

**OXFORD CAMBRIDGE AND RSA EXAMINATIONS  
GCSE**

**B711/01**

**GATEWAY SCIENCE  
SCIENCE B**

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

**WEDNESDAY 25 MAY 2016: Afternoon**

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

**MODIFIED ENLARGED 24pt**

<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.**

## **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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**Answer ALL the questions.**

## **SECTION A – Module B1**

**1 This question is about drugs.**

**(a) Finish the sentences about drugs.**

**Choose words from this list.**

**depressants**

**pain killers**

**stimulants**

**performance enhancers**

**hallucinogens**

**Drugs that slow down brain activity  
are called**

\_\_\_\_\_ .

**Drugs that distort what you see or  
hear are called**

\_\_\_\_\_ .

**[2]**

**(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 the graph on page 11.**

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

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

**Put ticks (✓) 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/100 ml 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/100 ml are at least 200 times more likely to have an accident than people with no alcohol in their blood.**

☐

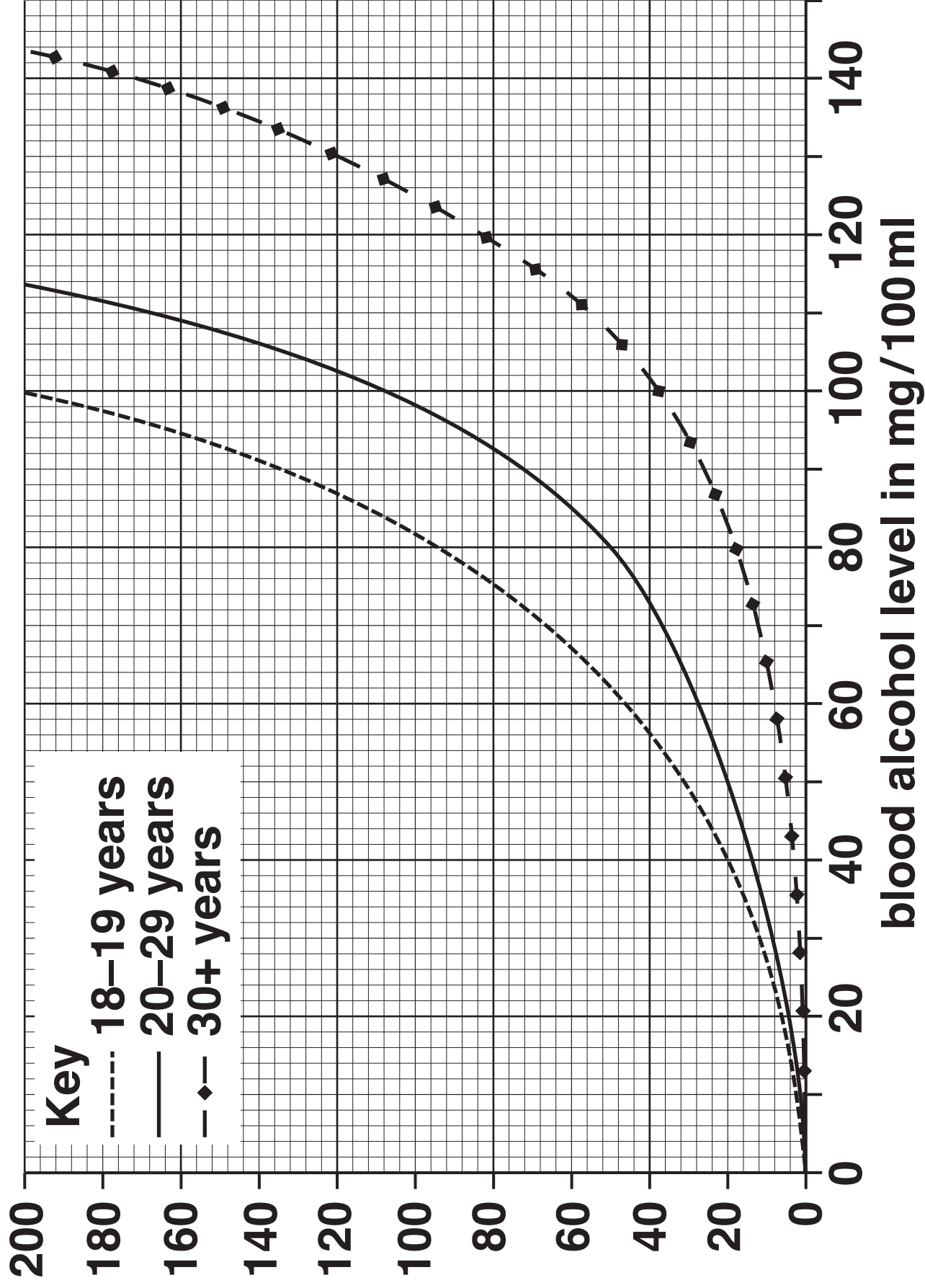
**The lower the blood alcohol level the more likely you are to have an accident.**

☐

**[2]**

**[TOTAL: 6]**

relative risk of  
an accident



**2 This question is about insulin.**

**(a) Write down the name of the organ in the body that makes insulin.**

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

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

**Jim needs medical treatment for his Type 1 diabetes.**

**He injects insulin into his body.**

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

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

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

**Explain why.**

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**[2]**

**(d) Jim thinks he inherited Type 1 diabetes from his father.**

**(i) Inherited characteristics are controlled by genes.**

**Write down the part of the cell that contains genes.**

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**[1]**

**(ii) Characteristics can be controlled by genes and by the environment.**

**Put a ring around one characteristic controlled by BOTH genes and the environment.**

**colour blindness**

**cystic fibrosis**

**eye colour**

**intelligence**

**[1]**

**[TOTAL: 6]**

**3 Polio is an illness caused by a virus. In 1988 a campaign started to rid the world of polio.**

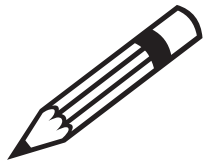
**The campaign wanted to vaccinate children all over the world.**

**Look at the table below.**

**It shows the number of reported polio cases for different areas of the world in 1996 and 2011.**

<b>AREA OF THE WORLD</b>	<b>NUMBER OF POLIO CASES</b>	
	<b>1996</b>	<b>2011</b>
<b>Africa</b>	<b>1949</b>	<b>397</b>
<b>America</b>	<b>0</b>	<b>0</b>
<b>Eastern Mediterranean region</b>	<b>532</b>	<b>297</b>
<b>Europe</b>	<b>193</b>	<b>0</b>
<b>South East Asia</b>	<b>1203</b>	<b>1</b>
<b>Western Pacific region</b>	<b>197</b>	<b>21</b>

**(a) Describe the patterns in the data and suggest reasons for these patterns.**



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

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**[6]**



**(b) When polio viruses enter the body white blood cells try to destroy them.**

**Write down TWO ways white blood cells can destroy viruses.**

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**[2]**

**[TOTAL: 8]**

**4 Benny is cooking his tea.**

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

**The plate is very hot.**

**Benny holds onto the plate until he can slowly put it down.**

**(a) Benny's response to the hot plate is NOT a reflex action.**

**Explain why his response is not a reflex action.**

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[2]

**(b) The hot plate is a stimulus.**

**How does the brain receive  
information about this stimulus?**

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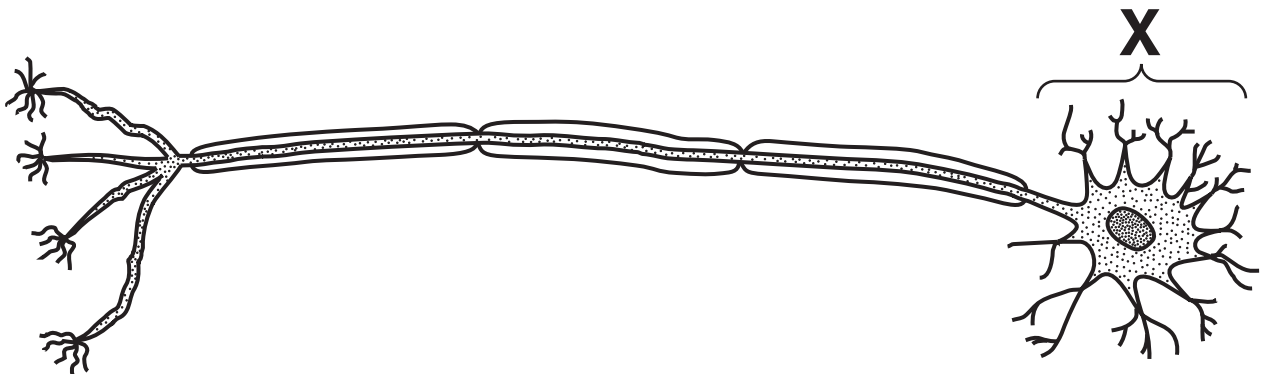
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**[2]**

**(c) 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]

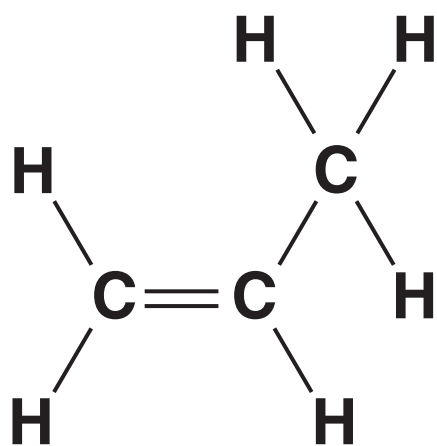
**[TOTAL: 5]**

## SECTION B – Module C1

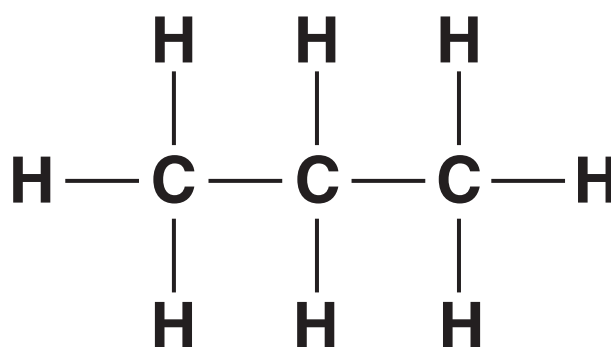
5 This question is about carbon compounds.

Look at the displayed formulas below.

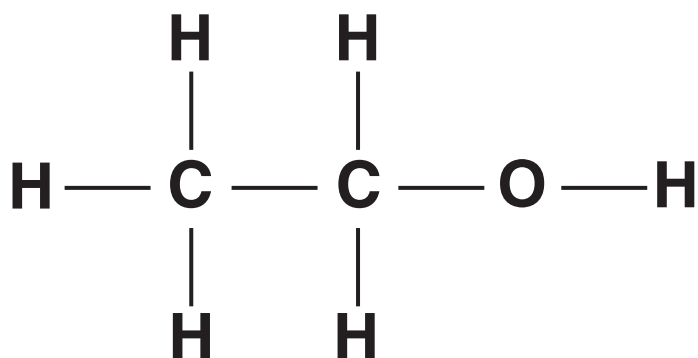
Compound A



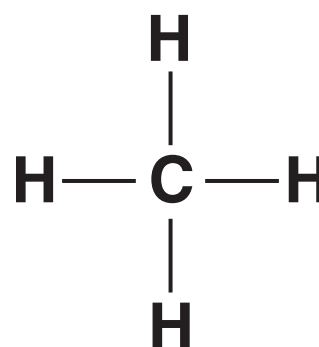
Compound B



Compound C



Compound D



**(a) Which displayed formula contains a total of 11 ATOMS?**

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

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

**(b) Which compound is NOT a hydrocarbon?**

**Explain your answer.**

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

**(c) Molecules of compound A can join together to make a polymer called poly(propene).**

**What is the NAME of compound A?**

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

**(d) What is the MOLECULAR FORMULA of compound C?**

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

**[TOTAL: 5]**

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

**(a) Crude oil is separated into useful products called fractions.**

**(i) What is the name of the process that is used to separate crude oil?**

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

**(ii) Diesel is one fraction separated from crude oil.**

**Write down the names of TWO OTHER fractions that are separated from crude oil.**

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



**(b) Carbon monoxide gas is formed by the incomplete combustion of diesel in car engines.**

**(i) Write down one problem caused by carbon monoxide.**

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

**(ii) What part of a car removes carbon monoxide from the exhaust gases?**

**Choose from the list.**

**antioxidant**

**catalytic converter**

**catalytic cracker**

**engine**

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

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

**These oil tankers sometimes spill crude oil.**

**Crude oil spills cause environmental problems.**

**Write about TWO of these problems.**

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[2]

**[TOTAL: 7]**

**7 This question is about fuels.**

**(a) Butane burns in oxygen.**

**Carbon dioxide and water are made.**

**Write a WORD equation for this combustion reaction.**

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

**(b) Combustion of butane releases energy.**

**What type of useful energy is released?**

**Choose from the list.**

**chemical**

**electrical**

**heat**

**kinetic**

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

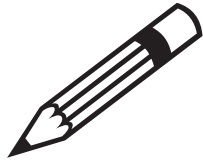
**(c) Look at the information opposite about some fuels.**

**A factory owner decides to use methane as a fuel to heat a new factory.**

**Using the information in the table, write about the ADVANTAGES and DISADVANTAGES of her choice.**

**Write down TWO OTHER factors, not in the table, that she would need to consider when choosing which fuel to use.** [6]

<b>FUEL</b>	<b>STATE AT ROOM TEMPERATURE</b>	<b>AVAILABILITY</b>	<b>ENERGY RELEASED IN kJ/g</b>	<b>IS CARBON DIOXIDE RELEASED?</b>	<b>COST OF 1 kg IN £</b>
<b>COAL</b>	<b>solid</b>	<b>good</b>	<b>33</b>	<b>yes</b>	<b>0.3</b>
<b>ETHANOL</b>	<b>liquid</b>	<b>limited</b>	<b>30</b>	<b>yes</b>	<b>0.8</b>
<b>HYDROGEN</b>	<b>gas</b>	<b>limited</b>	<b>122</b>	<b>no</b>	<b>5.0</b>
<b>METHANE</b>	<b>gas</b>	<b>good</b>	<b>56</b>	<b>yes</b>	<b>1.3</b>



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

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**[TOTAL: 8]**

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**8 This question is about chemical changes.**

**Four substances, A, B, C and D are added to four different test tubes of acid.**

**Look at the table opposite. It shows the results of the experiments.**

**(a) Two of the substances react with acid to produce a CHEMICAL CHANGE.**

**Which two?**

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

**Explain your answer.**

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**[3]**



<b>SUBSTANCE</b>	<b>OBSERVATIONS</b>	<b>TEMPERATURE AT START IN °C</b>	<b>TEMPERATURE AT END IN °C</b>
<b>A</b>	stays a white solid	19	19
<b>B</b>	colourless gas given off	23	18
<b>C</b>	solution stays colourless	19	24
<b>D</b>	stays a grey solid	18	18

**(b) A chemical change happens when cakes rise.**

**Baking powder is added to flour to make the cake rise.**

**Baking powder contains a chemical with the formula  $\text{NaHCO}_3$ .**

**Write down the NAMES of the ELEMENTS in  $\text{NaHCO}_3$ .**

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**[2]**

**[TOTAL: 5]**

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## **SECTION C – Module P1**

**9 This question is about waves.**

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

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

**infrared**

**microwave**

**radio**

**ultraviolet**

**visible**

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

**(i) Sending text messages on  
mobile phones uses**

---

**signals.**

**[1]**

**(ii) TV remote controls use**

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**radiation.**

**[1]**

**(iii) The wave with the highest frequency is**

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**. [1]**

**(b) All electromagnetic waves travel in a vacuum.**

**Put a tick (✓) in the box next to the correct statement about electromagnetic waves in a vacuum.**

**Waves with a high frequency travel faster than waves with a low frequency.**

☐

**Waves with a long wavelength travel faster than waves with a short wavelength.**

☐

**Waves all travel at the same speed in a vacuum.**

☐

**Waves in a vacuum have the same speed as waves in glass and air.**

☐

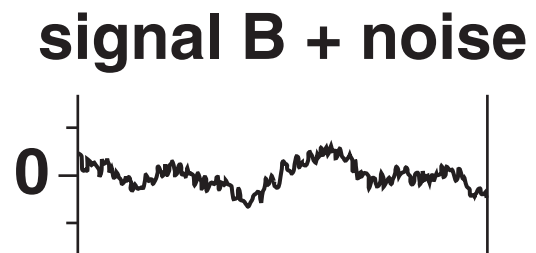
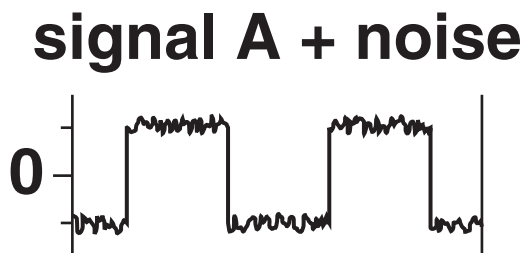
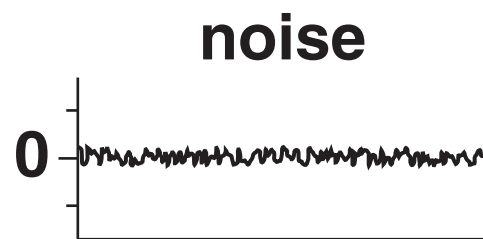
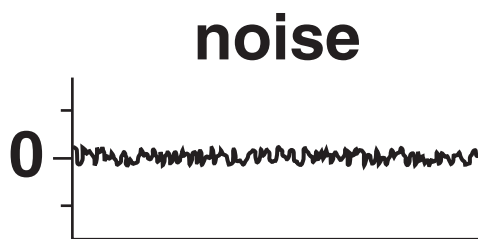
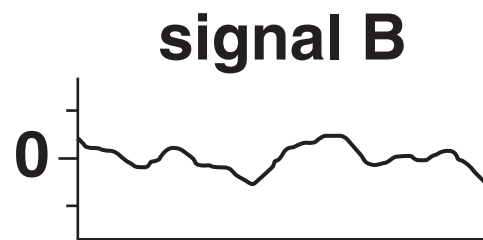
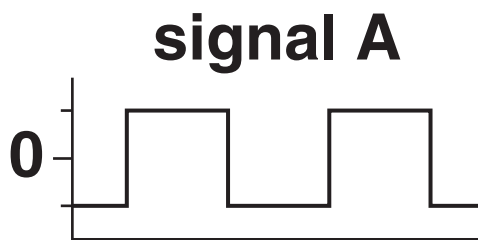
**[1]**

**[TOTAL: 4]**

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**10 This question is about two different signals.**

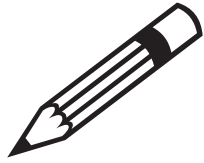
**Look at the information showing what happens to these signals when noise is added to them.**



**Name the types of signals shown by A and B and describe how they change when noise is added to them.**



**Explain why it is easier to remove noise from signal A.**



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

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[6]

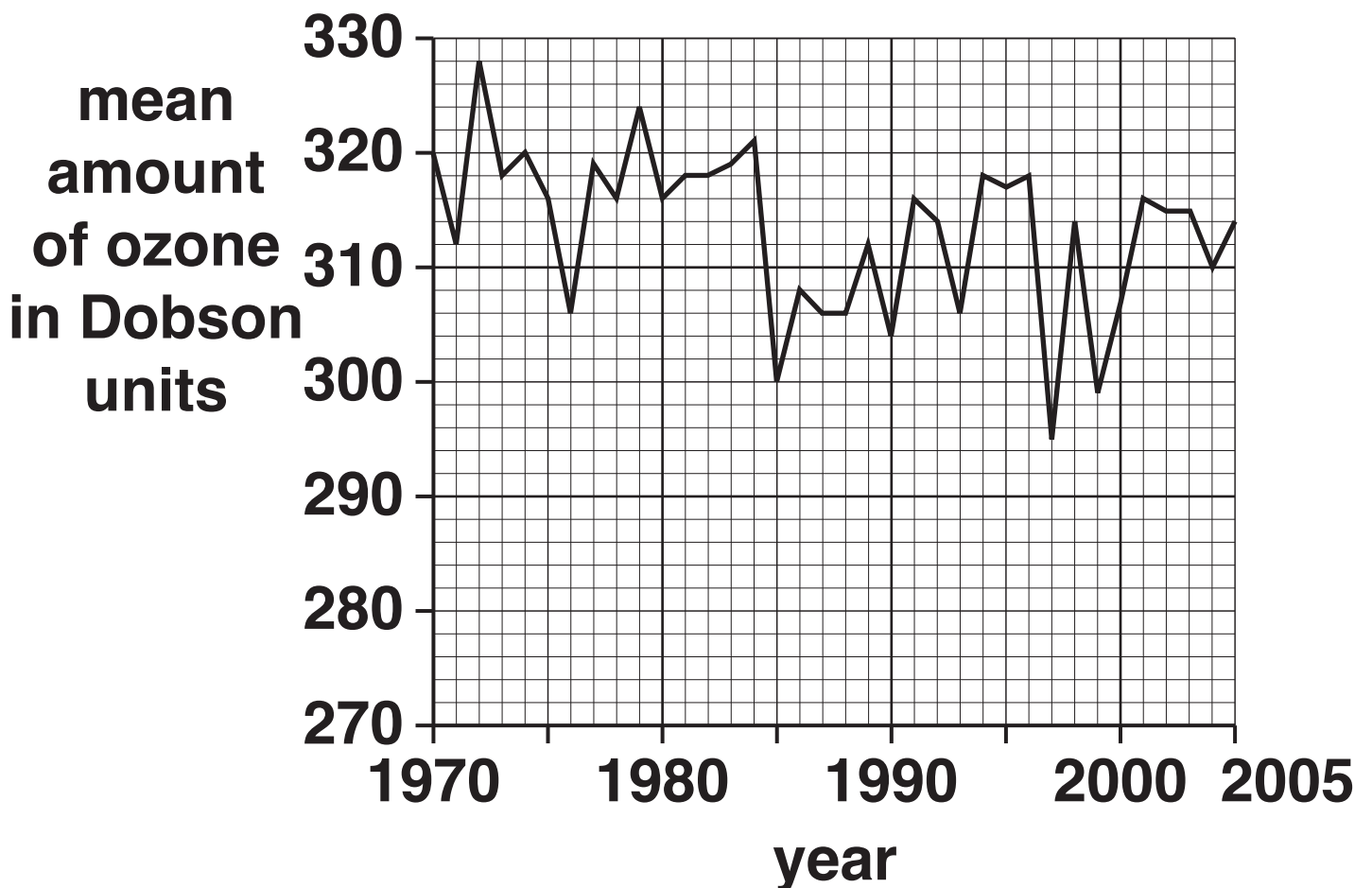
**[6]**

**[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 below from 1970 to 2005.



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

**(i) Is this prediction correct?**

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**Explain your answer.**

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**[1]**

**(ii) What should the scientists do to check their prediction?**

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**[1]**

**(b) The ozone layer protects the Earth from ultraviolet radiation (UV).**

**(i) Use the graph on page 42 to find out the year that the ozone layer gave the most protection from ultraviolet radiation.**

**Most protection from UV was in**

**the year \_\_\_\_\_ . [1]**

**(ii) Too much exposure to UV can cause sunburn.**

**Write down TWO other health problems caused by too much exposure to UV.**

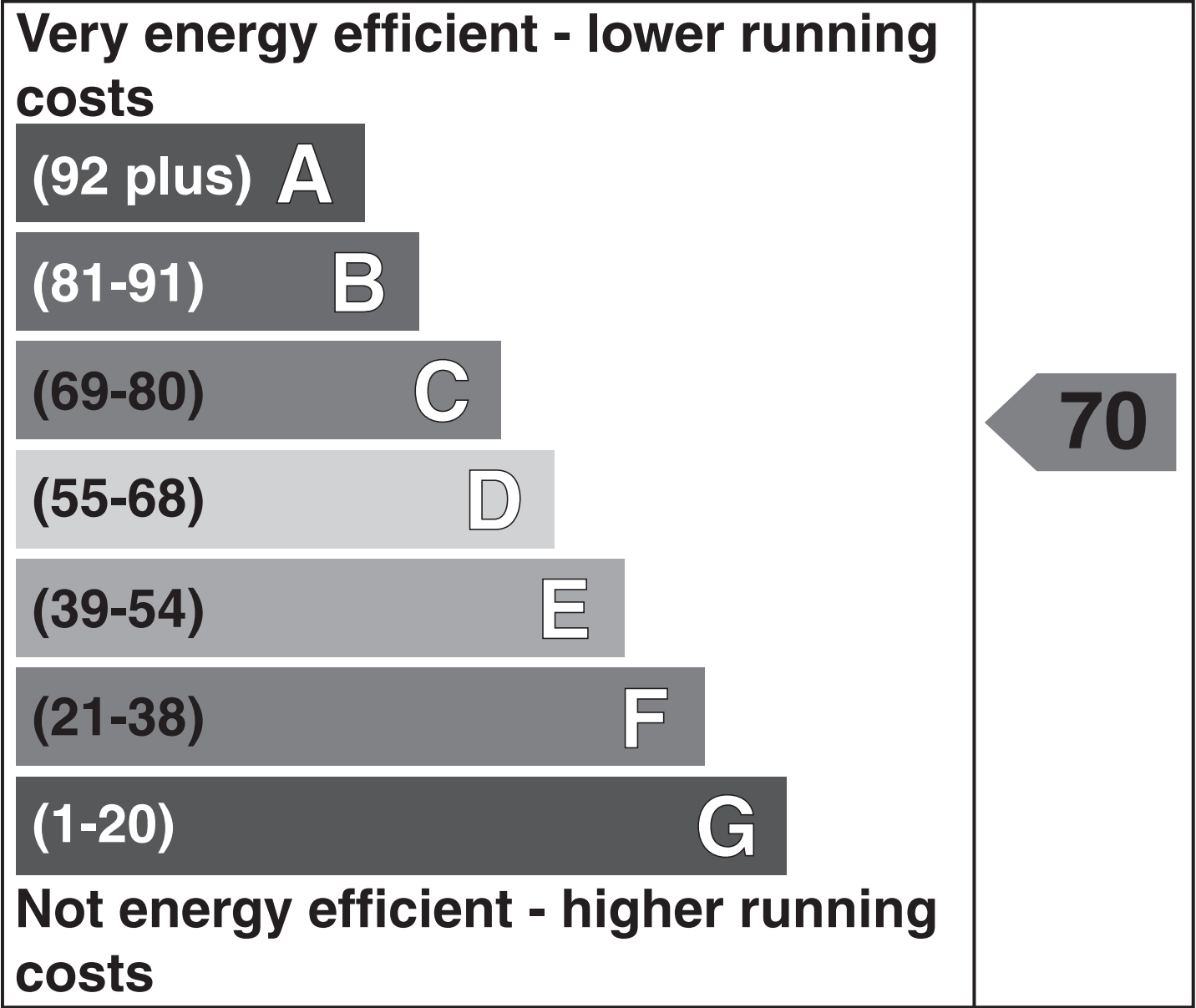
\_\_\_\_\_  
\_\_\_\_\_ [2]

**[TOTAL: 5]**

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12 Lyndsay and Kevin buy a new house.

The house has an energy performance certificate.



- (a) The energy efficiency of their house is 70.**

**The efficiency is calculated when the heating is on for 9 hours a day.**

**All house efficiency measurements are made using this time.**

**Suggest why.**

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**[1]**

- (b) Lyndsay and Kevin want to check the energy efficiency of their house.**

**Write down TWO measurements they use to calculate the energy efficiency of their house.**

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**[2]**

**(c) 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.**

**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 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]**

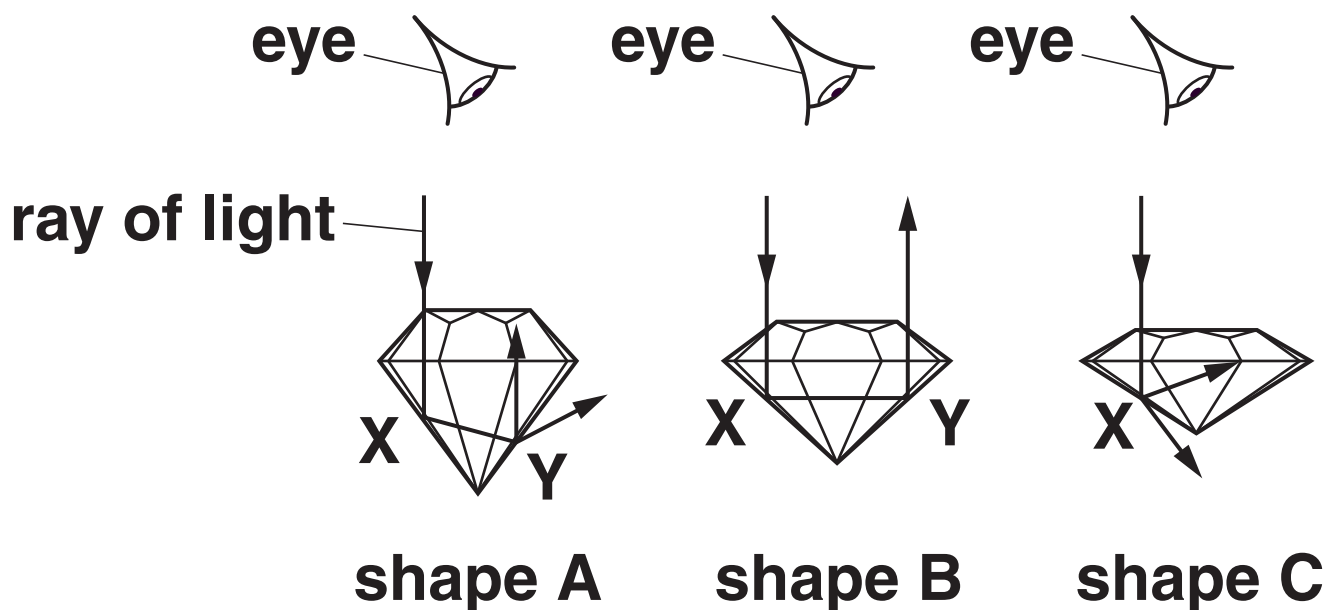
**[TOTAL: 7]**

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**13 Gemstones are cut into shapes to make them reflect as much light as possible.**

**The more light they reflect, the more they sparkle.**

**Look at the diagrams below of three different shaped gemstones.**



**Describe what happens to the ray of light in each diagram AND use this to explain which gemstone sparkles the most when looked at from above.**

**The description for shape A has been done for you.**

**In shape A the ray of light passes through the gemstone and is reflected at X and then at Y it is reflected and refracted.**

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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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