OCR
Oxford Cambridge and RSA

F

Wednesday 21 June 2017 – Morning

GCSE GATEWAY SCIENCE
FURTHER ADDITIONAL SCIENCE B

B762/01 Further Additional Science modules B6, C6, P6 (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 30 minutes

* B 7 6 2 0 1 *

* 6 7 5 5 9 3 1 7 0 3 *

Candidate forename		Candidate surname	

Centre number						Candidate number				

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. 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.
- Do **not** write in the barcodes.

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 **85**.
- This document consists of **32** pages. Any blank pages are indicated.

EQUATIONS

$$\text{energy} = \text{mass} \times \begin{matrix}\text{specific}\\ \text{heat}\\ \text{capacity}\end{matrix} \times \begin{matrix}\text{temperature}\\ \text{change}\end{matrix}$$

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

$$GPE = mgh$$

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

$$v = u + at$$

$$v^2 = u^2 + 2as$$

$$s = ut + \frac{1}{2}at^2$$

$$m_1u_1 + m_2u_2 = (m_1 + m_2)v$$

$$\text{refractive index} = \frac{\text{speed of light in vacuum}}{\text{speed of light in medium}}$$

$$\text{magnification} = \frac{\text{image size}}{\text{object size}}$$

$$I_e = I_b + I_c$$

$$\frac{\begin{matrix}\text{voltage across}\\ \text{primary coil}\end{matrix}}{\begin{matrix}\text{voltage across}\\ \text{secondary coil}\end{matrix}} = \frac{\begin{matrix}\text{number of}\\ \text{primary turns}\end{matrix}}{\begin{matrix}\text{number of}\\ \text{secondary turns}\end{matrix}}$$

$$\text{power loss} = (\text{current})^2 \times \text{resistance}$$

$$V_pI_p = V_sI_s$$

BLANK PAGE

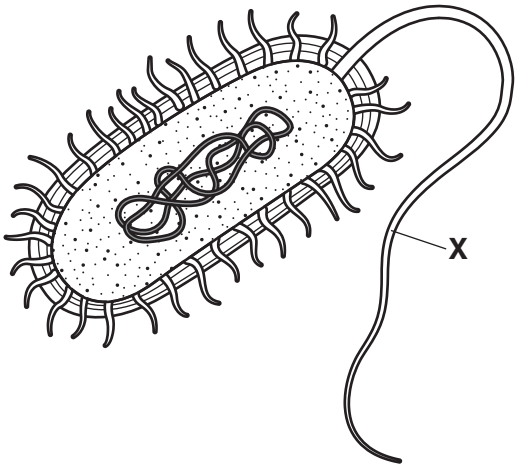
Question 1 begins on page 4

PLEASE DO NOT WRITE ON THIS PAGE

Answer **all** the questions.

SECTION A – Module B6

1 **(a)** The diagram shows a bacterial cell.



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

Put a (ring) around the correct answer.

cell wall **cytoplasm** **DNA** **flagellum** **nucleus**

[1]

(b) A cold is caused by a virus.

How are viruses different from bacteria?

.....

.....

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

(c) Sam has a cold.

When he sneezes, he makes sure he sneezes into a tissue or handkerchief.

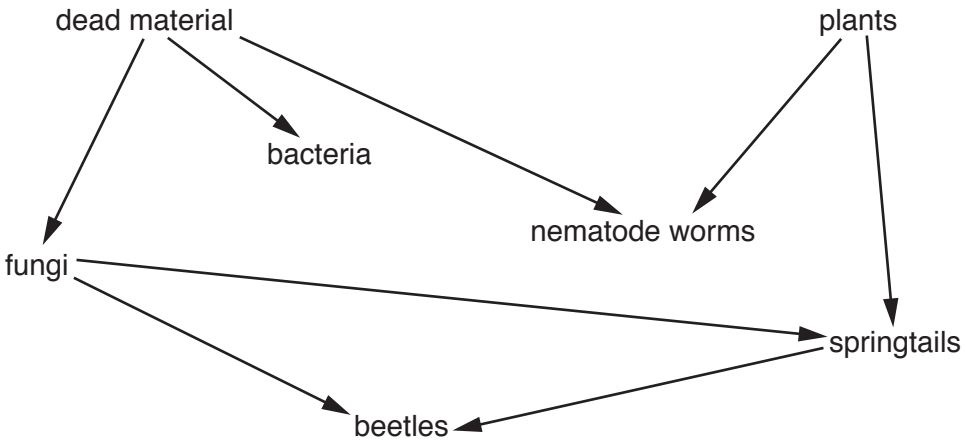
Explain why.

.....

.....

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

2 **(a)** The diagram shows part of a soil food web in a garden.



(i) Write down **one** carnivore from the food web.

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

(ii) Write down **one** herbivore from the food web.

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

(iii) Write down **one** detritivore from the food web.

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

(b) Sue adds compost to the soil in her garden to attract earthworms.

(i) Earthworms will help her plants grow.

Explain why.

.....

.....

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

(ii) Compost is made from dead plant material.

Describe how the plant material is turned into compost.

.....

.....

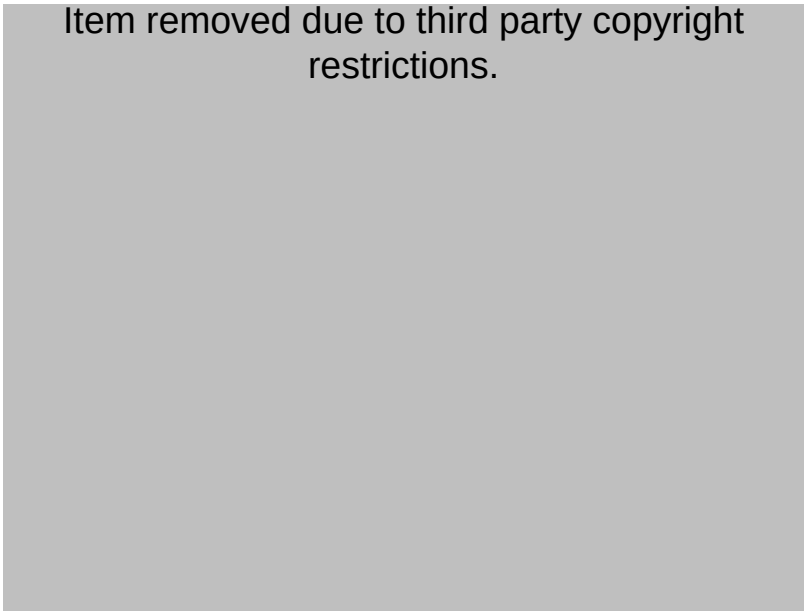
..... **[2]**

3 Yeast is a fungus that is used when making beer.

To make the beer, a chemical reaction must take place inside the yeast cells.

The yeast cells will also reproduce.

The graph shows how changing the temperature changes the activity of yeast.



Explain the role of yeast in the production of beer.

In your answer:

- describe how yeast reproduces
- describe the chemical reaction that takes place inside the cells
- suggest a reason why, when making beer, the temperature is kept between 20 °C and 25 °C.

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

.....

.....

.....

.....

.....

.....

.....

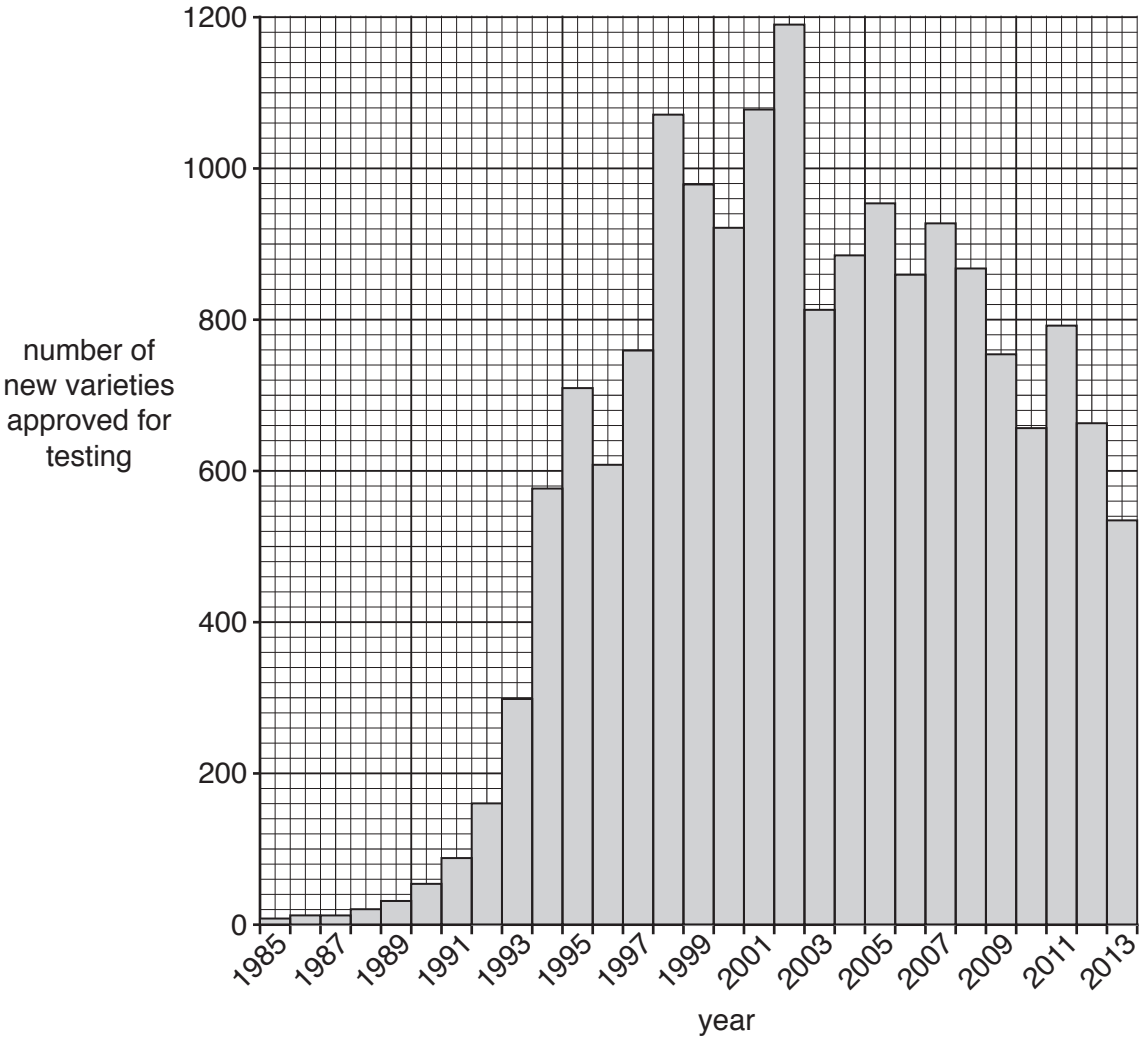
.....

.....

..... **[6]**

4 New varieties of genetically engineered crops are tested by growing them outside.

The graph shows the number of new varieties approved for testing by the US government.



(a) Describe the trends shown by the graph.

Include data from the graph in your answer.

.....

.....

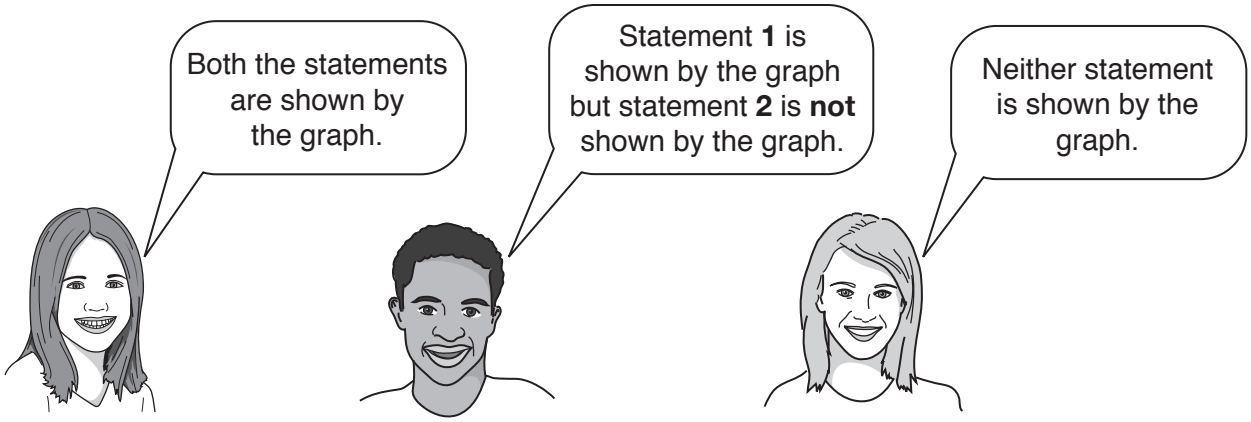
.....

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

(b) Look at two statements about genetically engineered crops.

Statement 1	Statement 2
The graph shows that the number of genetically engineered crops grown has been recently decreasing.	The graph shows that genetically engineered crops are now becoming less popular with consumers.

Some students are discussing these statements.



Which student is correct?

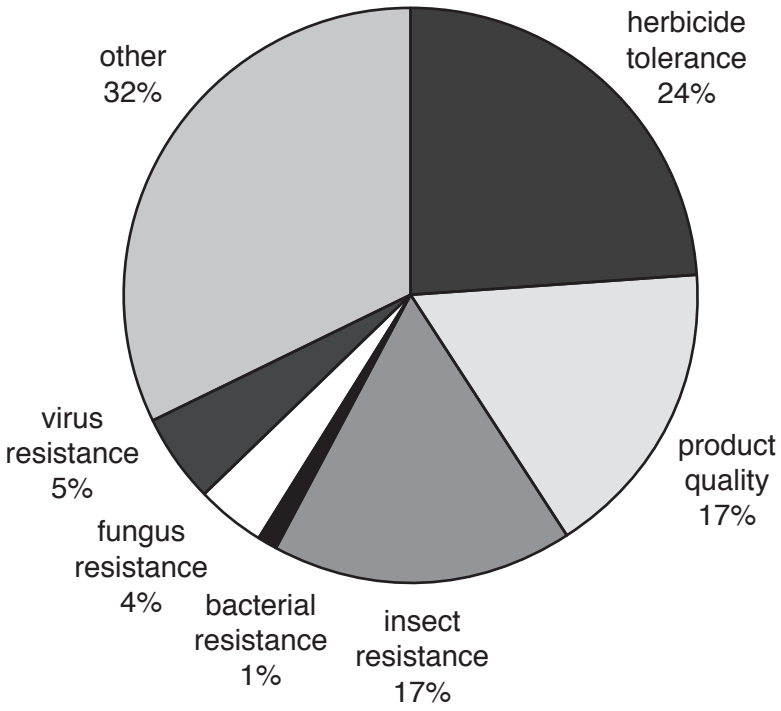
Explain your answer.

.....

.....

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

(c) The pie chart shows what characteristics the new varieties were tested for.



(i) Which characteristic is being tested for the most?

Put a (ring) around the correct answer.

herbicide tolerance

product quality

resistance to pests and infections

[1]

(ii) Explain your answer to part **(c)(i)**.

.....

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

(d) The table describes the stages of genetic engineering.

They are **not** in the correct order.

Put the stages in the correct order by writing numbers **1**, **2**, **3**, **4** and **5** in the boxes.

Two stages have been done for you.

Stages	Description
	cut open the DNA of a new plant
1	identify the desired gene in a plant
	insert the desired gene into the DNA
	remove the desired gene from the DNA
5	the desired gene works in the new plant

[1]

SECTION B – Module C6

5 A laboratory is developing a fuel cell to provide electrical power to a spacecraft.

Look at the information about a fuel cell.

fuel used	hydrogen
fuel reacts with	oxygen
waste product	water
mass of fuel cell	30 kg
efficiency	85%
voltage produced	0.9 volts
operating temperature	70 °C

(a) Write down **two** advantages of using this fuel cell to provide electrical power to a spacecraft.

.....

.....

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

(b) Write down **two** disadvantages of using this fuel cell to provide electrical power to a spacecraft.

.....

.....

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

(c) In this fuel cell, hydrogen, H_2, reacts with oxygen, O_2.

Water, H_2O, is made.

Write a **balanced symbol** equation for this reaction.

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

6 Tim has two shirts.

He has spilled red paint on one shirt and green paint on the other shirt.

Tim wants to choose solvents to remove the red and green paint.

Look at the table. It shows information about different solvents.

Solvent	Does it remove red paint?	Does it remove blue paint?	Does it remove green paint?	Does it damage the shirt?
A	yes	no	no	yes
B	no	no	yes	yes
C	yes	yes	no	no
D	no	yes	yes	no

(a) Tim wants to remove the red and green paints without damaging the shirts.

Which solvents should he use? Explain your answer.

.....

.....

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

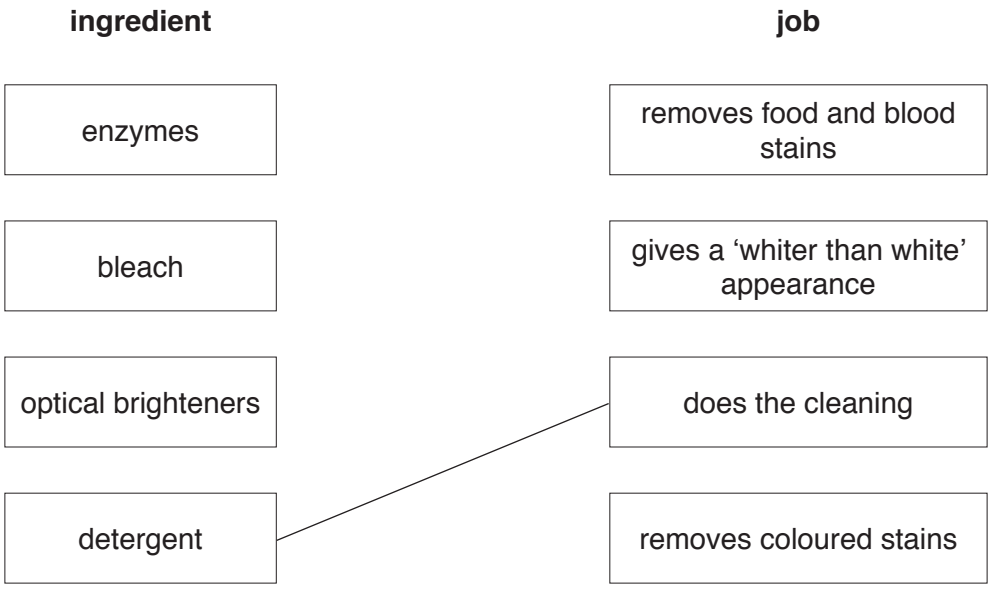
(b) Tim wants to wash his shirt.

He looks at the label on the washing powder.

The label shows some of the ingredients in the washing powder.

Match each ingredient to its job. One has been done for you.

Draw **only three** straight lines.



[2]

(c) Tim also has a jacket.

The jacket must be **dry cleaned**.

What is meant by dry cleaning?

.....

.....

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

7 This question is about fats and oils.

(a) What is the state of an oil at room temperature?

Choose from:

gas

liquid

solid

vapour

answer ..... **[1]**

(b) Vegetable oil reacts with sodium hydroxide solution.

What useful household substance is made?

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

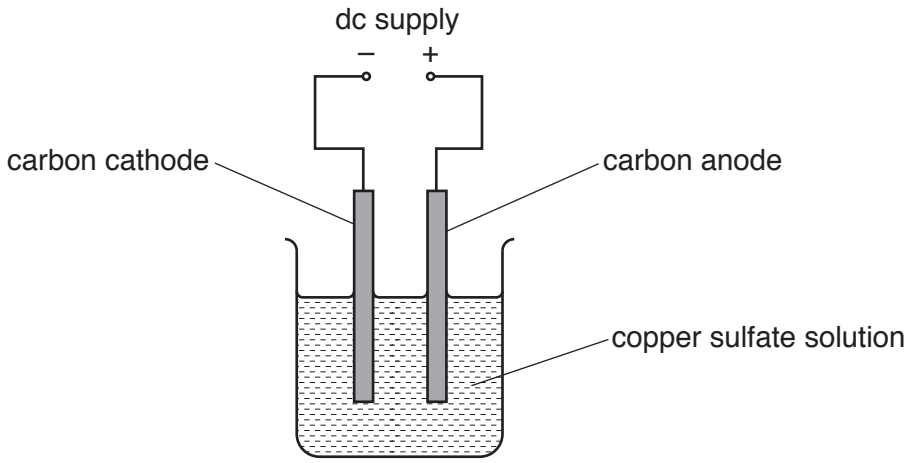
(c) Milk is an **emulsion**.

What is an emulsion?

.....

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

8 Jane is investigating the electrolysis of copper sulfate solution using carbon electrodes.



(a) What will Jane **see** happening at the carbon anode (positive electrode)?

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

(b) Copper is made at the carbon cathode.

Jane wants to increase the mass of copper deposited.

How can she do this?

Place a tick (✓) in the box next to the correct answer.

Reduce the time of the electrolysis. ☐

Increase the current passing through the copper sulfate solution. ☐

Use a different concentration of copper sulfate solution. ☐

Change the anode and cathode around. ☐

[1]

(c) Jane changes the copper sulfate solution to dilute sulfuric acid.

Hydrogen is made at the cathode.

What is the chemical test for hydrogen?

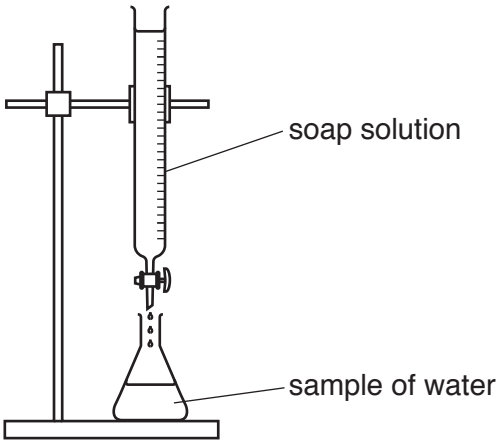
.....

.....

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

9 Abigail and Alfie investigate three samples of water, **A**, **B** and **C**.

Look at the diagram. It shows the apparatus they use.



They add soap solution to samples of water and shake them.

They keep adding more soap solution until a lather remains.

Look at the table. It shows their results.

Sample		**Volume of soap solution added in cm^3**
distilled water		3.0
sample **A**	before boiling	10.0
	after boiling	3.0
sample **B**	before boiling	12.0
	after boiling	12.0
sample **C**	before boiling	6.0
	after boiling	3.0

Identify, **with reasons**, the types of hardness in each of the samples **A**, **B** and **C**.

Put the samples in order of their hardness (hardest first).

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

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

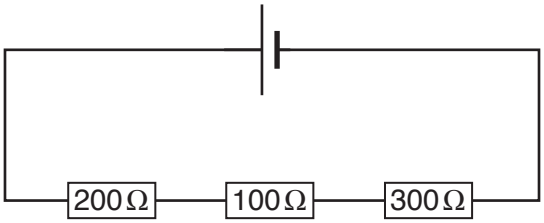
..... **[6]**

SECTION C – Module P6

10 John investigates resistance.

(a) He places three resistors in series.

Look at his circuit.



(i) Calculate the **total** resistance of the resistors in the circuit.

answer ..... ohms **[1]**

(ii) John places the same three resistors in **parallel**.

Suggest what happens to the total resistance of the resistors in the parallel circuit.

.....

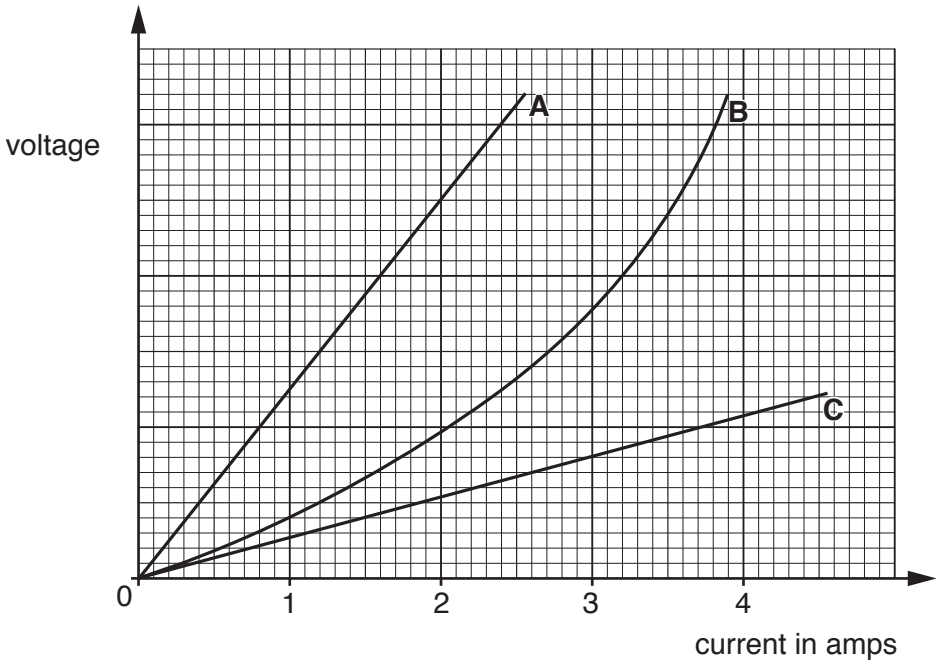
..... **[1]**

(b) John finds three unknown components.

He labels them **A**, **B** and **C**.

He takes current and voltage measurements for the components.

Look at the graph of his results.



(i) Explain which component **A**, **B** or **C** has the highest resistance at 2A.

.....

.....

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

(ii) Explain what is meant by electrical resistance in a metal conductor.

Use ideas about atomic structure in your answer.

.....

.....

.....

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

11 Kate investigates three different types of transformers.

She records the input and output voltages of the transformers.

Look at the table.

Name of transformer	Type of transformer	Input voltage in volts	Output voltage in volts
A		25 000	450 000
B		230	19
C		230	230

Identify the **type** and suggest a **use** for each transformer **A**, **B** and **C**.

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

.....

.....

.....

.....

.....

.....

.....

..... **[6]**

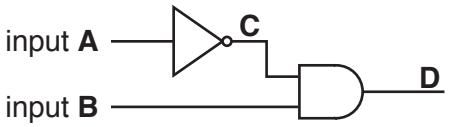
BLANK PAGE

Question 12 begins on page 22

PLEASE DO NOT WRITE ON THIS PAGE

12 Beth connects two logic gates together.

Look at a diagram of her circuit.



(a) Complete the truth table for this logic circuit.

A	**B**	**C**	**D**
0	0		
0	1		
1	0		
1	1		

[2]

(b) Which of the following could **not** be used to provide an output for a logic gate?

Put a (ring) around the correct answer.

thermistor **LED** **relay**

[1]

(c) Beth completes her homework on transistors.

Transistor Homework

Transistors are the basic building blocks of electronic components.

An average computer uses millions of transistors in its circuits.

A transistor is like a resistor.

Transistors can be connected together to make thermistors.

There are two mistakes in Beth's homework.

(i) Write down the **two** mistakes.

.....

.....

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

(ii) Choose **one** of the mistakes and write down the correct information.

.....

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

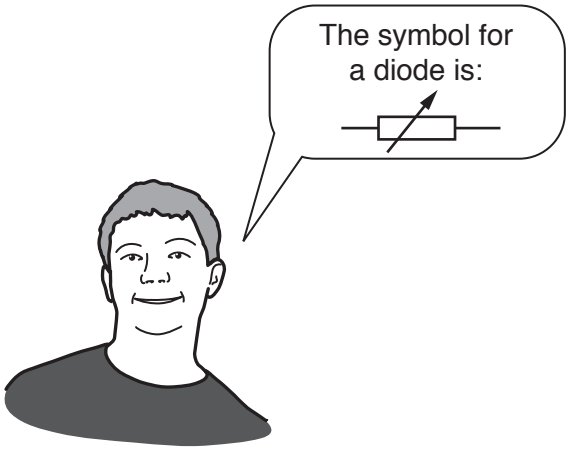
(d) For a transistor Beth measures the base current to be 0.1 A and the collector current to be 5.0 A.

Calculate the **emitter** current for this transistor.

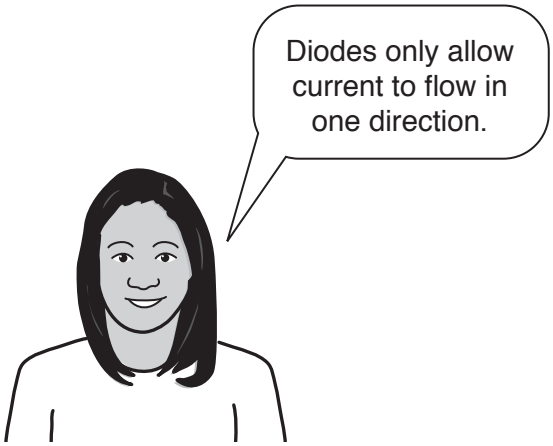
answer ..... A **[1]**

13 Four students discuss ideas about diodes.

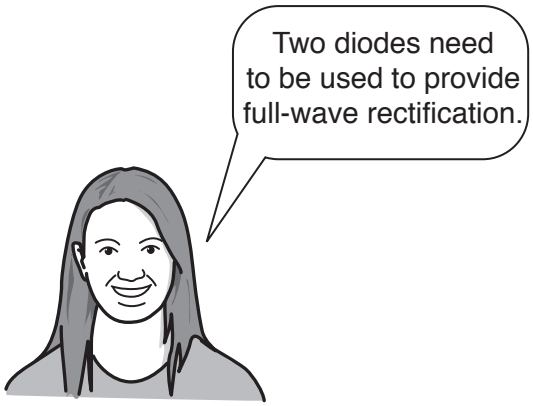
Look at their ideas.



Bob



Ula



Liz

Rav

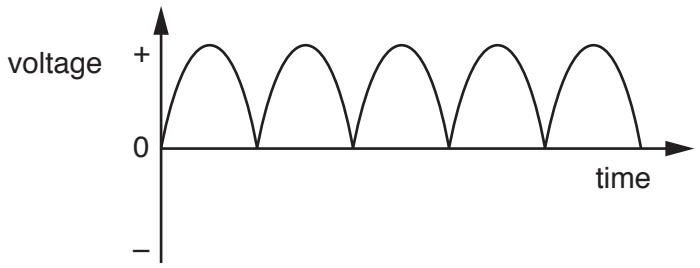
Only two students have correct ideas about diodes.

(a) Which **two** students have correct ideas about diodes?

..... and ..... **[2]**

(b) Rectification is used to change the current from AC to DC.

Look at the voltage-time graph.



(i) Which type of rectification is shown by the graph?

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

(ii) Many devices need a more constant electricity supply.

Sketch the voltage-time graph for a more constant supply.

[1]

14 Kevin investigates how electricity is generated.

He reads that the dynamo effect can be used to generate electricity.

Describe what the dynamo effect is.

.....

.....

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

SECTION D

15 James finds this headline in a newspaper.

> **Butter or margarine: which is really healthier?**

James thinks that margarine is healthier as it contains less saturated fat.

He decides to do some research about butter and margarine.

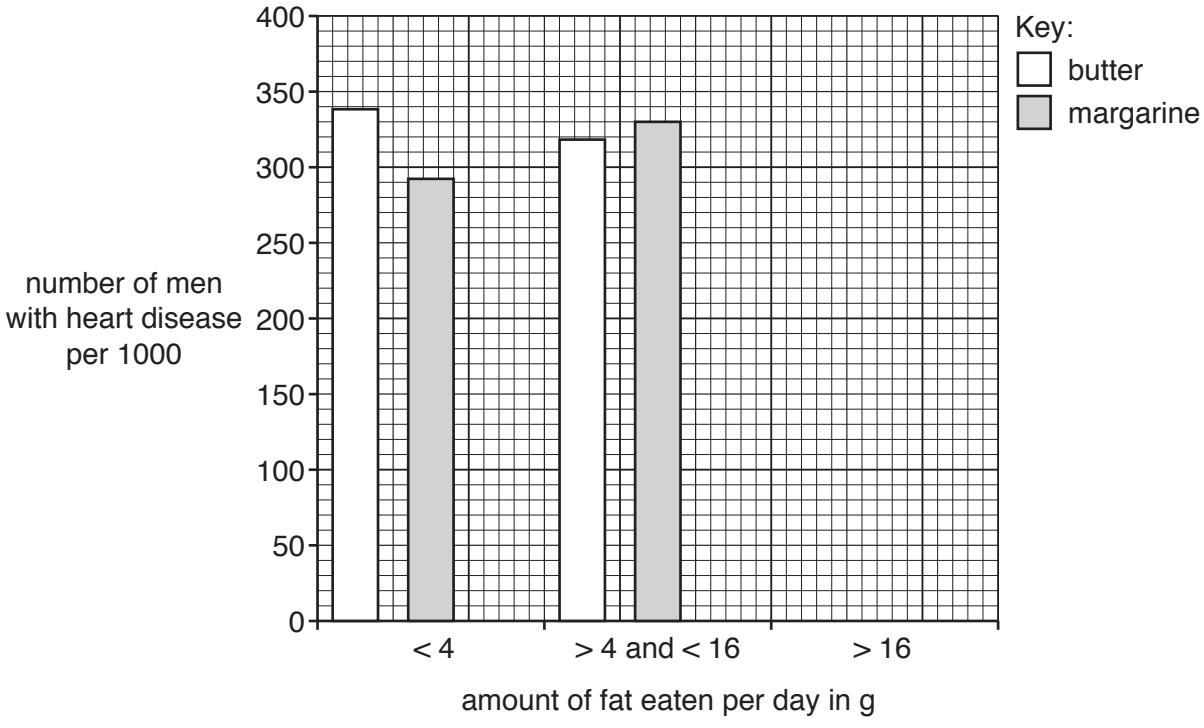
(a) James finds this table of data on the internet.

The data shows the amount of fat eaten as butter or margarine each day and how many men have heart disease.

Amount of fat eaten per day in g	Number of men with heart disease per 1000	
	Eat butter	Eat margarine
<4	340	295
> 4 and <16	320	330
> 16	300	400

(i) James draws a bar chart to show the data.

Complete the bar chart. **[1]**



(ii) James decides the answer to the question in the headline is

Eating butter is healthier than eating margarine.

Write down **one** way the data supports his answer and **one** way it does not support his answer.

support .....

.....

.....

does not support .....

.....

.....

[2]

(iii) James eats an average of 18 g of margarine a day.

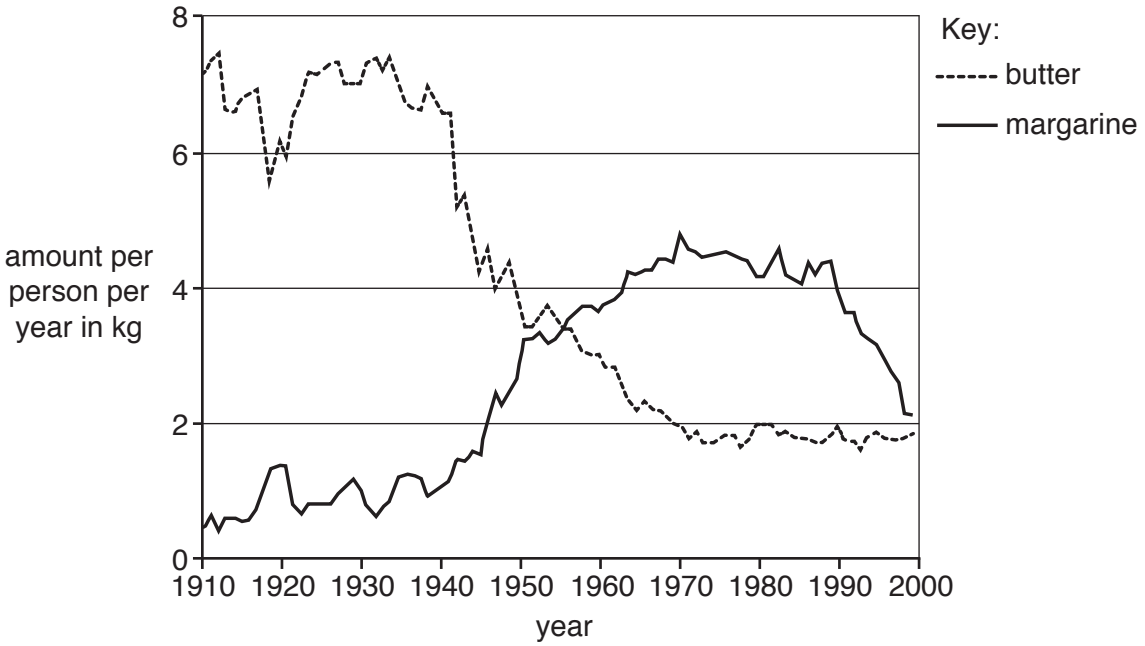
He uses the data to predict he has a 40% probability of getting heart disease.

Calculate the probability of getting heart disease if he ate **less than** 4 g of margarine each day.

answer ..... % **[2]**

(b) James finds this graph.

It shows the amount of butter and margarine eaten in a year by people living in America.



(i) In which year was the **most margarine** eaten per person? ..... **[1]**

(ii) Describe the trends in the amount of **butter** and **margarine** eaten between 1910 and 2000.

.....

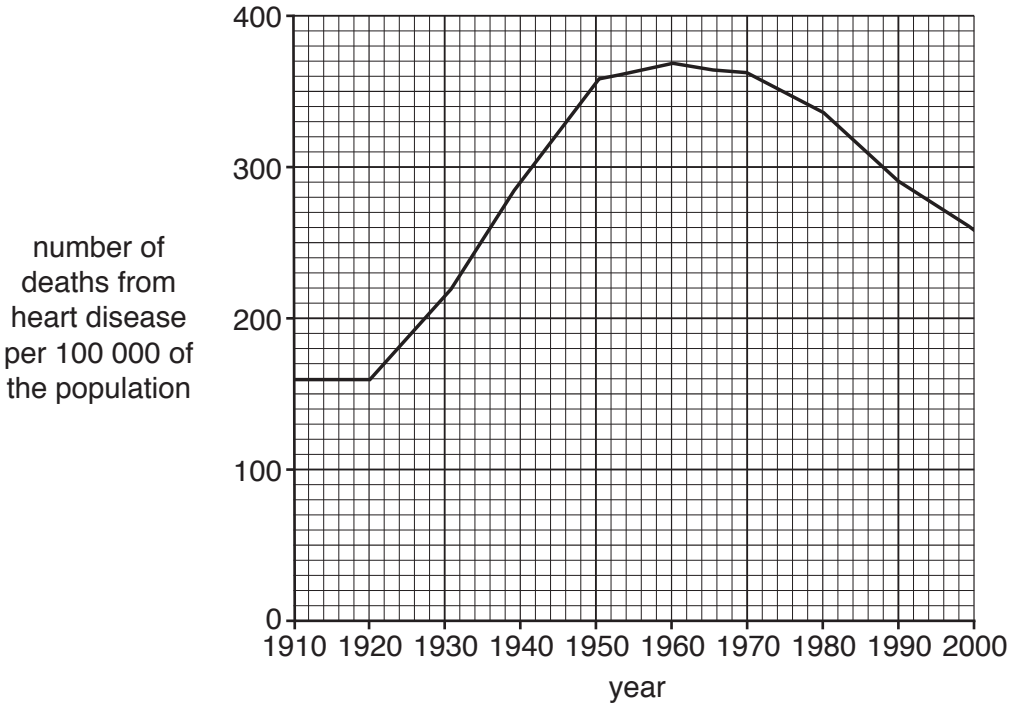
.....

.....

.....

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

(iii) Look at the graph. It shows the number of deaths from heart disease for America.



Together, the graphs in part **(b)**, **seem** to show a surprising link between eating margarine and heart disease.

Write about this link between eating margarine and heart disease.

Use evidence from **both** graphs in part **(b)** in your answer.

.....

.....

.....

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

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).

The Periodic Table of the Elements

1	2											3	4	5	6	7	0
							1 **H** hydrogen 1										4 **He** helium 2
7 **Li** lithium 3	9 **Be** beryllium 4											11 **B** boron 5	12 **C** carbon 6	14 **N** nitrogen 7	16 **O** oxygen 8	19 **F** fluorine 9	20 **Ne** neon 10
23 **Na** sodium 11	24 **Mg** magnesium 12											27 **Al** aluminium 13	28 **Si** silicon 14	31 **P** phosphorus 15	32 **S** sulfur 16	35.5 **Cl** chlorine 17	40 **Ar** argon 18
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						

Key

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.