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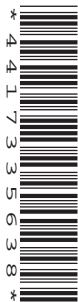
Wednesday 20 May 2015 – Afternoon

**GCSE GATEWAY SCIENCE  
SCIENCE B****B711/01** Science modules B1, C1, P1 (Foundation Tier)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)

**Duration:** 1 hour 15 minutes

Candidate forename		Candidate surname	
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Centre number						Candidate number				
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**INSTRUCTIONS TO CANDIDATES**

- Write your name, centre number and candidate number in the boxes above. 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).
- Do **not** write in the bar codes.

**INFORMATION FOR CANDIDATES**

- The quality of written communication is assessed in questions marked with a pencil (✎).
- A list of equations can be found on page 2.
- The Periodic Table can be found on the back page.
- 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**.
- This document consists of **32** pages. Any blank pages are indicated.

## 2

## EQUATIONS

energy = mass × specific heat capacity × temperature change

energy = mass × specific latent heat

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

wave speed = frequency × wavelength

power = voltage × current

energy supplied = power × time

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

distance = average speed × time

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

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

force = mass × acceleration

weight = mass × gravitational field strength

work done = force × distance

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

power = force × speed

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

momentum = mass × velocity

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

GPE = mgh

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

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

3

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**Question 1 begins on page 4**

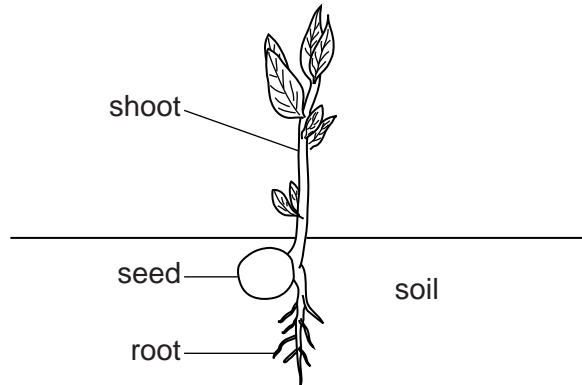
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Answer **all** the questions.

**SECTION A – Module B1**

1 This question is about plant growth.

(a) When a plant grows, the shoots grow upwards and the roots grow downwards.



(i) Explain why plant **shoots** grow upwards.

.....  
.....  
..... [2]

(ii) Write down **one** reason why plant **roots** grow downwards.

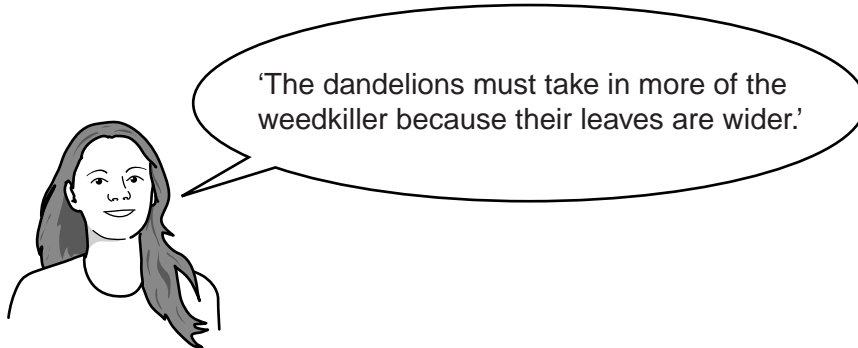
.....  
..... [1]

5

(b) Ria has dandelion plants growing in the grass on her lawn.

When she sprays the lawn with weedkiller only the dandelions are killed.

Ria tries to explain why only the dandelions are killed.



What name describes the kind of statement Ria has made?

Put a tick (✓) next to the best answer.

hypothesis

observation

prediction

variable

[1]

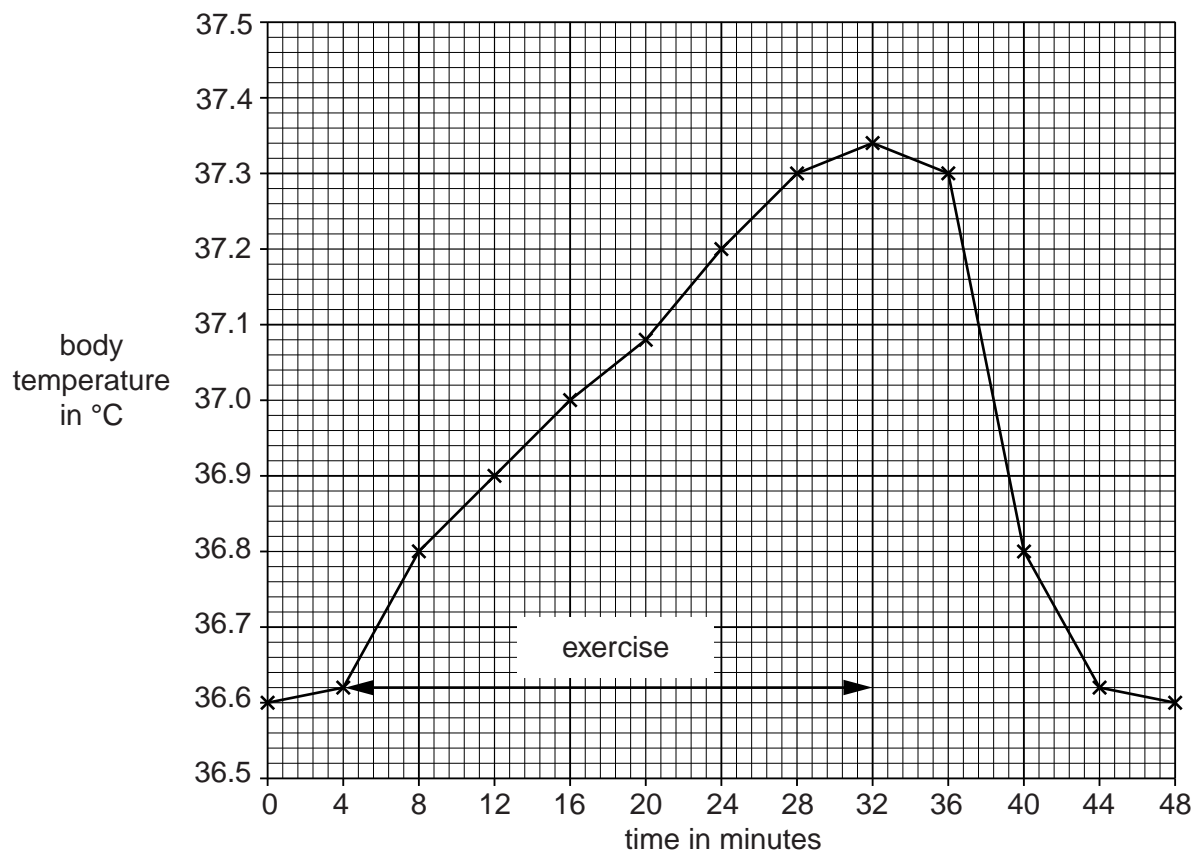
## 6

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.



(a) Use the graph to describe the pattern in their results.

Explain **how** and **why** exercise and sweating will cause the changes seen in the graph.



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

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[6]

(b) Exercise can help prevent heart disease.

Put a tick (✓) next to **one other** way to reduce the risk of heart disease.

Eat a diet with no proteins.

Eat less salt.

Eat only saturated fats.

Increase body mass.

[1]

8

(c) Energy is needed for exercise.

Which type of food provides energy for the body?

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

**carbohydrates**

**fibre**

**minerals**

**vitamins**

**[1]**



3 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.

Age group	Amount of protein in g
Infants	10
Teenage males	52
Teenage females	46
Adult males	56
Adult females	46

**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) Explain why proteins are needed in the diet.

..... [1]

(b) 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]

4 (a) Multiple sclerosis affects the nervous system.

(i) Which **two** parts of the body make up the central nervous system?

..... and ..... [1]

(ii) The nervous system sends **nerve impulses** around the body.

Finish the sentence about nerve impulses.

Nerve impulses are ..... signals sent along neurones. [1]

(b) 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.

Smoking cannabis has many risks.

The risks to MS patients taking cannabis mixed with tobacco could be reduced.

Suggest and explain how the risks to MS patients taking cannabis could be reduced.

Use the information to help you.

.....

.....

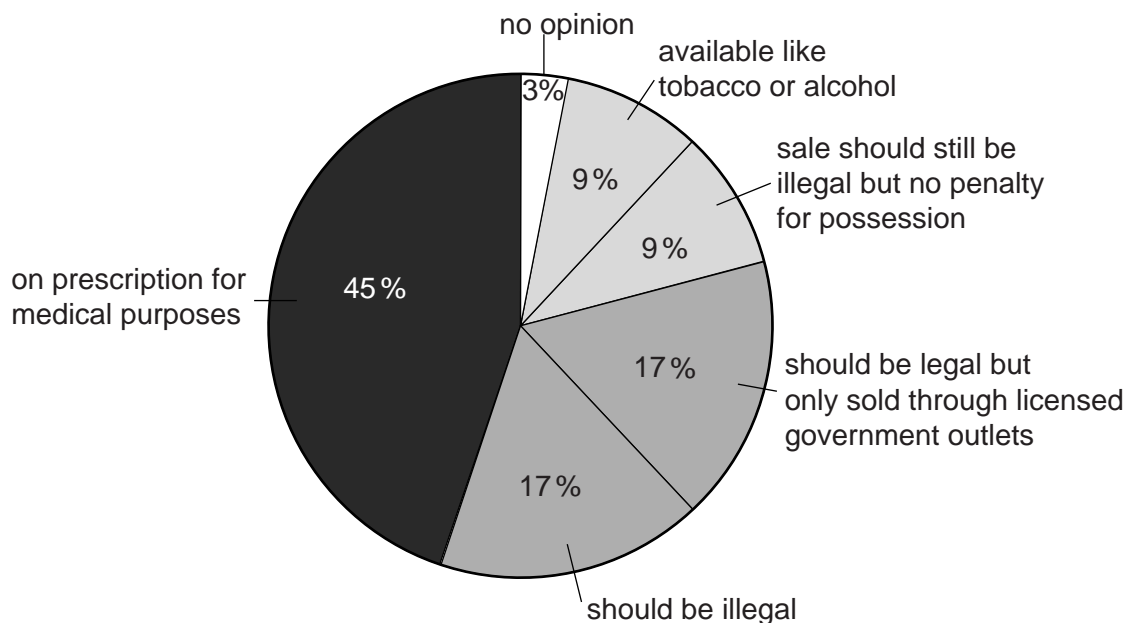
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..... [3]

(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.



(i) What total percentage of those asked think cannabis should be an illegal drug?

answer .....%

[1]

(ii) What does the chart show about people's opinions on cannabis use?

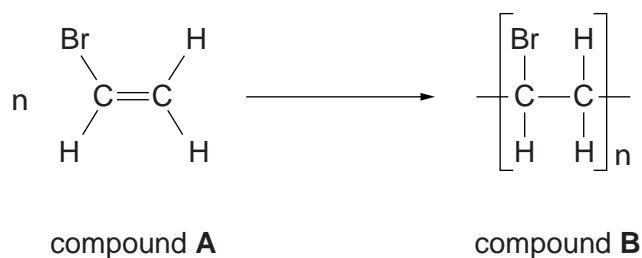
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..... [2]

## SECTION B – Module C1

5 This question is about carbon compounds.



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

Compound **A** is **not** a hydrocarbon.

Explain why.

.....  
 ..... [1]

(b) Compound **A** is changed into compound **B** in a chemical reaction.

What is the name of this **type** of chemical reaction?

Choose from the list.

**bromination**

**combustion**

**denaturing**

**polymerisation**

**thermal decomposition**

..... [1]

(c) Compound **A** is called bromoethene.

Write down the **name** of compound **B**.

..... [1]

13

6 Louise buys a new bottle of perfume.



(a) Two properties of the perfume are that it smells nice and evaporates easily.

Write down **two other** important properties that the perfume must have.

.....  
.....  
..... [2]

(b) Louise's perfume contains a chemical called an **ester**.

Complete the **word equation** for the reaction used to make an ester.

..... + alcohol → ester + water

[1]

7 Duncan investigates the combustion of four different fuels.

He burns the same amount of fuel in each experiment.

Look at his results.

Fuel	Is carbon dioxide made?	Is carbon monoxide made?	Is soot made?	Energy given out in J
A	✓	✗	✗	4200
B	✓	✓	✗	2800
C	✗	✓	✓	1100
D	✓	✗	✗	3400

(a) Duncan concludes that **incomplete** combustion happened in the experiment with fuel **C**.

Is he correct?

Use information from the table to explain your answer.

.....

.....

.....

..... [3]

(b) In each experiment Duncan tests to see if **carbon dioxide** is made.

Write about how Duncan tests for carbon dioxide.

.....

.....

..... [2]

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

Ethanol burns in oxygen.

Carbon dioxide and water are made.

Write the **word equation** for this reaction.

..... [1]

15

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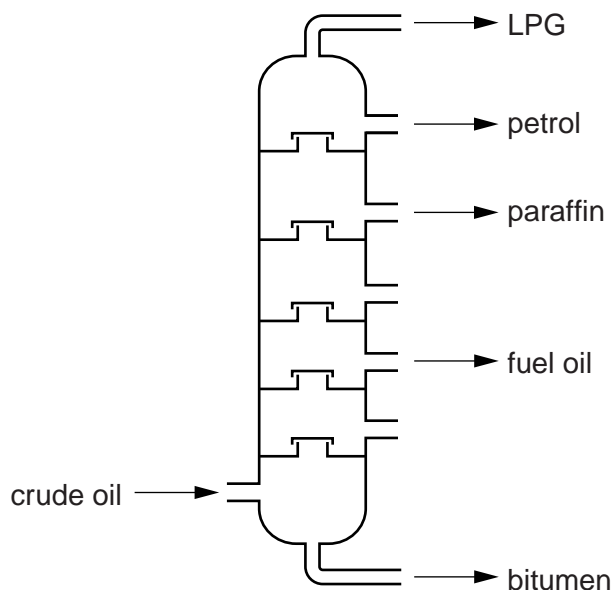
**Question 8 is on the next page**

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16

8 This question is about crude oil.

Crude oil can be separated into useful substances called fractions.



(a) What is the name of the process that separates crude oil into fractions?

..... [1]

(b) LPG contains butane gas.

LPG also contains **another** gas.

Which gas?

Choose from the list.

**ethene**

**nitrogen**

**oxygen**

**propane**

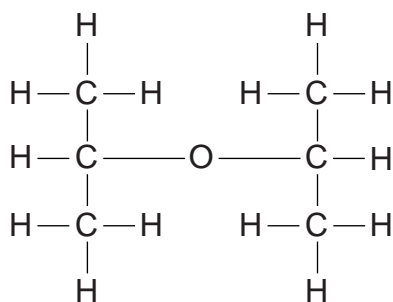
..... [1]



17

(c) DIPE is an additive sometimes put into petrol to improve combustion in a car engine.

Look at the displayed formula for DIPE.



Complete the table to show the numbers of each type of atom in one molecule of DIPE.

Atom	Number
C	.....
H	.....
O	.....

[2]

(d) Not enough petrol is made from crude oil to meet world demand.

Oil refineries make more petrol using a process called **cracking**.

Write about how cracking makes more petrol from other hydrocarbons.

Include the conditions needed for cracking.

.....

.....

.....

..... [3]

## 18

9 Poly(ethene) is a polymer that is used in two forms.

These are low density poly(ethene) (LDPE) and high density poly(ethene) (HDPE).

Look at the table.

It gives some information about LDPE and HDPE.

	<b>LDPE</b>	<b>HDPE</b>
<b>Density in g/cm<sup>3</sup></b>	0.91	0.97
<b>Maximum usable temperature in °C</b>	80	120
<b>Relative strength</b>	11.8	31.4
<b>Relative flexibility</b>	flexible	rigid

LDPE is used for making plastic carrier bags.

HDPE is used for making water pipes.



19

Explain why LDPE is used to make plastic carrier bags but HDPE is used to make water pipes.

Use the information from the table to help you.



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

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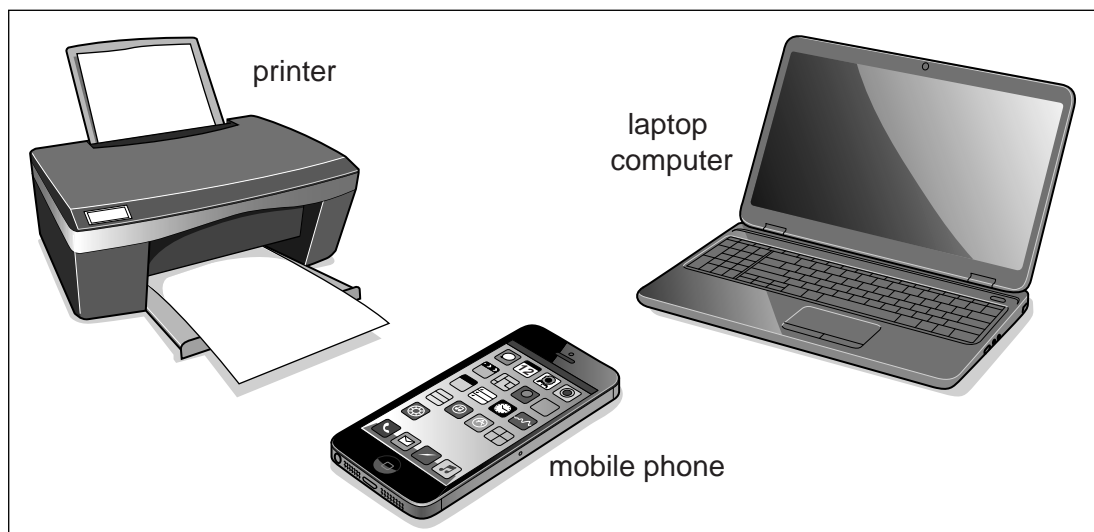
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..... [6]

## SECTION C – Module P1

10 OCRA is an advertising company.

Here is a picture from one of their adverts.



The advert is about the advantages of using **wireless technology**.

(a) Write about the **advantages** of wireless communication between the devices in the picture.

.....

.....

.....

.....

.....

..... [2]

(b) What does wireless technology use for communication between devices?

Choose the **best** answer from

**electricity**

**electromagnetic radiation**

**nuclear radiation**

**sound**

**thermal energy**

..... [1]

21

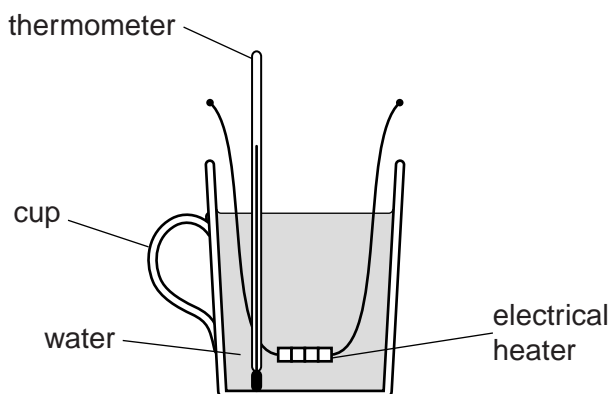
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**Question 11 is on the next page**

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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.

Mass of water in kg	Temperature increase in °C	Specific heat capacity of water in J/kg °C	Energy in J
0.2	40	4200	33600
0.2	30	4200	25200
0.2	20	4200	.....



24

- (iii) Emily measures how long it takes to increase the temperature of this water by  $60^{\circ}\text{C}$ . 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  $60^{\circ}\text{C}$ .

Explain your answer.

.....  
..... [2]



25

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**Question 12 is on the next page**

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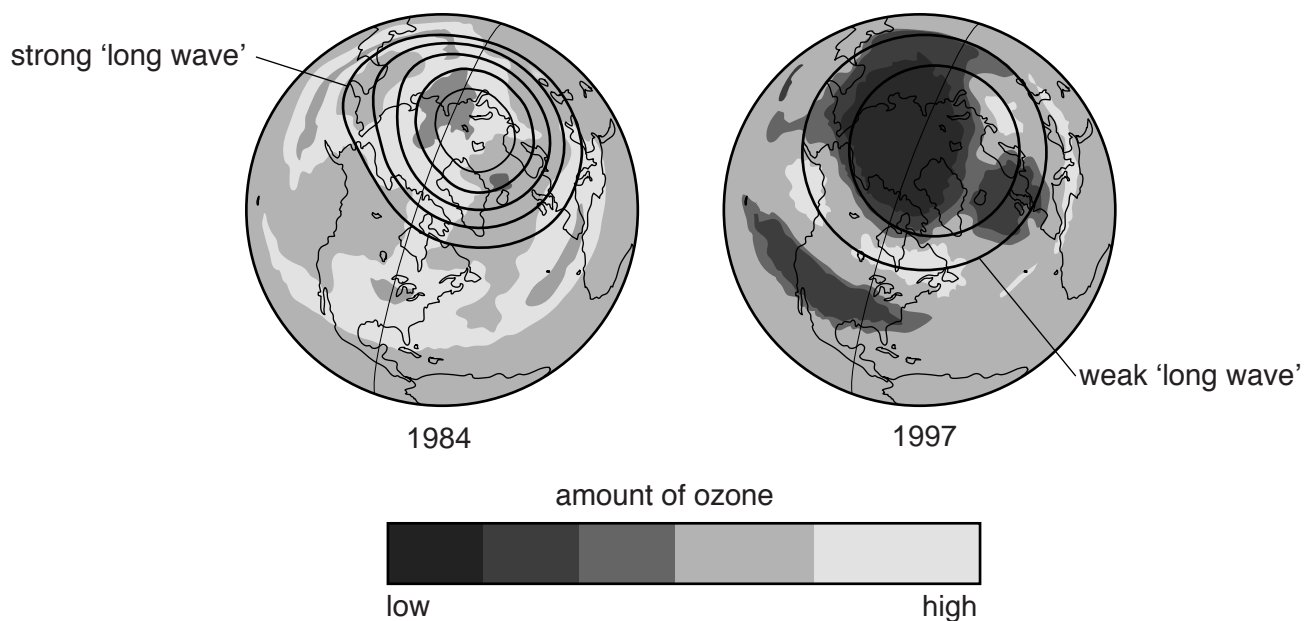
12 Scientists have measured the amount of ozone in the upper atmosphere.

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 increased the size of the hole in the ozone layer over Antarctica.

This has increased the amount of ultraviolet (UV) radiation reaching the surface of the Earth.

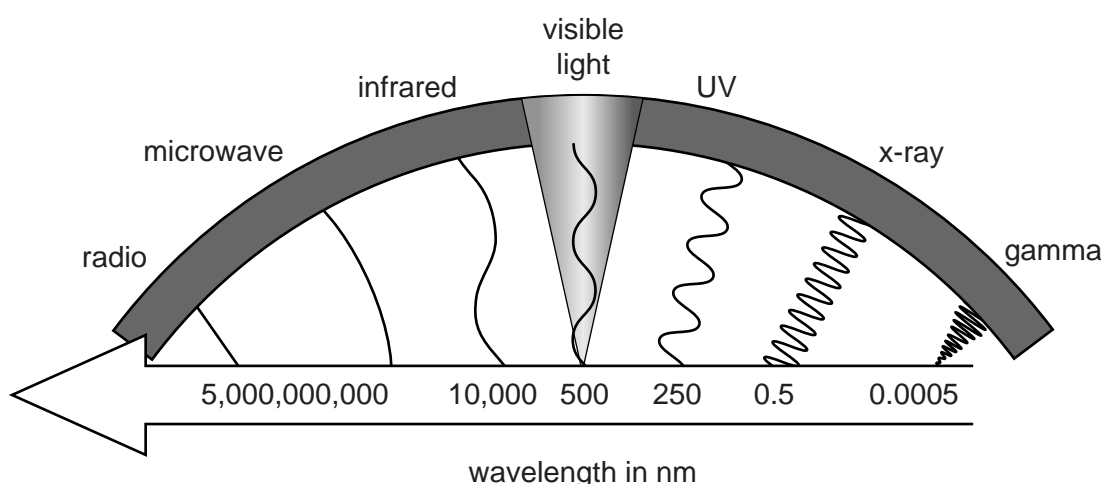
(i) Describe how increased amounts of UV radiation damage human skin **and** eyes.

.....  
.....  
..... [2]

(ii) Describe **two** ways to reduce damage to human skin by UV radiation.

.....  
.....  
..... [2]

13 Tobias finds information about microwaves and infrared radiation on the internet.



(a) Use the diagram to describe **one** difference between microwaves and infrared radiation.

.....  
 ..... [1]

(b) Microwaves and infrared radiation have different properties.

Next to each statement write either **true** or **false**.

The first one has been done for you.

Infrared radiation heats the surface of food. **true** .....

Infrared radiation is absorbed by a dull surface. ....

Infrared radiation is reflected from a shiny surface. ....

Microwaves cause cooling when absorbed by water. ....

[2]

29

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

Look at the table. It shows some properties of materials **A**, **B**, **C** and **D**.

Material	Does total internal reflection happen?	Cost per metre in £
<b>A</b>	yes	83
<b>B</b>	no	24
<b>C</b>	yes	45
<b>D</b>	no	80

Which material is the best for making optical fibres?

Choose from **A B C D**.

.....

Explain your answer.

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..... [2]

**END OF QUESTION PAPER**

30

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# The Periodic Table of the Elements

	1	2	3	4	5	6	7	0										
	7 <b>Li</b> lithium 3	9 <b>Be</b> beryllium 4	11 <b>Na</b> sodium 11	12 <b>Mg</b> magnesium 12	13 <b>Al</b> aluminium 13	14 <b>N</b> nitrogen 7	15 <b>P</b> phosphorus 15	16 <b>O</b> oxygen 8	17 <b>F</b> fluorine 9	18 <b>Ar</b> argon 18								
	19 <b>K</b> potassium 19	20 <b>Ca</b> calcium 20	21 <b>Sc</b> scandium 21	22 <b>Ti</b> titanium 22	23 <b>V</b> vanadium 23	24 <b>Cr</b> chromium 24	25 <b>Mn</b> manganese 25	26 <b>Fe</b> iron 26	27 <b>Co</b> cobalt 27	28 <b>Ni</b> nickel 28	29 <b>Cu</b> copper 29	30 <b>Zn</b> zinc 30	31 <b>Ga</b> gallium 31	32 <b>Ge</b> germanium 32	33 <b>As</b> arsenic 33	34 <b>Se</b> selenium 34	35 <b>Br</b> bromine 35	36 <b>Kr</b> krypton 36
	37 <b>Rb</b> rubidium 37	38 <b>Sr</b> strontium 38	39 <b>Y</b> yttrium 39	40 <b>Zr</b> zirconium 40	41 <b>Nb</b> niobium 41	42 <b>Mo</b> molybdenum 42	43 <b>Tc</b> technetium [98]	44 <b>Ru</b> ruthenium 44	45 <b>Rh</b> rhodium 45	46 <b>Pd</b> palladium 46	47 <b>Ag</b> silver 47	48 <b>Cd</b> cadmium 48	49 <b>In</b> indium 49	50 <b>Sn</b> tin 50	51 <b>Sb</b> antimony 51	52 <b>Te</b> tellurium 52	53 <b>I</b> iodine 53	54 <b>Xe</b> xenon 54
	55 <b>Cs</b> caesium 55	56 <b>Ba</b> barium 56	57 <b>La*</b> lanthanum 57	72 <b>Hf</b> hafnium 72	73 <b>Ta</b> tantalum 73	74 <b>W</b> tungsten 74	75 <b>Re</b> rhenium 75	76 <b>Os</b> osmium 76	77 <b>Ir</b> iridium 77	78 <b>Pt</b> platinum 78	79 <b>Au</b> gold 79	80 <b>Hg</b> mercury 80	81 <b>Tl</b> thallium 81	82 <b>Pb</b> lead 82	83 <b>Bi</b> bismuth 83	84 <b>Po</b> polonium 84	85 <b>At</b> astatine 85	[222] <b>Rn</b> radon 86
	[223] <b>Fr</b> francium 87	[226] <b>Ra</b> radium 88	[227] <b>Ac*</b> actinium 89	[261] <b>Rf</b> rutherfordium 104	[262] <b>Db</b> dubnium 105	[266] <b>Sg</b> seaborgium 106	[264] <b>Bh</b> bohrium 107	[277] <b>Hs</b> hassium 108	[268] <b>Mt</b> meitnerium 109	[271] <b>Ds</b> darmstadtium 110	[272] <b>Rg</b> roentgenium 111	Elements with atomic numbers 112-116 have been reported but not fully authenticated						

1	<b>H</b> hydrogen 1
---	---------------------------

relative atomic mass
atomic symbol
name
atomic (proton) number

\* 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.