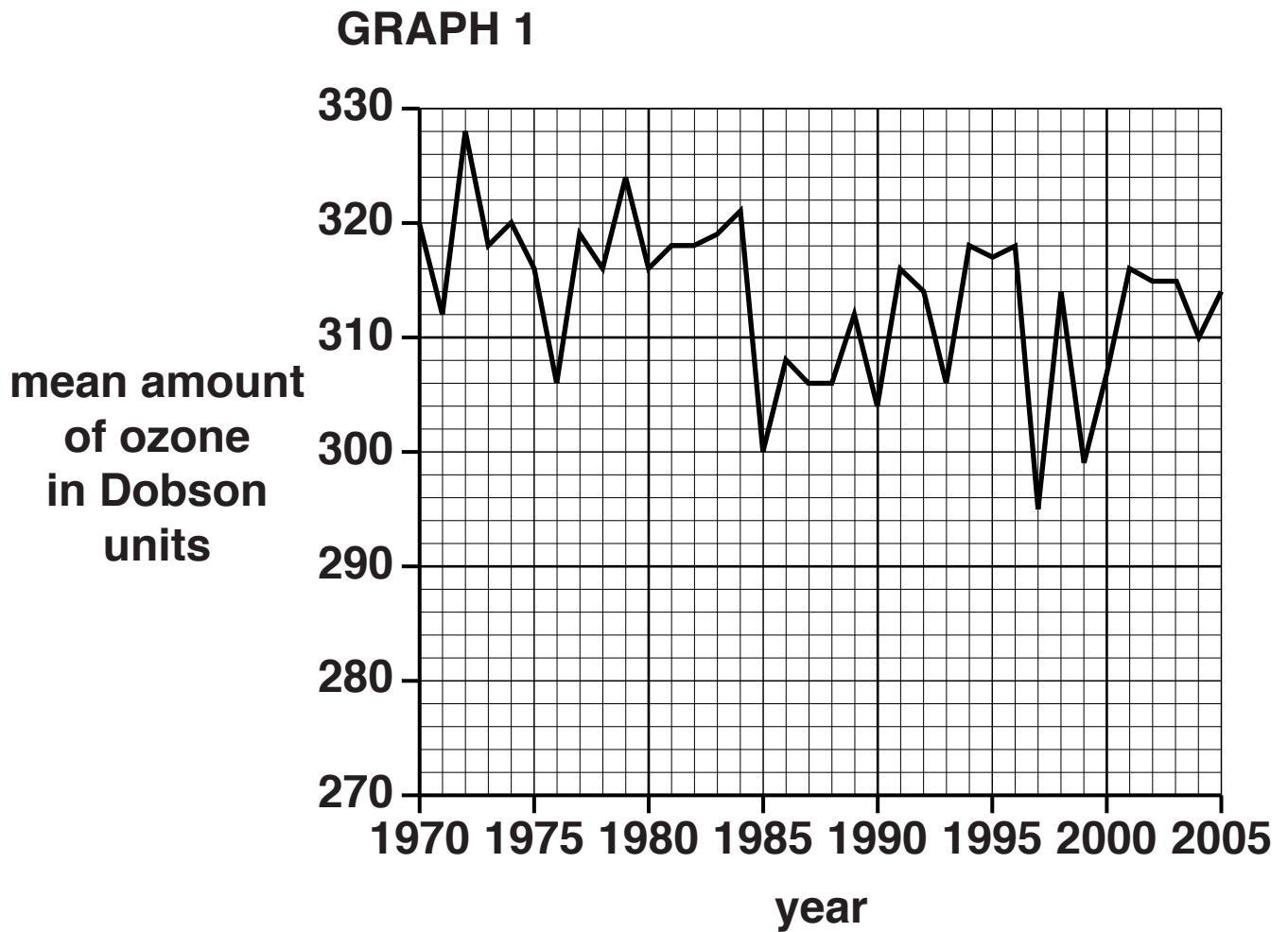
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**[TOTAL: 6]**

**11 The condition of the ozone layer near the South Pole concerns scientists.**

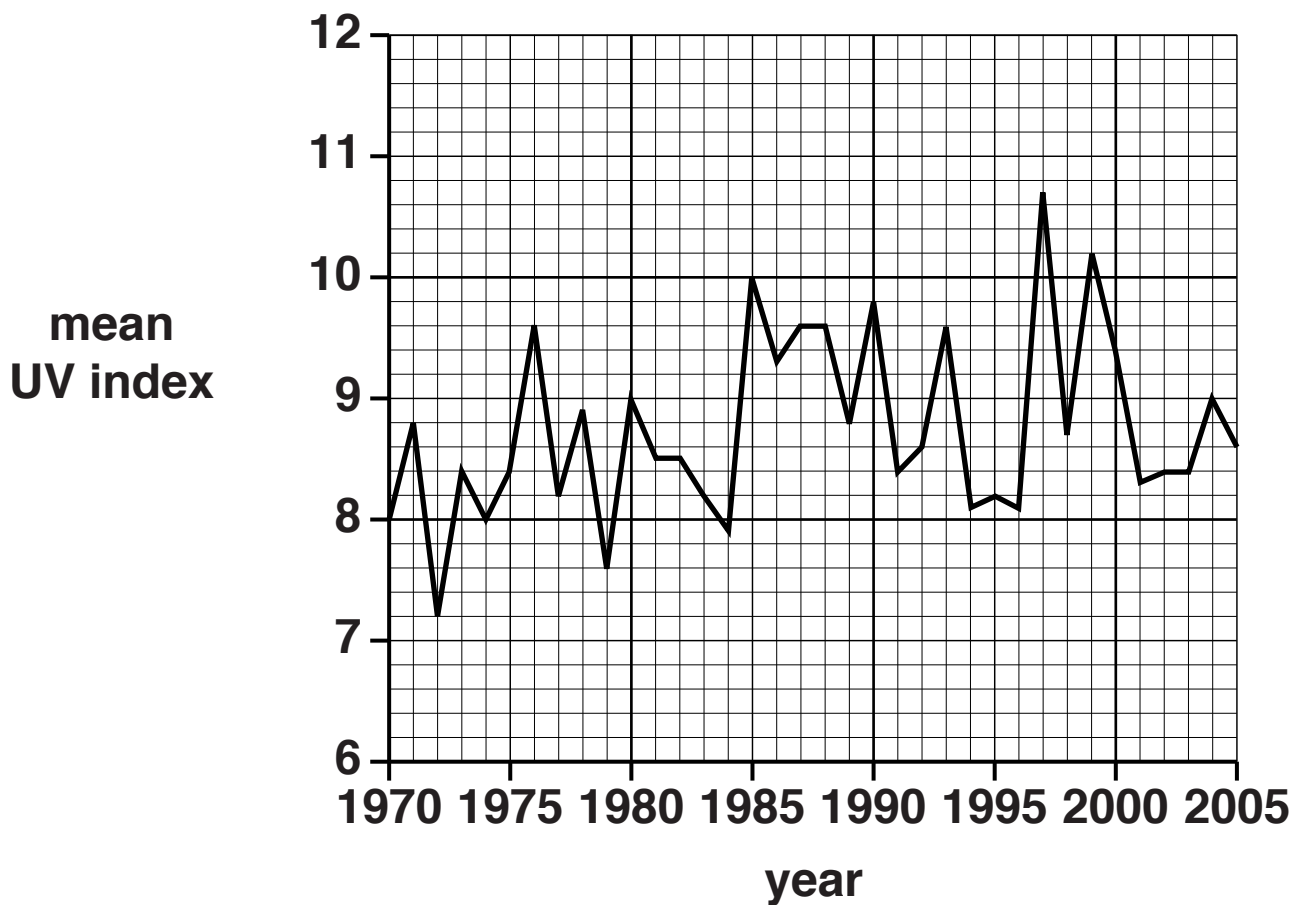
**Scientists have been measuring the mean amount of ozone in the upper atmosphere.**

**Look at their results from 1970 to 2005.**



Scientists have also been measuring the mean ultraviolet (UV) index from 1970 to 2005.

**GRAPH 2**



(a) Look at GRAPH 1 on page 34.

Scientists predicted that the amount of ozone in 1997 was the lowest they were likely to record.

Is this prediction correct?

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Explain your answer.

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[1]

**(b) (i) Compare Graphs 1 and 2 on pages 34 and 35.**

**Describe the relationship between the mean amount of ozone and mean UV index.**

\_\_\_\_\_

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

**(ii) Describe why it is important to maintain a high level of ozone in the Earth's upper atmosphere.**

\_\_\_\_\_

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

**(c) Describe why the reduction in the level of pollution from CFCs needed international agreement to benefit society.**

\_\_\_\_\_

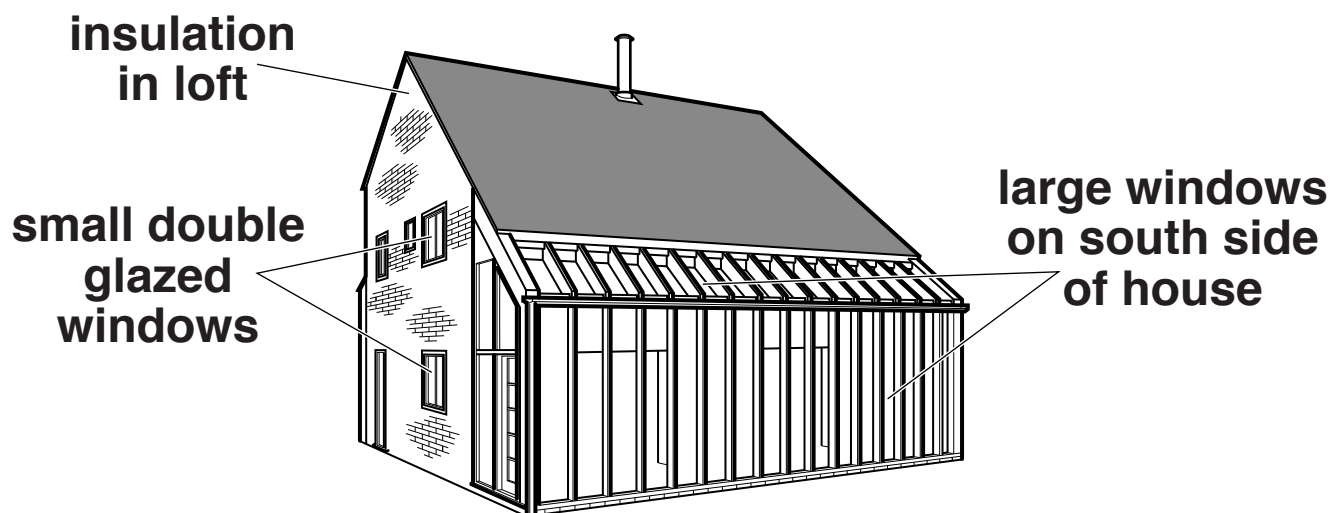
\_\_\_\_\_

\_\_\_\_\_

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

**[TOTAL: 5]**

**12 Lyndsay and Kevin buy a new house.**



- (a) Their house does NOT have cavity wall insulation but is more energy efficient than most houses.**

**Look at the picture.**

**Explain how TWO energy saving features of their house improve its energy efficiency.  
Use ideas about energy transfer in your answer.**

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**[2]**

**(b) Here are three different ways to increase the energy efficiency of Lyndsay and Kevin's house.**

<b>HOW TO INCREASE ENERGY EFFICIENCY</b>	<b>COST TO INSTALL IN £</b>	<b>SAVING ON ENERGY BILLS EACH YEAR IN £</b>
<b>Cavity wall insulation</b>	<b>1400</b>	<b>400</b>
<b>Low energy light bulbs for whole house</b>	<b>20</b>	<b>10</b>
<b>Thermostat for heating</b>	<b>35</b>	<b>100</b>

**(i) One of the ways to increase efficiency is to add cavity wall insulation to the house.**

**Lyndsay thinks this is a good idea because they will be living in the house for at least 5 years.**

**Use the information in the table above to show that Lyndsay is correct.**

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**[2]**

**(ii) Kevin thinks the cost of cavity wall insulation is expensive.**

**He wants to spend £55 on low energy light bulbs and a thermostat.**

**Which will save more money after 5 years**  
**cavity wall insulation**

**low energy light bulbs and a thermostat?**

**answer**

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**Explain your answer.**

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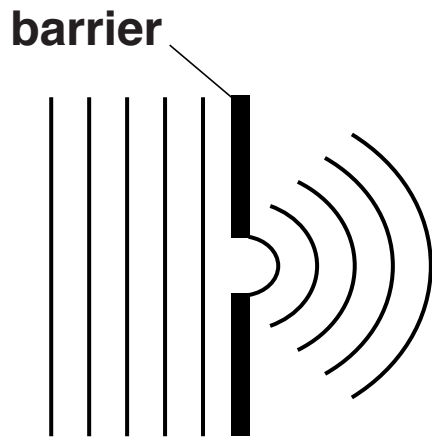
**[2]**

**[TOTAL: 6]**

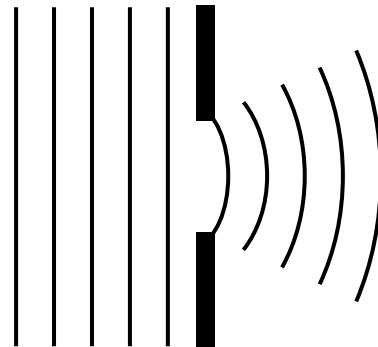
**13 Diffraction patterns in water are made using a ripple tank.**

**Look at the two different diffraction patterns.**

**Diffraction pattern A**



**Diffraction pattern B**





**Describe and explain the similarities and differences between these two diffraction patterns.**

**You may draw on the diffraction patterns and draw diagrams to help explain your answer.**

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**[3]**

**[TOTAL: 3]**

**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).**

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