

Candidate forename						Candidate surname					
Centre number						Candidate number					

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

**B711/01**

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

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

**TUESDAY 12 JUNE 2012: Morning**

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

**MODIFIED ENLARGED**

**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 and 5.
- An enlarged copy of the Periodic Table will be provided.
- 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.

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## **EQUATIONS**

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

$$\text{GPE} = mgh$$

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

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**Answer ALL the questions.**

**SECTION A – MODULE B1**

**1 Bethany is a scientist.**

**Look at the list of Bethany's characteristics.**

**BLOOD GROUP O  
BODY MASS OF 60 kg  
1.65 m TALL  
HAS PIERCED EARS  
SPEAKS ENGLISH**

**(a) Write down TWO characteristics that are a result of BOTH environmental and inherited factors.**

**Choose your answers from the list.**

**1 \_\_\_\_\_**

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

**(b) Bethany is testing some common foods to find their protein content.**

**Proteins are made of lots of small molecules joined together.**

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

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

**(c) Look at the table.**

**It shows the daily protein intake for different age groups in four countries.**

**Protein deficiency is a problem in some countries.**

<b>NAME OF COUNTRY</b>	<b>TYPE OF COUNTRY</b>	<b>AVERAGE PROTEIN INTAKE IN GRAMS PER PERSON PER DAY</b>	
		<b>6 TO 10 YEARS</b>	<b>11 TO 18 YEARS</b>
<b>Ghana</b>	<b>developing</b>	<b>14.9</b>	<b>36.5</b>
<b>Mexico</b>	<b>developing</b>	<b>18.2</b>	<b>40.2</b>
<b>United Kingdom</b>	<b>developed</b>	<b>25.8</b>	<b>45.8</b>
<b>USA</b>	<b>developed</b>	<b>27.3</b>	<b>52.6</b>



**EXPLAIN** how a lack of protein affects a person and **SUGGEST** why their protein intake depends on age and location.

Use the table opposite to help you.



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

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**[6]**

**[Total: 9]**

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**2 Malaria is an infectious disease.**

**(a) (i) Which type of pathogen causes malaria?**

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

**BACTERIA**

**FUNGI**

**PROTOZOA**

**VIRUS**

**[1]**

**(ii) One symptom of malaria is a high fever.**

**Paracetamol is a drug that can be used to reduce fever.**

**A boy has a temperature of 41 °C.**

**How much is this above NORMAL core body temperature?**

\_\_\_\_\_ °C **[1]**

**(iii) Describe ONE OTHER use of paracetamol and the effect it has on the body.**

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

**(b) Malaria is common in many African countries.**

**SICKLE CELL ANAEMIA is a disorder also found in these countries.**

**(i) What name is given to types of disorder like sickle cell anaemia?**

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

**(ii) Read the information below on a new treatment for sickle cell anaemia.**

**Severe sickle cell anaemia can be treated with a medicine called hydroxyurea.**

**Doctors are studying the long-term effects of hydroxyurea on people who have sickle cell anaemia.**

**In an early study, eight children were all given the drug.**

**Most of the children showed improved growth and general health.**

**This suggests that hydroxyurea helps to improve the health of people with sickle cell anaemia.**

**Use the information in the article to answer the question.**

**Doctors are NOT convinced that hydroxyurea helps to improve the health of people with sickle cell anaemia.**

**Explain why.**

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**[2]**

**[Total: 7]**

**3 Coronary heart disease (CHD) is one of the UK's biggest killers.**

**88 000 people died from CHD in 2008.**

**Since 2000, health authorities have been trying to lower the death rate from CHD.**

**Look at the table.**

<b>DEATH RATES FROM CHD PER 100 000 POPULATION</b>				
<b>YEAR</b>	<b>AGE 55–64</b>		<b>AGE 65–74</b>	
	<b>MEN</b>	<b>WOMEN</b>	<b>MEN</b>	<b>WOMEN</b>
<b>2000</b>	<b>291</b>	<b>84</b>	<b>823</b>	<b>347</b>
<b>2001</b>	<b>271</b>	<b>79</b>	<b>763</b>	<b>328</b>
<b>2002</b>	<b>250</b>	<b>72</b>	<b>707</b>	<b>304</b>
<b>2003</b>	<b>238</b>	<b>66</b>	<b>660</b>	<b>275</b>
<b>2004</b>	<b>219</b>	<b>57</b>	<b>599</b>	<b>250</b>
<b>2005</b>	<b>204</b>	<b>54</b>	<b>558</b>	<b>225</b>
<b>2006</b>	<b>194</b>	<b>52</b>	<b>500</b>	<b>207</b>
<b>2007</b>	<b>188</b>	<b>49</b>	<b>471</b>	<b>187</b>
<b>2008</b>	<b>175</b>	<b>47</b>	<b>443</b>	<b>179</b>

**(a) (i) Describe the trend in death rates between the years 2000 and 2008.**

**[1]**

- (ii) Write down one difference between the two age groups.

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

- (iii) In 2008 the total number of deaths per 100 000 population in the 55–64 age group was 222.

Calculate the percentage of these deaths that were men.

answer \_\_\_\_\_%

What does the result tell you?

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

**(b) Scientists have discovered a new drug.**

**They think it will help lower the death rate from CHD.**

**The main cause of CHD is a build up of fat in the arteries.**

**The new drug is NOT classed as an antibiotic.**

**Explain why.**

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**[2]**

**[Total: 6]**



**4 This question is about the nervous system.**

**(a) Describe how nerve impulses travel along nerves.**

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

**(b) Andrew is paralysed from the waist down because of spinal damage. He uses a wheelchair.**

**Impulses can travel from a stimulus below Andrew's waist to his central nervous system but he cannot respond.**

**Explain why Andrew cannot respond.**

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

**[Total: 3]**

## SECTION B – MODULE C1

### 5 Coal, oil and natural gas are non-renewable fuels.

Two scientists estimate how many years it will be before these fuels run out.

Look at the table.

FUEL	HOW MANY YEARS BEFORE THE FUEL WILL RUN OUT	
	ESTIMATE OF SCIENTIST A	ESTIMATE OF SCIENTIST B
coal	143	417
natural gas	61	167
oil	43	43

(a) Which fossil fuel do the scientists think will run out first?

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

(b) Both scientists used evidence to make their estimates.

Suggest why the two sets of estimates are not the same.

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

**(c) Crude oil is often transported across the sea in large ships.**

**Sometimes these ships have an accident and crude oil spills into the sea.**

**Write about environmental problems this could cause.**

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**[2]**

**[Total: 4]**

## 6 Crude oil contains a mixture of hydrocarbons.

Look at the table. It gives information about some of these hydrocarbons.

HYDROCARBON	MOLECULAR FORMULA	MELTING POINT IN °C	BOILING POINT IN °C
propane	$C_3H_8$	-188	-42
butane	$C_4H_{10}$	-138	0
hexane	$C_6H_{14}$	-95	69
decane	$C_{10}H_{22}$	-30	174
hexadecane	$C_{16}H_{34}$	18	287

- (a) Which hydrocarbon has a molecule with a total of 14 ATOMS?

Choose from the table.

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

- (b) Larger hydrocarbon molecules contain more carbon atoms.

How does MELTING POINT change as the molecules get larger?

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

**(c) Petrol has a boiling range from 40 °C to 110 °C.**

**Which hydrocarbon is found in petrol?**

**Choose from the table.**

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

**[Total: 3]**

## 7 Simon investigates baking powder.

He finds it contains sodium hydrogencarbonate,  $\text{NaHCO}_3$ .

Sodium hydrogencarbonate breaks down when heated.

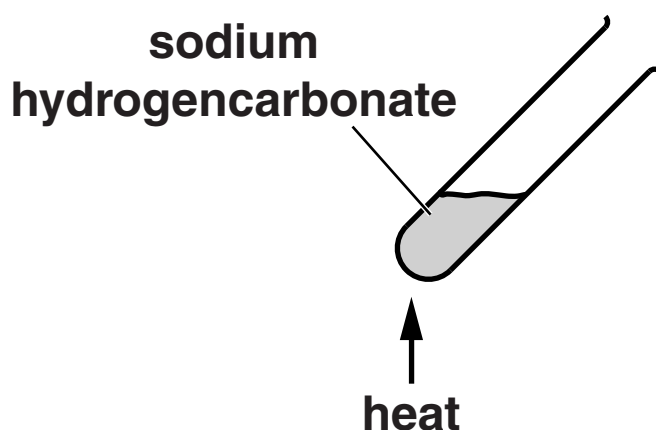
- (a) Look at the balanced symbol equation. It is not finished.

Finish the equation by writing in the missing formula.



- (b) Simon heats a 1.00 g sample of sodium hydrogencarbonate for one minute.

Look at the diagram. It shows the apparatus he uses.



He measures the mass of the solid left in the test tube.

Simon repeats the experiment four more times.

Each time he heats the sodium hydrogencarbonate for a different number of minutes.

Look at the table of his results.

TIME OF HEATING IN MINUTES	1	2	3	4	5
MASS OF SOLID LEFT IN TEST TUBE IN GRAMS	0.87	0.73	0.66	0.63	0.63

- (i) Simon wants to show that carbon dioxide is made in the reaction.

Describe how Simon can show that carbon dioxide is made.

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[2]

- (ii) After the first minute the mass of solid in the test tube decreases.

After four minutes the mass has stopped decreasing.

Suggest a reason for EACH of these observations.

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[2]

[Total: 5]



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**8 Some solvents are used to remove nail varnish.**

**Stowmarket Synthetics make solvents.**

**Phil is a research chemist. He finds out information about four solvents (see opposite).**

**(a) Which solvent would be the most suitable for use as a nail varnish remover?**

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

**Explain your answer.**

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

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

**(b) Phil also wants to use the solvent in a perfume.**

**He thinks it would be useful to know more information about the solvent.**

**Write about TWO more pieces of information he should find out about the solvent.**

\_\_\_\_\_

\_\_\_\_\_

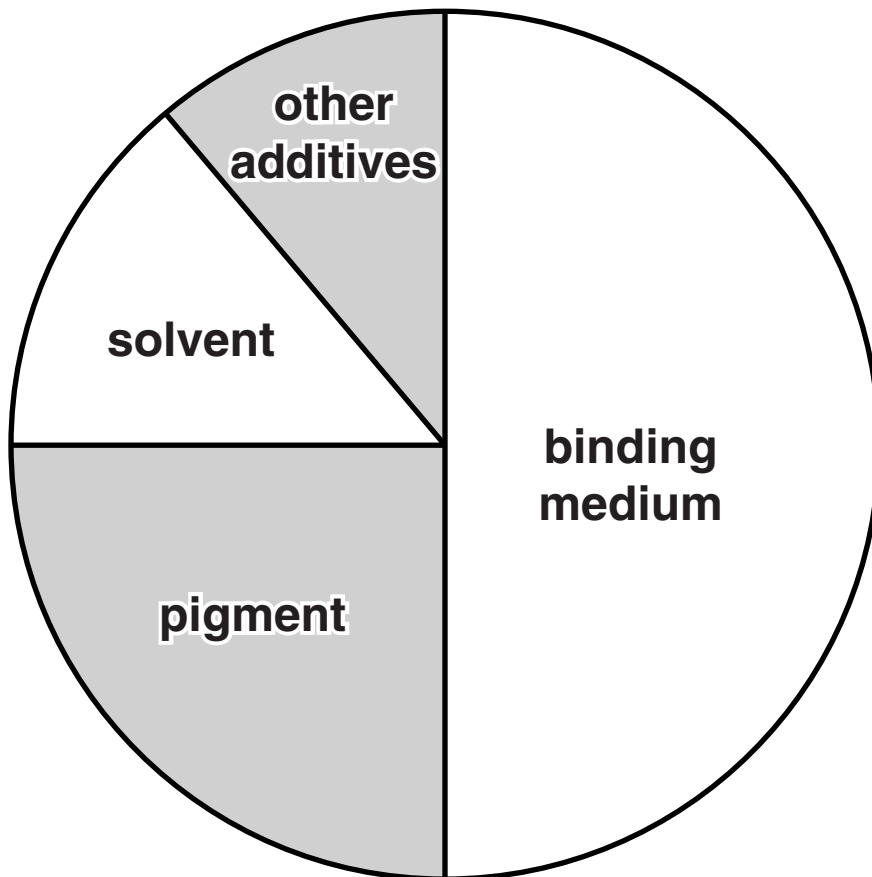
\_\_\_\_\_ [2]

**[Total: 4]**

<b>SOLVENT</b>	<b>IS IT POISONOUS?</b>	<b>IS IT FLAMMABLE?</b>	<b>will it dissolve</b>	
			<b>RED NAIL VARNISH?</b>	<b>BLACK NAIL VARNISH?</b>
<b>A</b>	<b>yes</b>	<b>yes</b>	<b>yes</b>	<b>yes</b>
<b>B</b>	<b>no</b>	<b>yes</b>	<b>yes</b>	<b>yes</b>
<b>C</b>	<b>no</b>	<b>no</b>	<b>no</b>	<b>no</b>
<b>D</b>	<b>no</b>	<b>yes</b>	<b>no</b>	<b>yes</b>

**9 Paints contain several ingredients.**

**Look at the pie chart of the ingredients of a paint.**



**(a) What is the percentage of the ingredient that sticks the paint to a surface?**

\_\_\_\_\_

**[1]**

**(b) Some pigments are THERMOCHROMIC.**

**Write down one use of a thermochromic pigment and explain why it is suitable for this use.**

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**[2]**

**[Total: 3]**

## **10 Plastics contain polymer molecules.**

**Many shopping bags are made from polymers (plastics).**

**Poly(ethene) is often used to make plastic shopping bags.**

**These shopping bags need to be disposed of after use.**

**One of the properties of poly(ethene) is that it is non-biodegradable.**

**Suggest, with reasons, OTHER properties needed by poly(ethene) so that it can be used to make a plastic shopping bag and write about the disposal of these bags.**



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

[illegible]

**[Total: 6]**

## SECTION C – MODULE P1

- 11 (a) Nihal takes a black and white THERMOGRAM picture of his house.

Explain what a thermogram shows and why it is useful.

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[2]

- (b) Nihal wants to reduce the heat loss from the windows.

Look at the information about the materials he could add to the windows.

MATERIAL ADDED TO WINDOW	REDUCTION IN HEAT LOSS
lightweight curtains	2%
heavyweight curtains	20%
wooden shutters	45%



**All the materials use the same property of AIR to reduce heat loss from his house.**

**Explain how the materials reduce heat loss and why the percentage reduction is different for each material.**



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

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**[6]**

**(c) Nihal decides to add curtains to all the windows.**

<b>TYPE OF CURTAIN</b>	<b>COST TO FIT IN £</b>	<b>SAVING ON FUEL BILLS PER YEAR IN £</b>	<b>PAYBACK TIME IN YEARS</b>
<b>lightweight curtains</b>	<b>130</b>	<b>10</b>	
<b>heavyweight curtains</b>	<b>2000</b>	<b>100</b>	

- (i) Calculate the PAYBACK TIME for BOTH types of curtain.**

**Write your answers in the table. [1]**

- (ii) Nihal expects to keep the curtains for 25 years.**

**Use this information to EXPLAIN which type of curtain would be the BEST to fit.**

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**[2]**

**[Total: 11]**

## **12 Mobile phones use microwave radiation.**

**(a) Scientific studies look at the EFFECTS of mobile phone microwave radiation.**

**(i) Results from these studies are published.**

**Explain why scientists publish their results.**

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**[2]**

- (ii) Four scientists look at the effects of mobile phone microwave radiation.

Here are their results.

NAME OF SCIENTIST	NUMBER OF PEOPLE IN THE STUDY	NUMBER OF PEOPLE REPORTING POSSIBLE EFFECTS
Ethan	1000	15
Jayden	17 000	20
Kiera	18 000	20
Maisie	30 000	30

One conclusion is that

- Ethan's results show 1.5% of the people reported possible effects.  
However, the number of people in the study is too low for it to be accurate.

Use the DATA in the table to suggest ANOTHER conclusion.

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[1]

**(b) Annabel likes to text on her mobile phone.**

**Her parents worry about the length of time she spends using her mobile phone.**

**Write about some of the health CONCERNS they may have.**

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**[2]**

**[Total: 5]**

**13 Earthquakes produce shock waves.**

- (a) Write down the NAME of the equipment used to DETECT earthquakes.**

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

- (b) Look at the recording of shock waves opposite.**

**Different sized shock waves were recorded.**

- (i) What is the AMPLITUDE of the largest shock wave?**

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

- (ii) What TIME is it recorded at?**

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

- (c) The TWO types of seismic waves are P WAVES and S WAVES.**

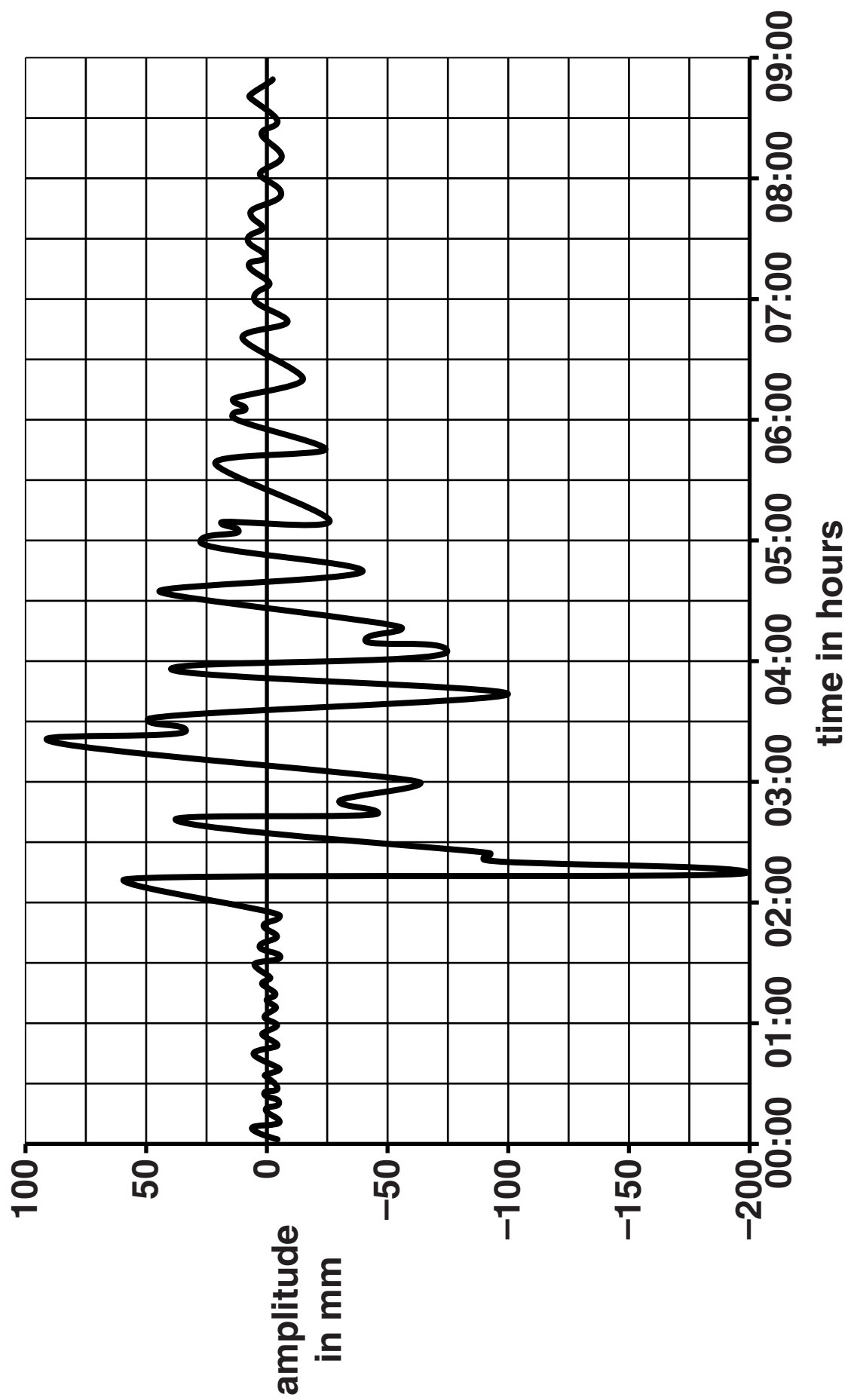
**Which type of wave will be seen first on the recording and why?**

**TYPE of wave** \_\_\_\_\_

**REASON** \_\_\_\_\_

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

**[Total: 4]**



- 14 This question is about the **ELECTROMAGNETIC SPECTRUM**. Examples of five different types of electromagnetic wave being used are listed below.

**X-RAY OF A HAND**

**RADIO BROADCAST**

**MICROWAVE OVEN**

**CANDLES GIVING OFF VISIBLE LIGHT**

**ULTRAVIOLET LIGHT SHOWING A HAND PRINT**

- (a) Put the five types of electromagnetic wave in the table to show **INCREASING** frequency.

Two have been done for you.

<b>FREQUENCY IN Hz</b>	<b>ORDER OF FREQUENCY</b>	<b>TYPE OF ELECTROMAGNETIC WAVE</b>
$10^6$	<b>lowest</b> ↓ <b>highest</b>	
$10^{10}$		<b>microwave</b>
$10^{15}$		
$10^{16}$		<b>ultraviolet</b>
$10^{18}$		

[1]



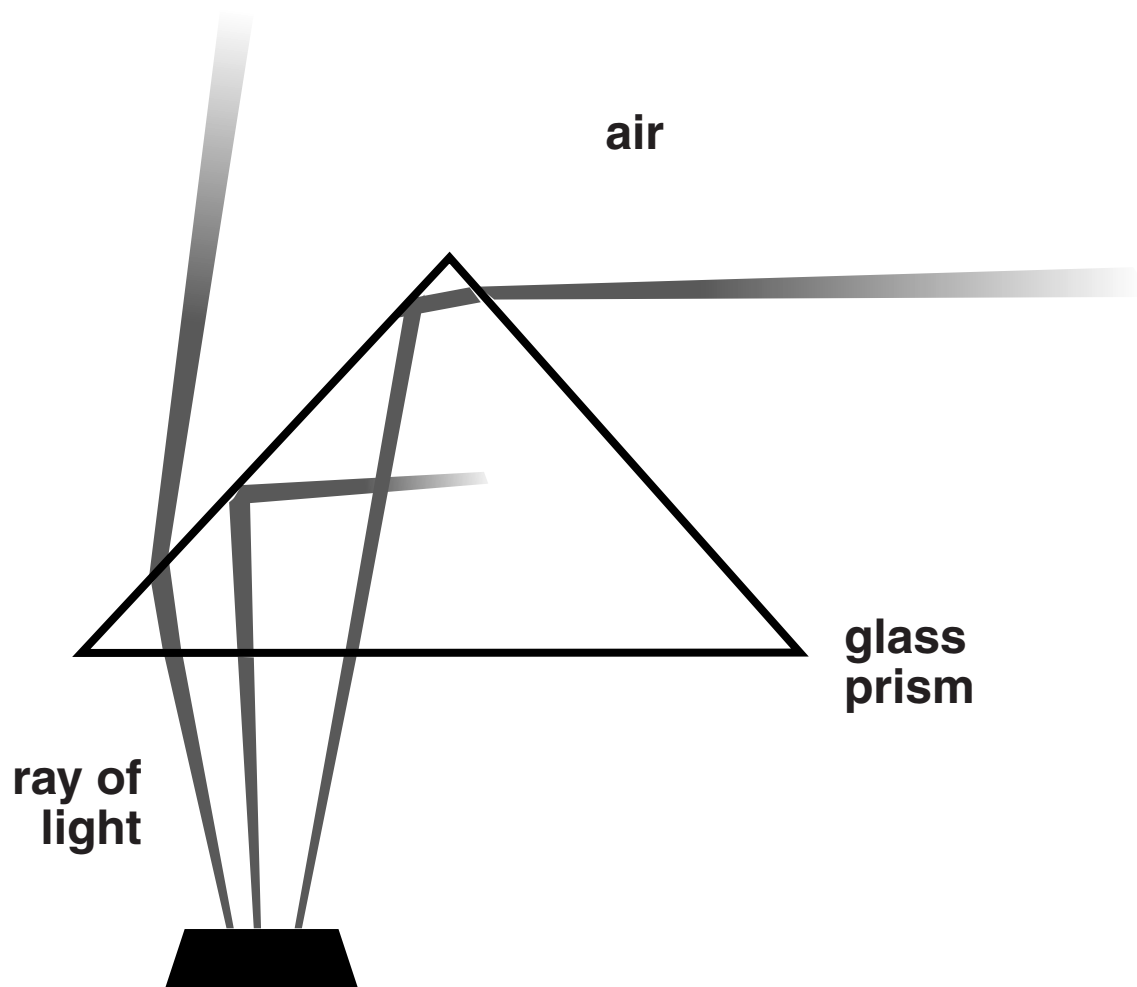
**(b) Infrared waves have a frequency BETWEEN visible light and microwaves.**

**Use the data in the table to estimate the frequency of infrared waves.**

**answer \_\_\_\_\_ Hz**

**[1]**

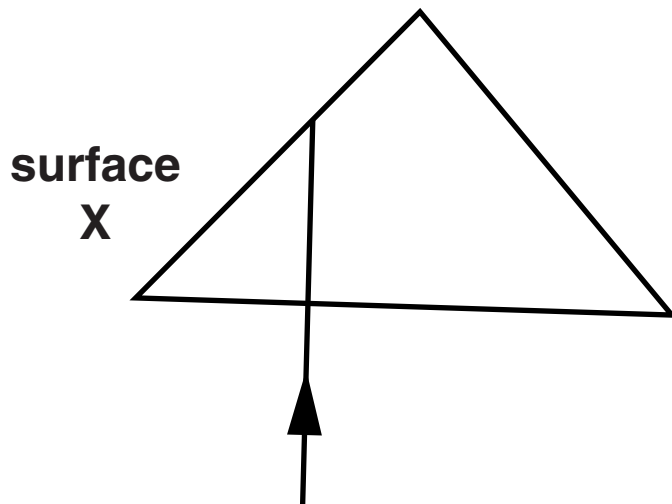
**(c) Look at the picture of a prism.**



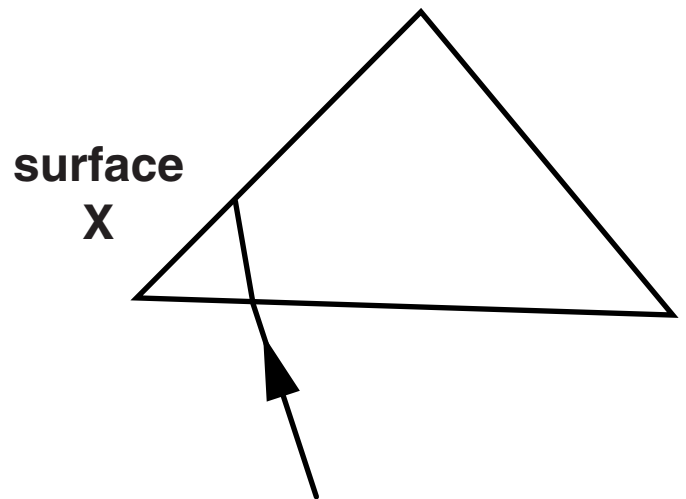
**Rays of light are being reflected AND refracted.**

**Complete the diagrams below to show where reflection and refraction happen at surface X and explain why refraction happens.**

**REFLECTION**



**REFRACTION**



**explanation** \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_ [3]

**[Total: 5]**

**END OF QUESTION PAPER**

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