

**OXFORD CAMBRIDGE AND RSA EXAMINATIONS  
GCSE**

**B711/01**

**GATEWAY SCIENCE  
SCIENCE B**

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

**MONDAY 10 JUNE 2013: 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:**

**None**

**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**

- **Your quality of written communication is assessed in questions marked with a pencil ().**
- **A list of equations can be found on pages 4–5.**
- **The Periodic Table can be found on page 51.**
- **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**

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

$$\text{GPE} = mgh$$

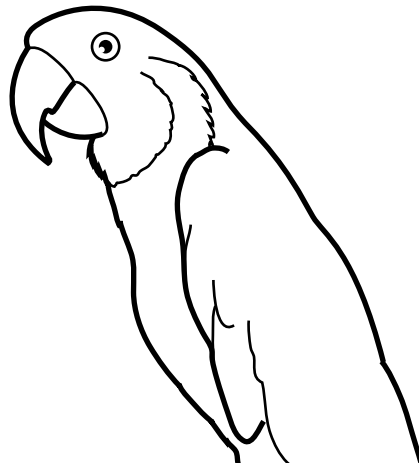
$$mgh = \frac{1}{2}mv^2$$

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

**Answer ALL the questions.**

**SECTION A – MODULE B1**

**1 Look at the picture of a macaw.**



**There are 70 chromosomes in each body cell of a macaw.**

**(a) How many chromosomes are in a SPERM cell of a macaw?**

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

**(b) Macaws can be bred in captivity.**

**There are NO VISIBLE  
DIFFERENCES that identify male  
and female macaws.**

**Breeders often test the DNA of their  
macaws before they use them for  
breeding.**

**Suggest why they are tested.**

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[2]

**(c) The natural environment for a macaw is the top of trees in tropical rainforests.**

**Explain why the position of the eyes on the head of a macaw would be an advantage in its natural environment.**

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**[2]**

**[TOTAL: 5]**

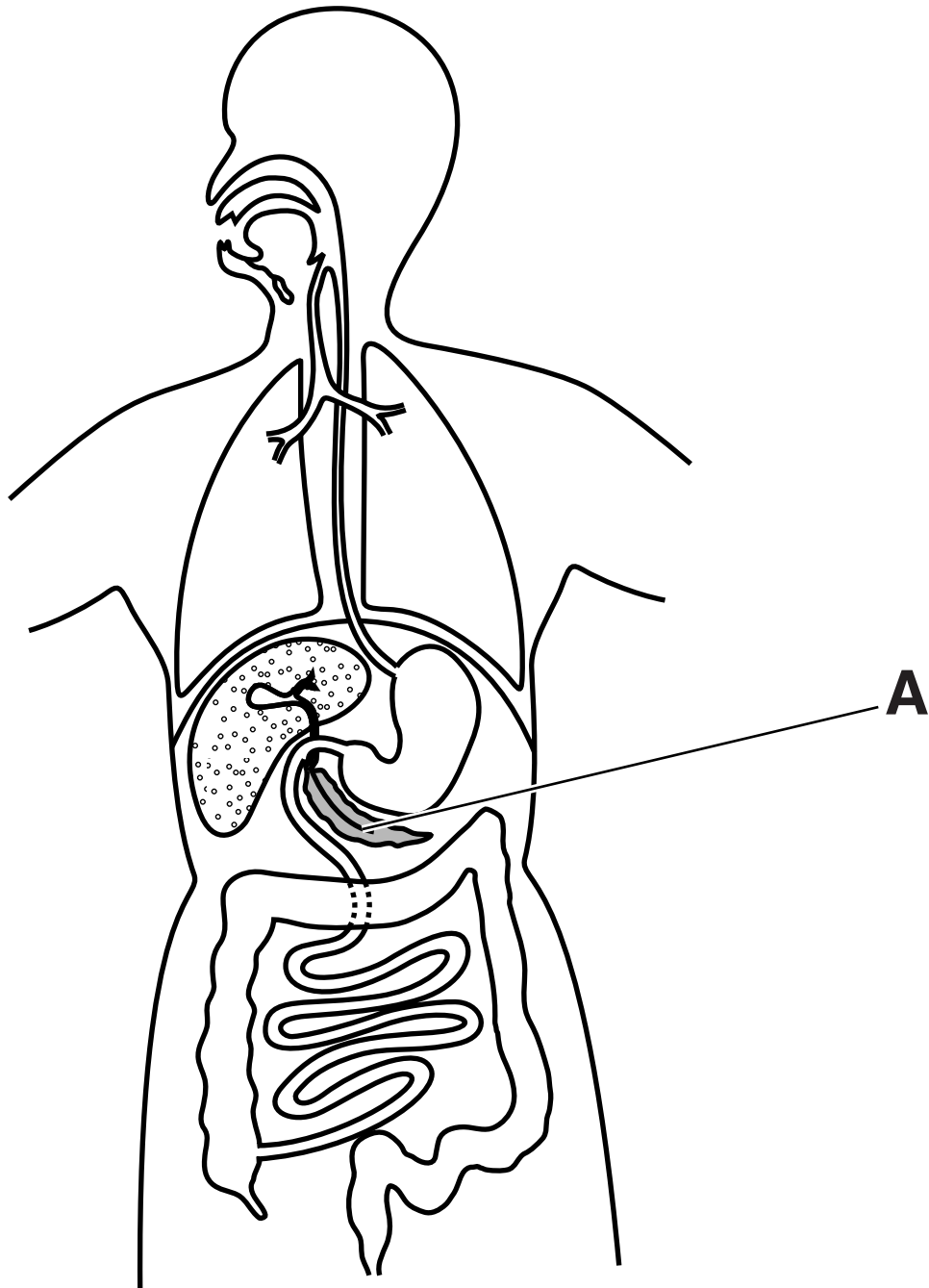


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**QUESTION 2 BEGINS ON PAGE 10**

**2 This question is about diabetes.**

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



**What is the name of part A?**

**Choose your answer from the list.**

**LIVER**

**LUNG**

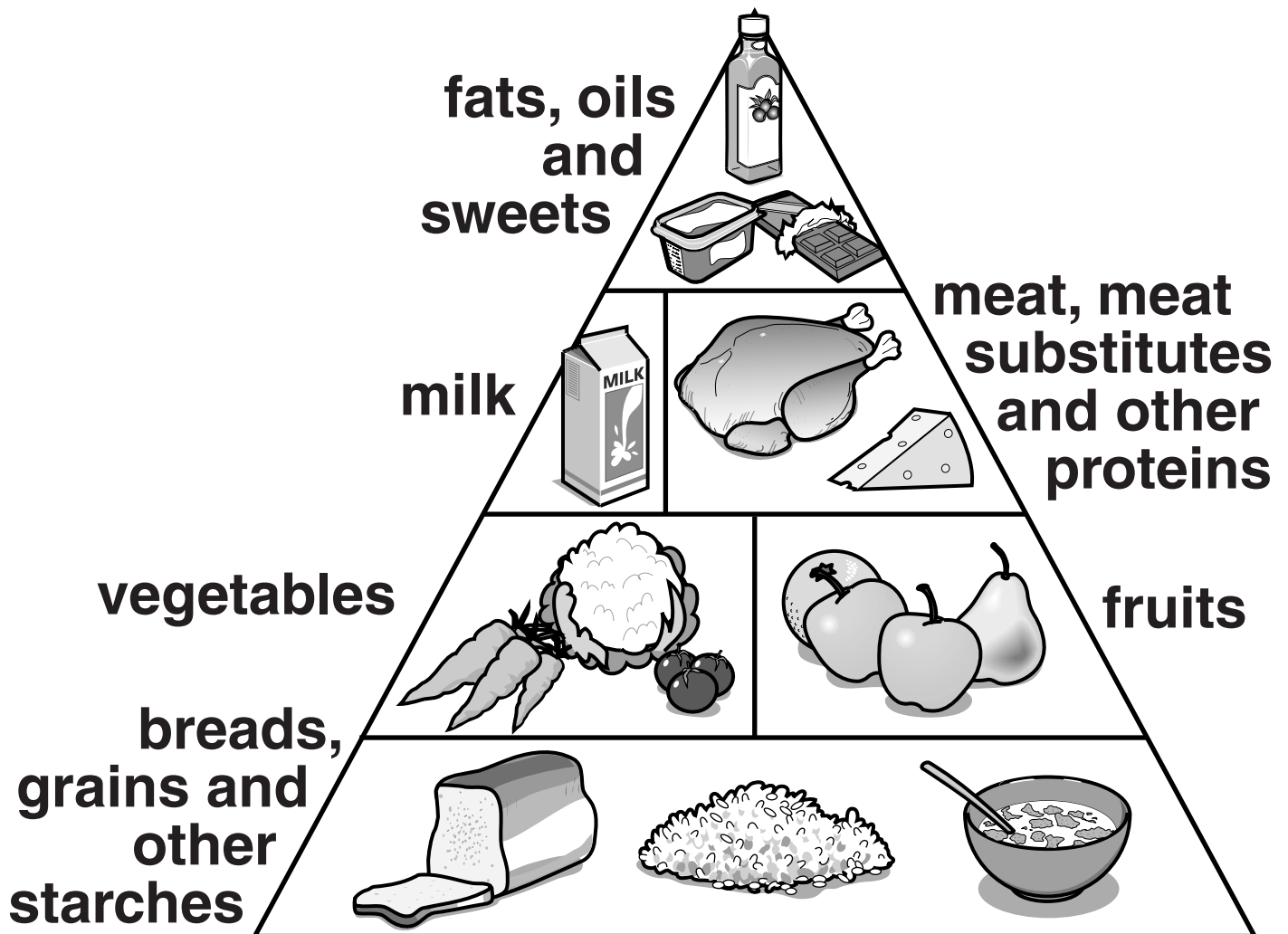
**OESOPHAGUS**

**PANCREAS**

**STOMACH**

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

**(b) Look at the picture of the diabetic food pyramid.**  
**It is a guide to the amounts of different types of food that people with diabetes should eat.**



**There are two forms of diabetes known as Type 1 and Type 2.**

**The diabetic food pyramid is used as a guide for people with diabetes.**

[illegible]

**(c) Diabetes can affect the retina.**

**The retina is part of the eye.**

**Describe the job of the retina.**

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**[2]**

**[TOTAL: 9]**

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**QUESTION 3 BEGINS ON PAGE 16**

- 3 Alex is a marathon runner preparing for a race.**

**Diet specialists recommend that he uses a HIGH ENERGY diet during the month before his race.**

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

<b>Diet A</b>	
<b>food group</b>	<b>%</b>
<b>carbohydrate</b>	<b>60</b>
<b>protein</b>	<b>20</b>
<b>fat</b>	<b>10</b>
<b>fibre</b>	<b>10</b>

<b>Diet B</b>	
<b>food group</b>	<b>%</b>
<b>carbohydrate</b>	<b>70</b>
<b>protein</b>	<b>15</b>
<b>fat</b>	<b>10</b>
<b>fibre</b>	<b>5</b>

<b>Diet C</b>	
<b>food group</b>	<b>%</b>
<b>carbohydrate</b>	<b>65</b>
<b>protein</b>	<b>15</b>
<b>fat</b>	<b>10</b>
<b>fibre</b>	<b>10</b>



**Which diet should Alex use during the month before his race?**

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

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

**(b) Alex can improve his fitness by training.**

**A person's maximum heart rate in beats per minute, can be calculated by subtracting their age from 220.**

**Alex is 26 years old.**

**(i) What is Alex's maximum heart rate?**

**\_\_\_\_\_ beats per minute [1]**

**(ii) During training Alex's heart rate varies between 126 and 146 beats per minute.**

**126 beats per minute is 65% of his maximum heart rate.**

**Calculate what percentage 146 beats per minute is of his maximum heart rate.**

**answer \_\_\_\_\_ % [2]**

**(iii) During training, Alex should keep his heart rate between 70% and 80% of his maximum heart rate. This will improve his fitness.**

**Use your answer from PART (ii) to evaluate whether Alex's training will improve his fitness.**

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**[2]**

**[TOTAL: 6]**

**4 Nicola is a pharmacist.**

**She is asked to recommend a treatment for a disease called athlete's foot.**

**Athlete's foot causes skin to crack and flake.**

**Nicola advises that there are two drug treatments, but one of them needs a prescription.**

**(a) What type of pathogen causes athlete's foot?**

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

**(b) Explain why some drugs need a prescription.**

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

**(c) It is important to repair the damaged skin as quickly as possible.**

**One reason is to reduce the pain and discomfort.**

**Suggest and explain ONE OTHER reason.**

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**[2]**

**[TOTAL: 5]**

## SECTION B – MODULE C1

**5 Many foods contain food additives.**

**(a) Draw FOUR straight lines to match the type of FOOD ADDITIVE with its JOB.**

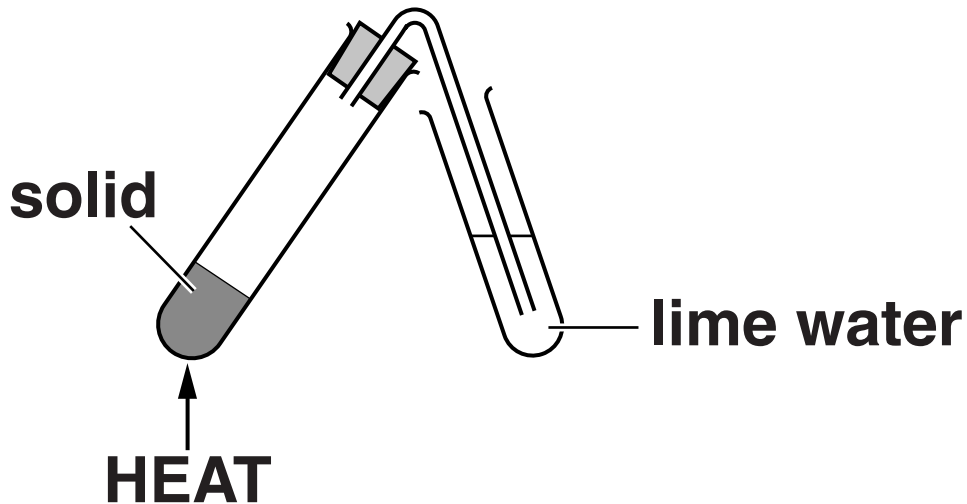
<b>FOOD ADDITIVE</b>	<b>JOB</b>
<b>antioxidant</b>	<b>improves the colour of a food</b>
<b>emulsifier</b>	<b>makes a food taste better</b>
<b>flavour enhancer</b>	<b>stops foods reacting with oxygen</b>
<b>food colour</b>	<b>helps to stop oil and water separating in a food</b>

**[2]**

**(b) Baking powder helps to make a cake rise when it is baked in an oven.**

**Oscar heats a sample of baking powder for five minutes.**

**Look at the apparatus he uses.**



**The baking powder does not change colour while it is heated.**

**Oscar sees bubbles in the lime water.**

**The lime water turns milky during the heating.**

**How can you tell that heating baking powder is a chemical change?**

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**[2]**

**[TOTAL: 4]**

**6 The air may contain different pollutants.**

**Look at the table opposite.**

**It shows the relative concentration of pollutants found in the air in two places.**

**(a) Write down the names of TWO of the pollutants that have molecules with only THREE atoms.**

\_\_\_\_\_

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



Pollutant	Molecular formula	Relative concentration in the air	
		in a city centre	near a volcano
carbon monoxide	CO	0.3	0.01
hydrogen sulfide	H <sub>2</sub> S	0.01	210
nitrogen dioxide	NO <sub>2</sub>	1.5	0.1
sulfur dioxide	SO <sub>2</sub>	200	1500
trichlorofluoromethane	CFC <sub>13</sub>	0.01	0.005

**(b) The concentration of air pollutants in a city centre is different from that near a volcano.**

**(i) There is a HIGHER concentration of carbon monoxide in a city centre than near a volcano.**

**Suggest why.**

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

**(ii) Describe TWO OTHER differences in the concentrations of air pollutants.**

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

- (c) Some scientists think that volcanic eruptions cause acid rain.**

**What evidence is there in the table of data to support this idea?**

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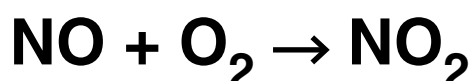
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**[2]**

- (d) Nitrogen monoxide, NO, reacts with oxygen, O<sub>2</sub>.**

**Nitrogen dioxide, NO<sub>2</sub>, is made.**

**Look at the symbol equation for this reaction. It is not balanced.**



**Construct the BALANCED SYMBOL equation for this reaction.**

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**[1]**

**[TOTAL: 7]**

**7 Butane,  $C_4H_{10}$ , is a hydrocarbon.**

**Butane is used as a fuel in a camping stove.**

**Butane burns in oxygen from the air.**

**Both COMPLETE combustion and INCOMPLETE combustion can happen when butane burns.**

**Describe, with the help of WORD equations, the complete and incomplete combustion of butane.**



**[TOTAL: 6]**

**8 Chemists are developing polymers that are**

**biodegradable**

**soluble in water.**

**(a) Suggest ADVANTAGES of polymers that are biodegradable.**

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[2]

**(b) These chemists publish their results using books, the internet and conferences.**

**Why is it important that these chemists publish their results?**

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[2]

**(c) Polymers are large molecules made from many small molecules called monomers.**

**A polymer is made from the monomer chloroethene.**

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

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

**(d) Look at the table. It shows the properties of some polymers.**

<b>Polymer</b>	<b>Colour</b>	<b>Hardness (1 = Soft, 10 = Hard)</b>	<b>Biodegradable</b>
<b>A</b>	<b>white</b>	<b>10</b>	<b>yes</b>
<b>B</b>	<b>black</b>	<b>1</b>	<b>no</b>
<b>C</b>	<b>colourless</b>	<b>9</b>	<b>no</b>
<b>D</b>	<b>colourless</b>	<b>1</b>	<b>yes</b>



**The windscreen of a car is made from a polymer.**

**Which polymer is best to use for a car windscreen?**

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

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

**[TOTAL: 6]**

**9 Stowmarket Synthetics make a perfume.**

**The perfume must have certain properties.**

**One of these properties is that the perfume should not dissolve in water.**

**Write about some of the OTHER properties that a perfume must have.**

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**[2]**

**[TOTAL: 2]**

## SECTION C – MODULE P1

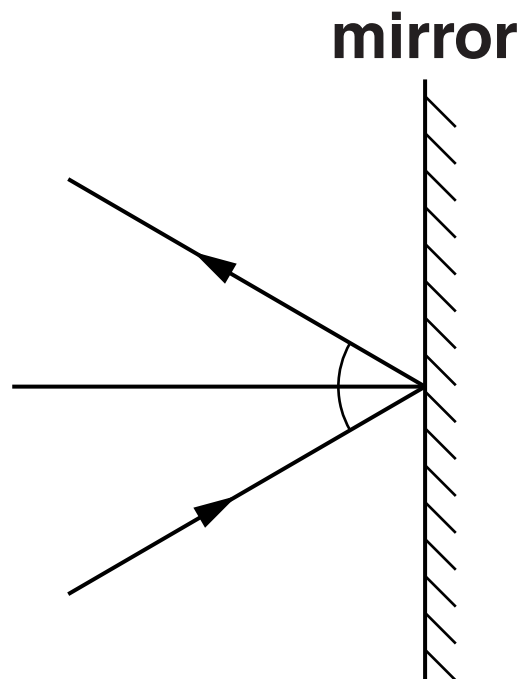
**10 This question is about light.**

- (a) (i) Light can change direction when it passes from one medium into another.**

**What is the NAME of this effect?**

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

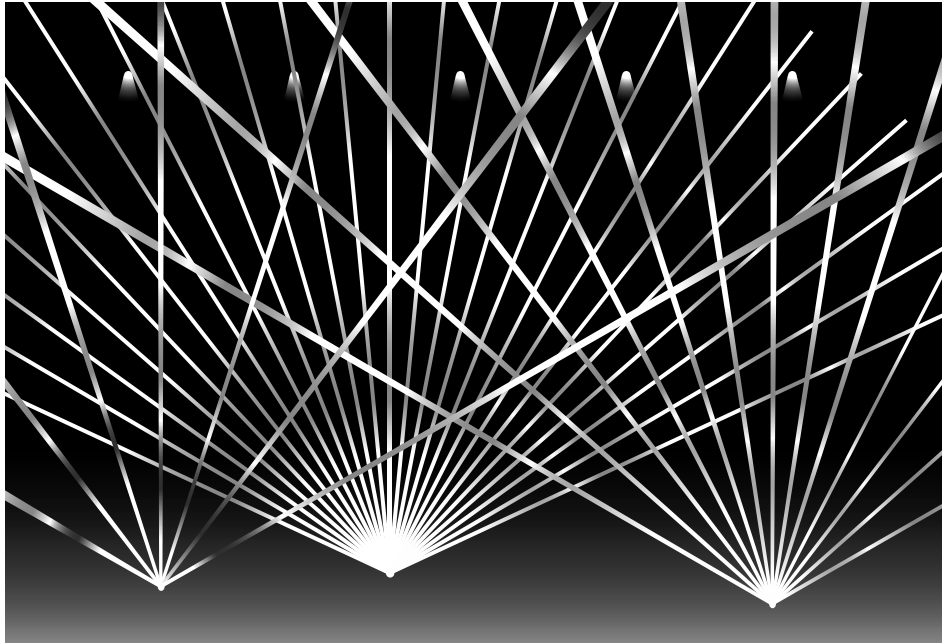
- (ii) What is happening to the ray of light in this diagram?**



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

**(b) Light can be produced by lasers.**

**Look at the picture of a laser light show.**



**Each laser produces a narrow beam of light of a single colour.**

**Describe how the properties of light produced by lasers allow them to be used for laser light shows.**

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**[2]**

**(c) In the past, Morse code was used for communication.**

**Look at the table showing part of the Morse code.**

<b>A</b> <b>·—</b>	<b>1</b> <b>·— — — —</b>
<b>B</b> <b>—...</b>	<b>2</b> <b>·· — — —</b>
<b>C</b> <b>— · — ·</b>	<b>3</b> <b>... — —</b>
<b>D</b> <b>— ..</b>	<b>4</b> <b>.... —</b>
<b>E</b> <b>·</b>	<b>5</b> <b>.....</b>
<b>F</b> <b>·· — ·</b>	<b>6</b> <b>— ....</b>

**(i) Morse code is a DIGITAL code.**

**Describe how LIGHT is used to send a Morse code message.**

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[2]

**(ii) Morse code can be sent by using light signals through the air.**

**It can also be sent using electricity in wires.**

**Give ONE ADVANTAGE of using light rather than using electricity.**

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**[1]**

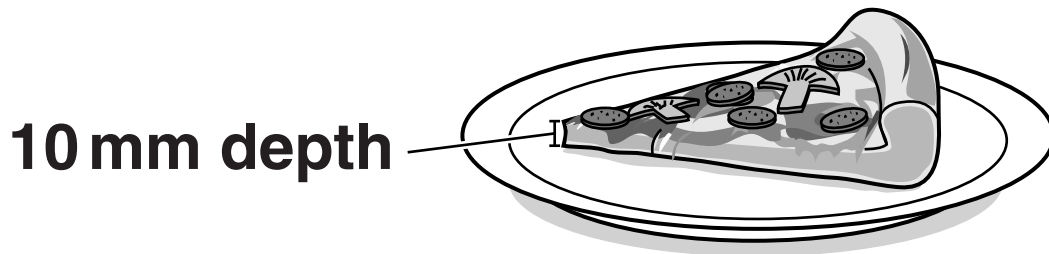
**[TOTAL: 7]**

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**QUESTION 11 BEGINS ON PAGE 40**

**11 Gino wants to heat a thin slice of pizza.**

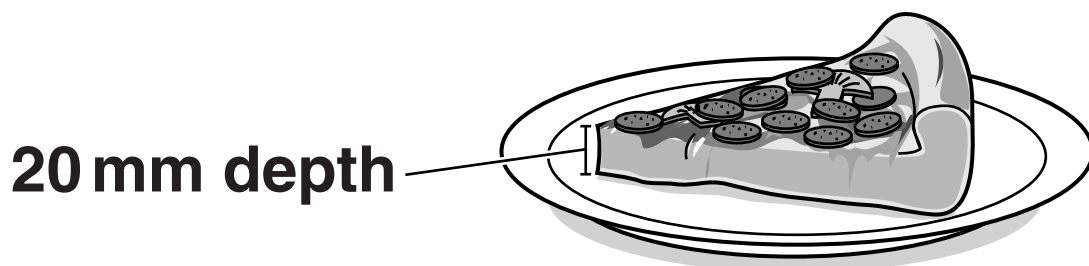
### **THIN PIZZA SLICE**



**Look at the information opposite about the two different methods of heating the THIN pizza slice.**

**Gino also wants to heat a thicker slice of pizza.**

### **THICK PIZZA SLICE**



**The THICK pizza contains a greater percentage (%) of WATER AND FAT.**



<b>Method of heating</b>	<b>How a pizza slice is heated</b>	<b>Distance waves can penetrate into a pizza slice in mm</b>	<b>Time to heat the thin pizza slice in minutes</b>
<b>oven using infrared waves</b>	<b>heats the top surface of the pizza</b>	<b>&lt;1</b>	<b>5</b>
<b>oven using microwaves</b>	<b>heats water and fat in the pizza</b>	<b>&gt;7</b>	<b>1.5</b>

**Estimate how long it would take to heat the THICK pizza slice using each of the two different methods of heating.**

**Use your knowledge and understanding about energy transfer, and the information in the table, to explain your answers.**



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

**[6]**

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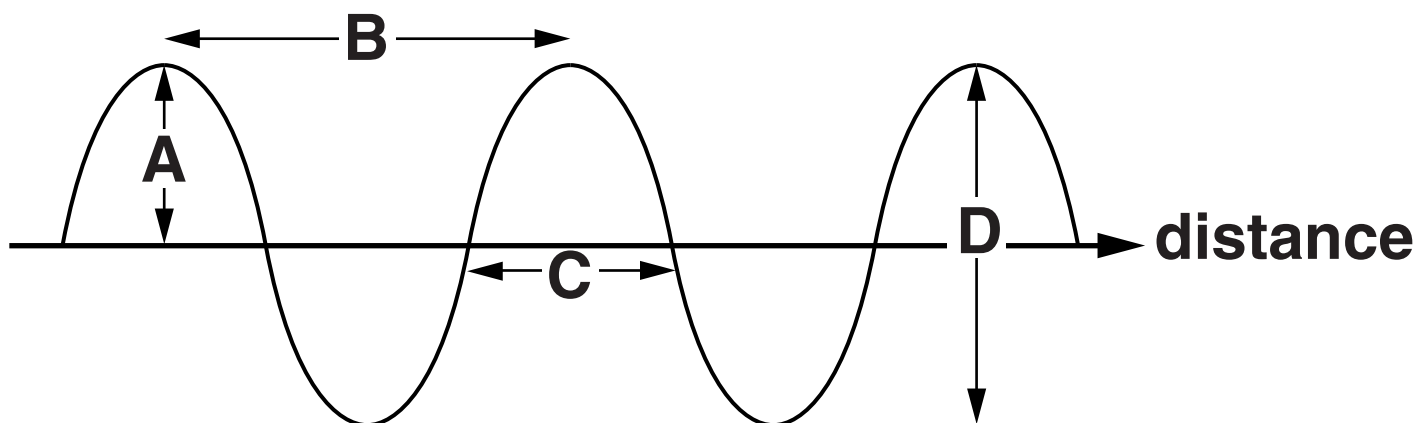
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**[TOTAL: 6]**

## 12 This question is about waves.

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



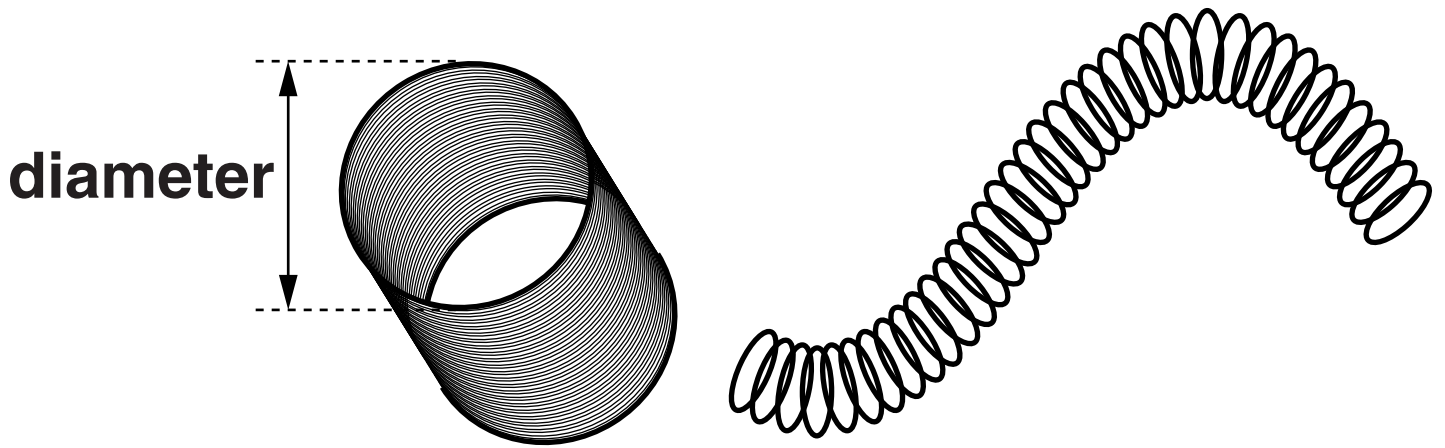
Complete the sentence.

Choose from A, B, C or D.

The wavelength is represented by

letter \_\_\_\_\_. [1]

(b) Kathy and Jonathan use springs to make transverse waves.



**They collect data about springs with different diameters.**

<b>Diameter of spring in cm</b>	<b>Wavelength in m</b>	<b>Frequency in Hz</b>	<b>Wave speed in m/s</b>
<b>4</b>	<b>1.68</b>	<b>2.0</b>	<b>3.36</b>
<b>6</b>	<b>1.42</b>	<b>2.0</b>	_____
<b>8</b>	<b>1.26</b>	<b>2.0</b>	<b>2.52</b>
<b>10</b>	<b>1.05</b>	<b>2.0</b>	<b>2.10</b>

**Calculate the WAVE SPEED of the spring with a diameter of 6 cm.**

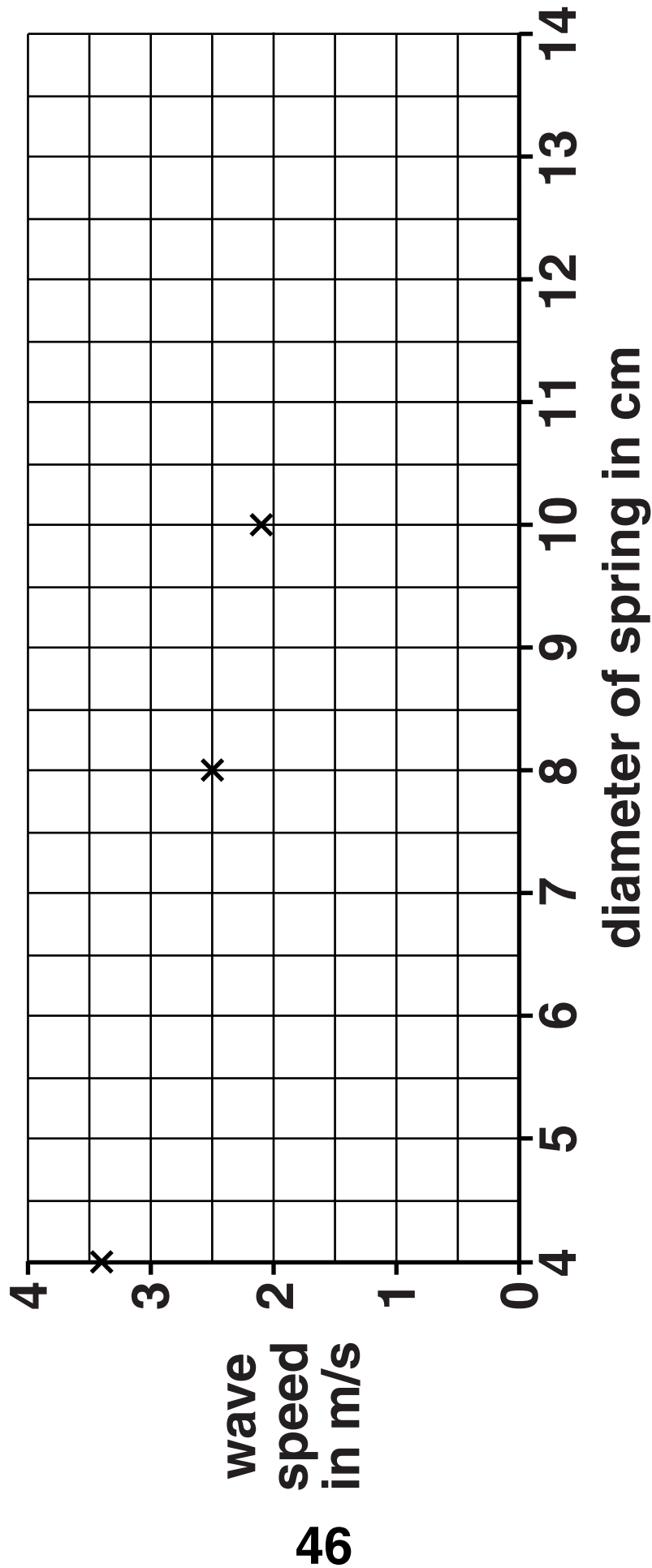
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**wave speed = \_\_\_\_\_ m/s [2]**

(c) Kathy plots a graph using the data.



**Using the graph:**

- (i) Look at the wave speed you calculated in part (b).**

**Plot the wave speed for a 6 cm diameter spring using the letter X.**

**[1]**

- (ii) Describe the relationship between the diameter of the spring and the wave speed.**

\_\_\_\_\_

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

- (iii) Find the WAVE SPEED of a spring with a diameter of 12 cm.**

**wave speed = \_\_\_\_\_ m/s [1]**

**[TOTAL: 6]**

### **13 Some waves are harmful to humans.**

- (a) The Sun emits harmful electromagnetic waves.**

**What type of electromagnetic waves causes sunburn?**

**Choose your answer from the list.**

**RADIO**

**ULTRAVIOLET**

**VISIBLE LIGHT**

**X-RAY**

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

- (b) Sunscreens can reduce the risk of sunburn.**

**A scientist collects evidence about a new sunscreen.**

**The scientist carries out four tests.**



<b>Test</b>	<b>Time taken for skin to burn in minutes</b>	
	<b>Without sunscreen</b>	<b>With the new sunscreen</b>
<b>A</b>	<b>30</b>	<b>90</b>
<b>B</b>	<b>40</b>	<b>120</b>
<b>C</b>	<b>10</b>	<b>30</b>
<b>D</b>	<b>20</b>	<b>60</b>

**The scientist makes the conclusion that the new sunscreen works.**

**Explain how the conclusion is based on the scientific evidence in the table.**

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**[2]**

**(c) Earthquakes produce shock waves.**

**These shock waves can cause a tsunami.**

**Describe how earthquakes are DETECTED and RECORDED and how this information can be USED to reduce harm to humans from a tsunami.**

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**[3]**

**[TOTAL: 6]**

**END OF QUESTION PAPER**

# The Periodic Table of the Elements

1	2	3					4	5	6	7	0						
1 H hydrogen 1		Key															
		relative atomic mass atomic symbol name atomic (proton) number															
7 Li lithium 3	9 Be beryllium 4																
23 Na sodium 11	24 Mg magnesium 12																
39 K potassium 19	40 Ca calcium 20	45 Sc scandium 21	48 Ti titanium 22	51 V vanadium 23	52 Cr chromium 24	55 Mn manganese 25	56 Fe iron 26	59 Co cobalt 27	59 Ni nickel 28	63.5 Cu copper 29	65 Zn zinc 30	70 Ga gallium 31	73 Ge germanium 32	75 As arsenic 33	79 Se selenium 34	80 Br bromine 35	84 Kr krypton 36
85 Rb rubidium 37	88 Sr strontium 38	89 Y yttrium 39	91 Zr zirconium 40	93 Nb niobium 41	96 Mo molybdenum 42	[98] Tc technetium 43	101 Ru ruthenium 44	103 Rh rhodium 45	106 Pd palladium 46	108 Ag silver 47	112 Cd cadmium 48	115 In indium 49	119 Sn tin 50	122 Sb antimony 51	128 Te tellurium 52	127 I iodine 53	131 Xe xenon 54
133 Cs caesium 55	137 Ba barium 56	139 La* lanthanum 57	178 Hf hafnium 72	181 Ta tantalum 73	184 W tungsten 74	186 Re rhenium 75	190 Os osmium 76	192 Ir iridium 77	195 Pt platinum 78	197 Au gold 79	201 Hg mercury 80	204 Tl thallium 81	207 Pb lead 82	209 Bi bismuth 83	[209] Po polonium 84	[210] At astatine 85	[222] 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						

\* 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.

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