

Wednesday 17 June 2015 – 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.

Duration: 1 hour 30 minutes

OCR supplied materials:
None

Other materials required:

- Pencil
- Ruler (cm/mm)



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

EQUATIONS

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

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

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

$$v = u + at$$

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

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

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

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

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

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

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

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

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

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

$$I_e = I_b + I_c$$

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

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

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

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

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

$$V_p I_p = V_s I_s$$

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

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

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

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

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

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

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

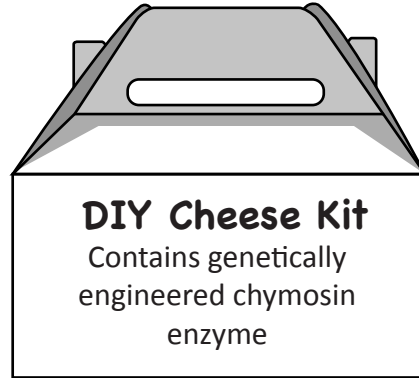
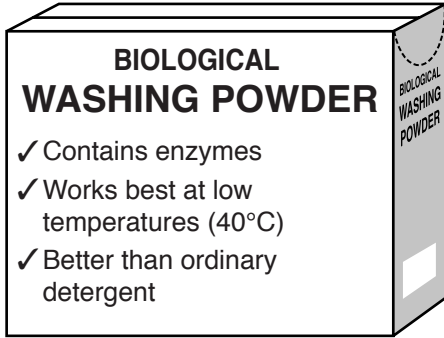
$$\text{GPE} = mgh$$

Answer **all** the questions.

SECTION A – Module B6

1 Gary is shopping.

Look at two items from his shopping basket.



(a) Why is the washing powder described as **biological**?

..... [1]

(b) The DIY Cheese Kit contains an enzyme called chymosin.

This chymosin has been made by genetically engineered bacteria.

(i) Describe what is meant by the term **genetic engineering**.

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

(ii) A small number of genetically engineered bacteria are produced.
The kit manufacturers need large amounts of chymosin.

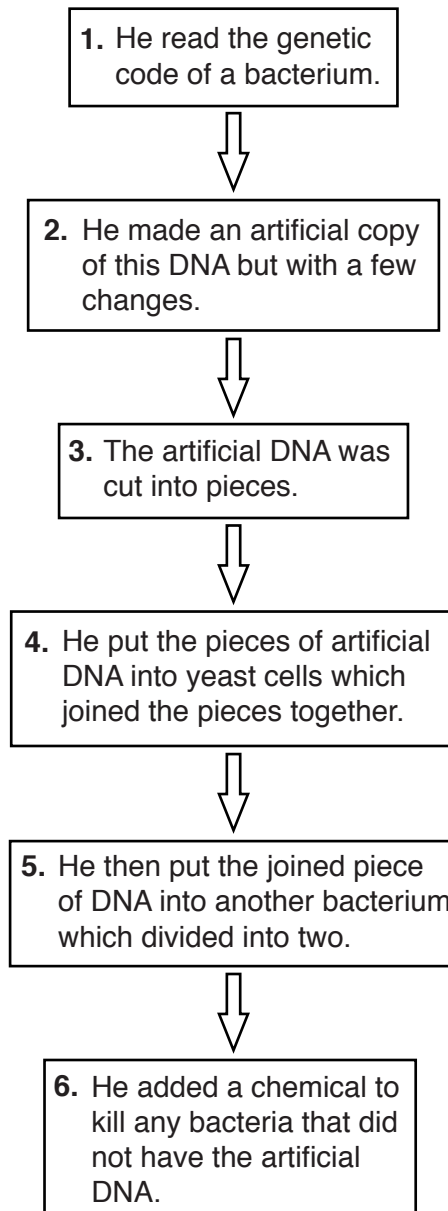
Complete the sentences to explain how these bacteria can make large amounts of chymosin.

The bacteria will be placed in large containers called

The bacteria are given nutrients, oxygen and kept warm so they can [2]

2 A scientist called Craig Venter has claimed to have made the first artificial life form.

The diagram shows six main stages in his method.



(a) The table shows some statements about Venter's method.

Write in the table the number of the stage that each statement refers to.

	Number of stage
This stage uses a fungus.	
Binary fission occurs in this stage.	
An antibiotic is used in this stage.	

[3]

(b) The results of this experiment appeared in many newspapers.

It was important that Venter also published his work in a scientific journal.

Explain why.

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

3 In Vietnam there are many small farms.

The farmers keep cows, goats and rabbits.

These animals produce a lot of manure.

The farmers can use manure in three different ways.

(a) The first method is to use the manure to make biogas in a digester.

(i) Which is the main gas in biogas?

Put a ring around the correct answer.

carbon dioxide

hydrogen

methane

oxygen

[1]

(ii) Biogas is only produced in anaerobic conditions.

Rabbit and goat manure float on the top of the liquid in the digester.

The floating manure does not make much biogas.

Suggest why.

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

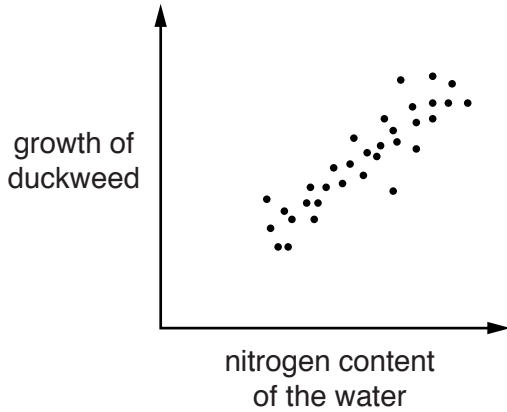
(b) The second method is to put manure into ponds.

A plant called duckweed grows in the ponds.

Farmers can feed this plant to their animals.

The nitrogen content of the water affects the growth of duckweed.

Look at the graph and the table.



Animal	Percentage of nitrogen in manure
cow	0.6
goat	1.1
rabbit	2.0

The farmers do **not** put the manure from cows into the ponds.

Use the graph and the table to explain why.

.....

.....

..... [2]

(c) The third method is to dig manure into the fields where crops will be grown.

It can be dug straight into the soil (untreated) or treated first with earthworms.

The earthworms speed up **decomposition** of the animal manure.

(i) Write about decomposition.

In your answer include

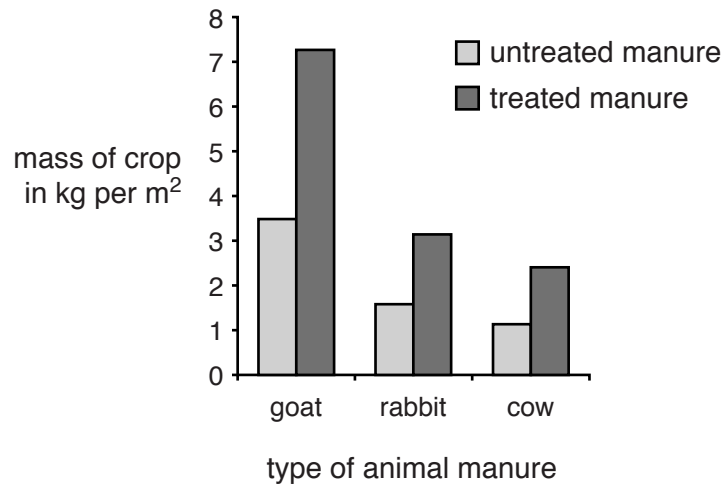
- what is meant by decomposition
- which type of organisms cause decomposition.

.....

.....

..... [2]

(ii) The graph shows the effect of untreated manure and treated manure on crop growth.



Write down **two** conclusions that can be made from this graph.

.....

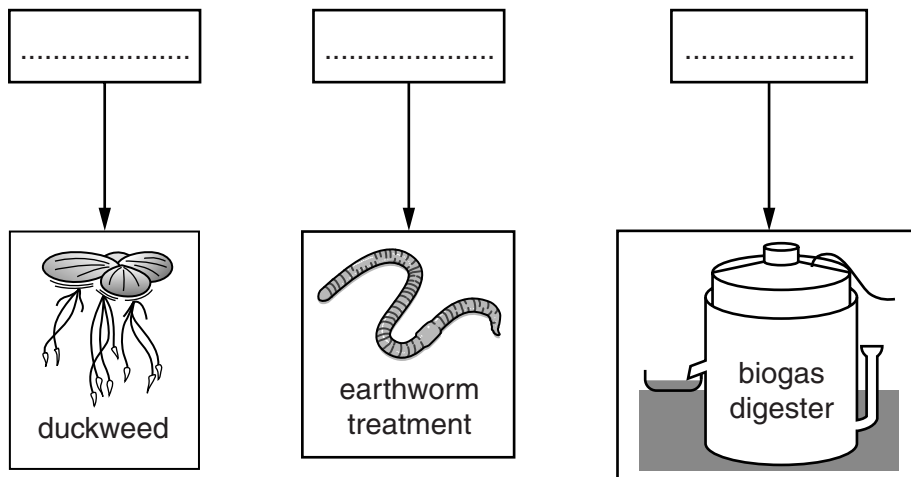
.....

..... [2]

(d) The diagram shows which method the farmers use to dispose of manure from each type of animal.

Write **cow**, **goat** or **rabbit** in each of the boxes.

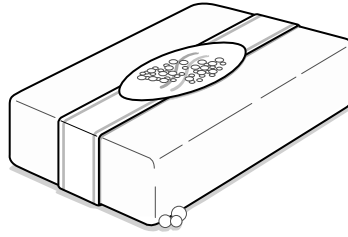
Use information from each part of this question to decide on your answer.



[1]

SECTION B – Module C6

- 5 Natural fats and oils are important raw materials for industry.



Soap made from natural fats and oils

- (a) Soap is made by reacting a chemical with vegetable oil.

What is the name of this chemical?

Choose from the list.

sodium chloride

sodium hydroxide

sodium nitrate

sodium sulfate

answer [1]

- (b) Substances can be solid, liquid or gas at room temperature.

Complete the table.

Substance	Solid, liquid or gas at room temperature
oil	
fat	


[2]

- (c) Vegetable oil can be used to make a fuel.

What is the name of this fuel?

..... [1]

6 The table shows the order of reactivity for five metals.

sodium	Most reactive  Least reactive
calcium	
zinc	
iron	
copper	

(a) Iron is added to copper sulfate solution.

Copper is made in this reaction.

Explain why.

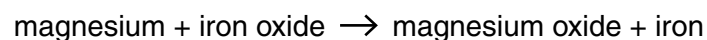
.....

.....

..... [1]

(b) When magnesium is heated with iron oxide a reaction takes place.

Look at the word equation for the reaction.



Magnesium is oxidised and iron oxide is reduced.

How can you tell from the equation?

.....

.....

..... [2]

(c) A metal, **M**, was added to a solution of iron sulfate. Iron solid was formed.

Metal **M** was also added to a solution of zinc sulfate. No reaction took place.

Where would metal **M** be placed in this reactivity series?

Explain your answer.

.....

.....

..... [2]

(d) Joe measures the temperature of 25 cm³ of copper sulfate solution.

He adds 0.5g of magnesium to the copper sulfate solution.

He measures the temperature of the solution again.

He repeats the experiment using 0.5g of different metals.

Look at the table. It shows his results.

Metal	Temperature at start in °C	Temperature at end in °C
magnesium	20	31
zinc	26	33
iron	18	21

Which metal gives the greatest temperature change?

Explain why.

.....

.....

..... [2]

7 (a) Fuel cells are used in submarines.

The reaction between hydrogen and oxygen is used in a fuel cell to make electricity.

The waste product of this reaction is **not** a pollutant.

Write down the **name** of this waste product.

..... [1]

(b) Methane is a fossil fuel.

The reaction between methane and oxygen is used in some power stations to make electricity.

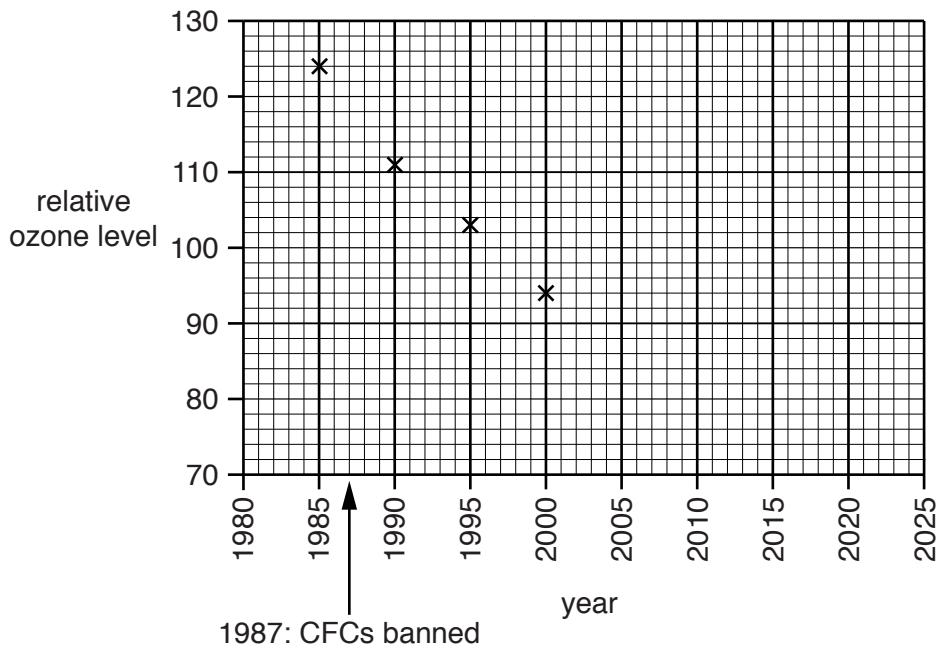
Write down the name of **one** polluting waste product made in this reaction and describe how it may affect the environment.

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

9 The table shows the level of ozone in part of the atmosphere from 1985 to 2015.

Year	Relative ozone level
1985	124
1990	111
1995	103
2000	94
2005	89
2010	96
2015	110

Variation in relative ozone level between 1985 and 2015



(a) Finish the graph by plotting the points for 2005 to 2015 and draw a curve of **best fit**. [2]

SECTION C – Module P6

10 Aditi experiments with electrical circuits.

(a) Answer the following questions.

Choose your answers from the list of components.

capacitor

diode

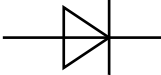
generator

LDR

thermistor

transformer

variable resistor

(i) Which component has this symbol? 

..... [1]

(ii) Which component changes resistance when the light level changes?

..... [1]

(iii) Which component can store charge and discharge it later?

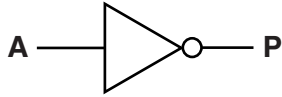
..... [1]

(b) Aditi uses logic gates in her circuits.

She has three gates: a **NOT** gate, an **OR** gate and an **AND** gate.

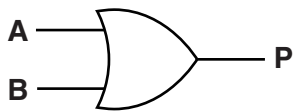
Complete the truth tables for the three gates.

NOT gate



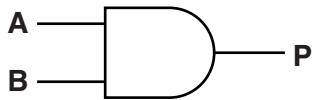
Input A	Output P
	1
1	

OR gate



Input A	Input B	Output P
0	0	
0	1	
1	0	
1	1	

AND gate

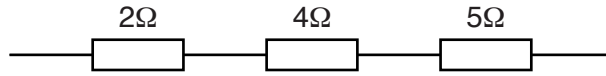


Input A	Input B	Output P
0	0	0
0		0
1	0	0
		1

[3]

11 Sylvia builds circuits using some resistors.

(a) She arranges the resistors in series.



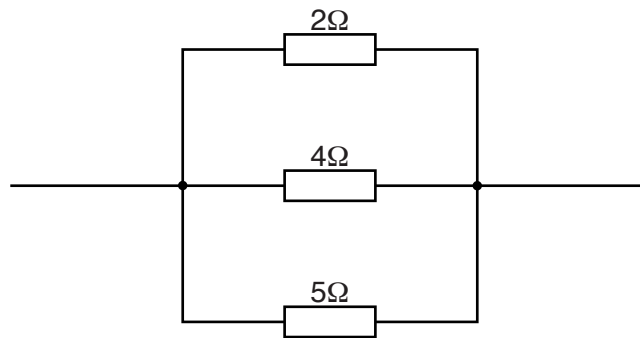
Calculate the total resistance of the resistors in series.

.....

answer Ω

[1]

(b) Sylvia arranges the resistors in parallel.



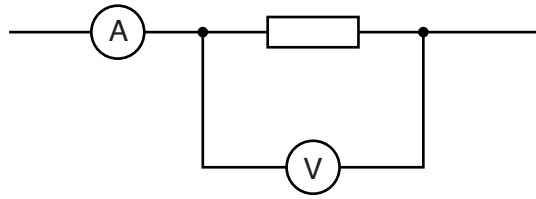
How does this parallel arrangement affect the **total** resistance compared with the series arrangement?

.....

..... [1]

(c) Sylvia builds another circuit. She uses a different resistor.

She does not know its resistance but she thinks it is greater than $5\ \Omega$.



The voltage is 12V and the current is 3A .

Calculate the resistance of the resistor to see if it is greater than $5\ \Omega$.

.....
.....

answer Ω

Is it greater than $5\ \Omega$?

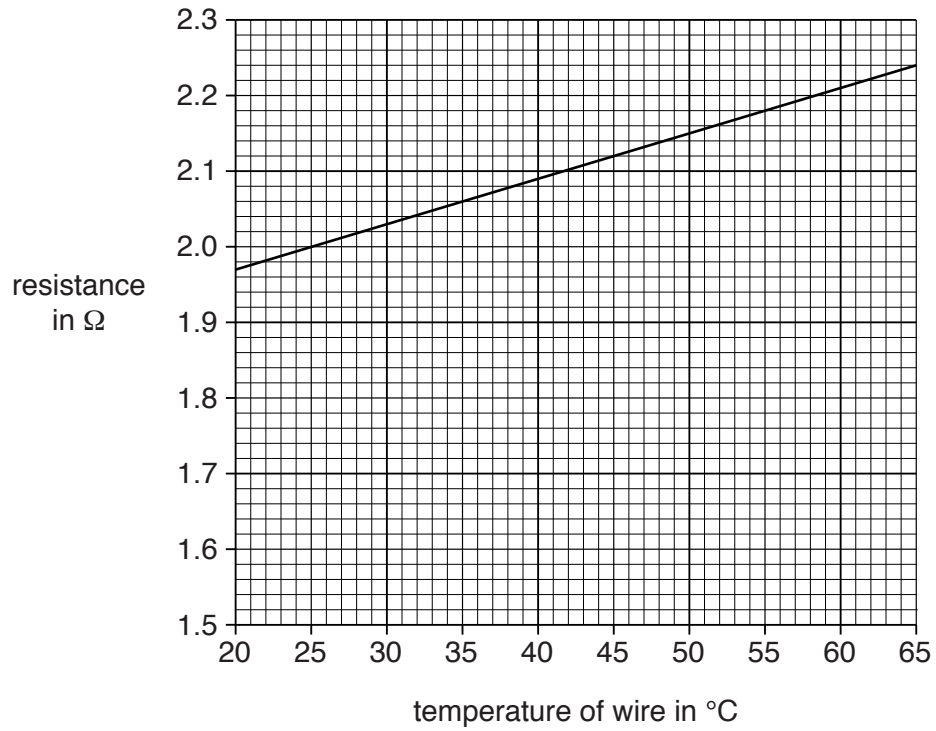
[2]

12 Sammy changes the current in a wire.

He notices that

- the current has an effect on the temperature of the wire
- the temperature has an effect on the resistance of the wire.

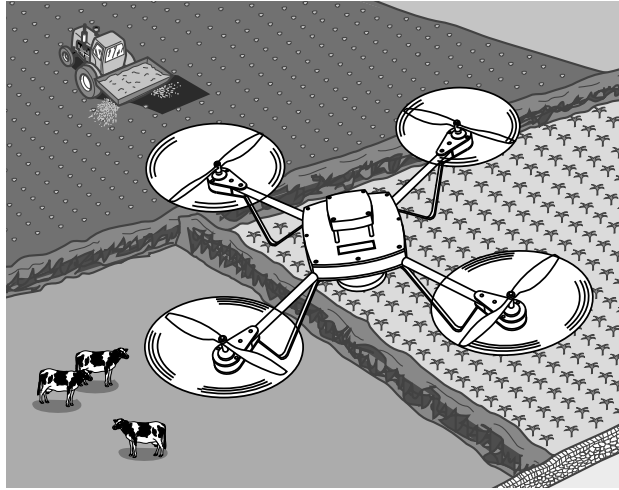
Look at some of the results he collects.



13 Modern electronic components allow robots to be small enough to fly.

These robots can be used to help farmers make observations and do tasks.

Look at the diagram.



Suggest how these flying robots can help farmers.

.....

.....

.....

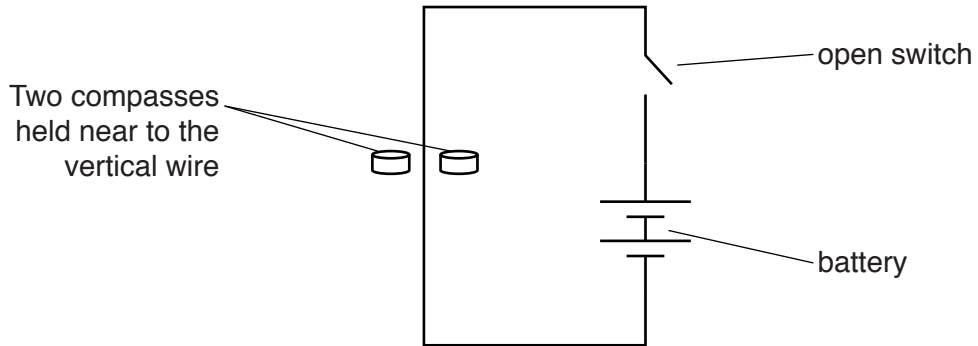
.....

..... [2]

14 Taylor learns about electric current and magnetism.

(a) She connects a wire to a battery and leaves the switch open.

Look at the diagram.



The two compasses are on opposite sides of the vertical wire.

They point towards the battery.

Taylor then closes the switch.

Describe what happens to the compasses and explain why this happens.

.....

.....

.....

.....

.....

..... [3]

(b) Look at the information about different electric motors for a lawn mower.

Electric motor	Input electrical power in W	Useful output power in W	Wasted power in W
Electro	200	190	10
Revolver	220	209	11
Spinner	240	228	12
Whizzer	160	152	8
Winder	280		14

Explain how the electrical power is used in the lawnmower and suggest how some power is wasted.

.....

.....

.....

..... [2]

(c) Which motor has the greatest useful output power?

Show your working.

.....

..... [2]

25
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SECTION D

15 This question is about organ donation.

Some people donate their organs when they die.

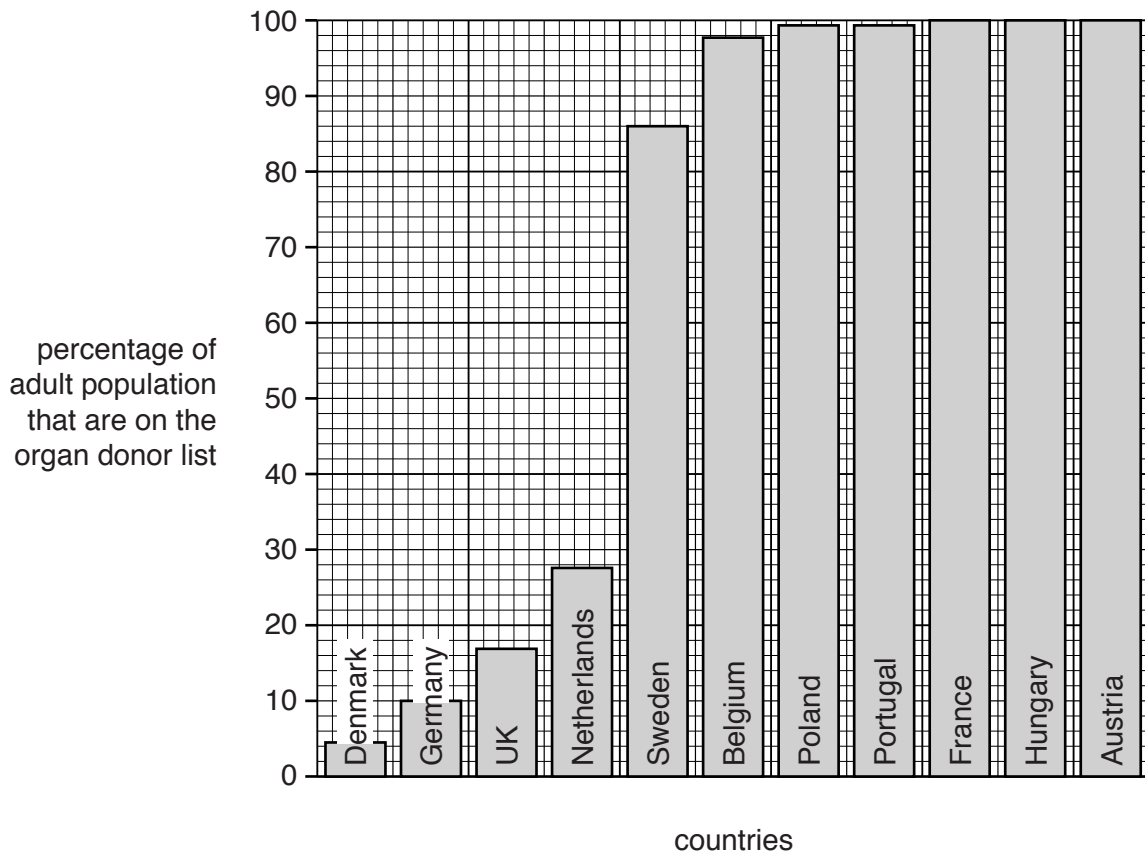
(a) There are two different organ donor systems.

System 1 – people who want to donate their organs register their names on an organ donor list.

System 2 – everyone is on the organ donor list unless they ‘opt out’.

The bar chart shows the percentage of the adult population in different countries that are on the organ donor list.

The information is from 2003.



(i) What percentage of adults in Germany were on the organ donor list in 2003?

..... percent

[1]

(ii) In 2003 the UK used system 1 for organ donation.

There are three **other** countries on the bar chart which use system 1.

Suggest the names of these countries.

Use information from the bar chart to explain your choices.

.....

.....

..... [2]

(b) The number of organs that have been transplanted has changed.

The table shows the number of transplants in the UK during 2008 and during 2013.

Organ	Number of transplants in 2008	Number of transplants in 2013
cornea	2489	3622
lung	115	187
liver	623	774
pancreas	58	38
kidney	1249	1749
heart	127	147

(i) The number of transplants of one organ has decreased between 2008 and 2013.

Write down which organ.

..... [1]

(ii) Two conclusions are made from the data.

- The total number of transplants for these organs is increasing.
- There is a bigger increase in kidney transplants compared to the increase in cornea transplants.

Do you agree with these conclusions?

Use the data to explain your answer.

.....

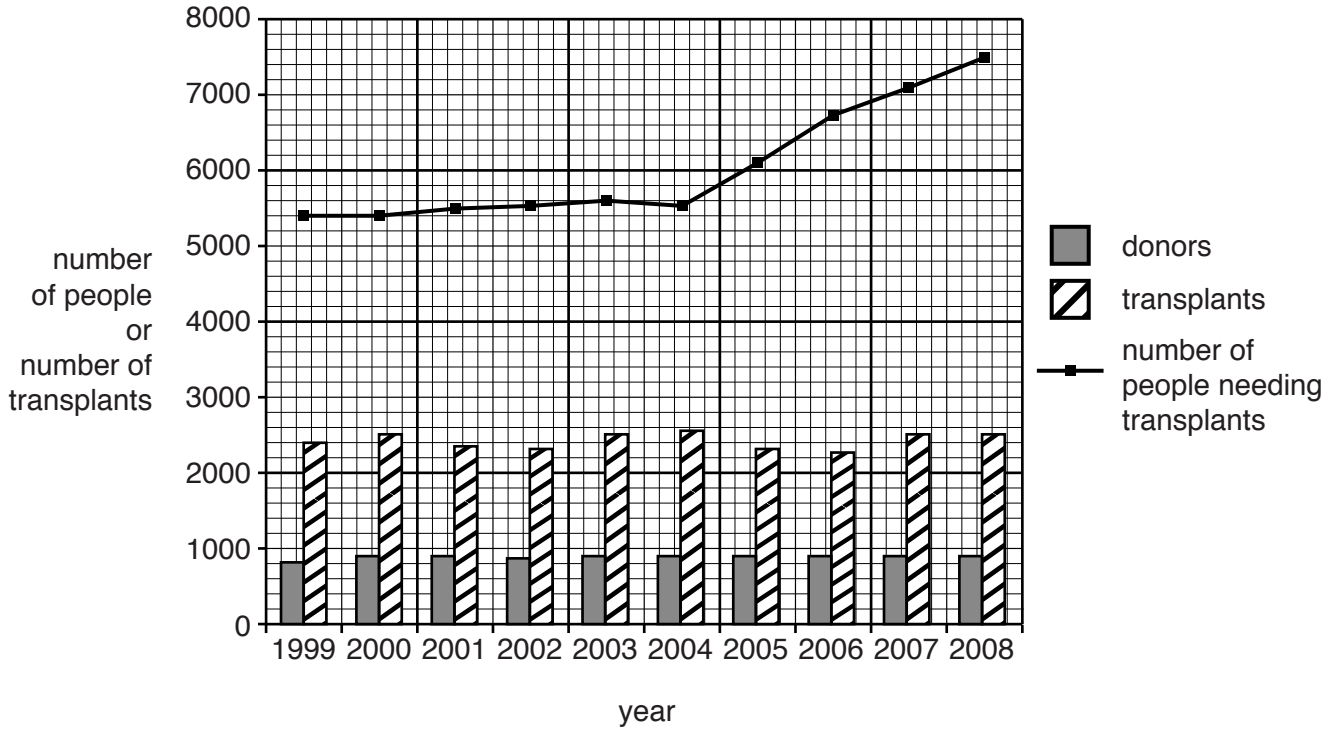
.....

.....

..... [3]

(c) Look at the graph.

It shows how organ donation and the number of people needing a transplant have changed in the UK between 1999 and 2008.



(i) The number of transplants is much greater than the number of donors.

Suggest why.

.....
 [1]

(ii) In 2015 Wales changed so that everyone is on the organ donor list unless they ‘opt out’ (system 2).

Some people think that the whole of the UK should change to system 2.

How does the data in parts (a) and (c) support the idea for changing?

.....

 [2]

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The Periodic Table of the Elements

	1	2	3	4	5	6	7	0										
	7 Li lithium 3	9 Be beryllium 4	11 Na sodium 11	12 C carbon 6	13 Al aluminium 13	14 N nitrogen 7	15 O oxygen 8	16 F fluorine 9	18 Ne neon 10									
	19 K potassium 19	20 Ca calcium 20	21 Sc scandium 21	22 Ti titanium 22	23 V vanadium 23	24 Cr chromium 24	25 Mn manganese 25	26 Fe iron 26	27 Co cobalt 27	28 Ni nickel 28	29 Cu copper 29	30 Zn zinc 30	31 Ga gallium 31	32 Ge germanium 32	33 As arsenic 33	34 Se selenium 34	35 Br bromine 35	36 Kr krypton 36
	37 Rb rubidium 37	38 Sr strontium 38	39 Y yttrium 39	40 Zr zirconium 40	41 Nb niobium 41	42 Mo molybdenum 42	43 Tc technetium [98]	44 Ru ruthenium 44	45 Rh rhodium 45	46 Pd palladium 46	47 Ag silver 47	48 Cd cadmium 48	49 In indium 49	50 Sn tin 50	51 Sb antimony 51	52 Te tellurium 52	53 I iodine 53	54 Xe xenon 54
	55 Cs caesium 55	56 Ba barium 56	57 La* lanthanum 57	72 Hf hafnium 72	73 Ta tantalum 73	74 W tungsten 74	75 Re rhenium 75	76 Os osmium 76	77 Ir iridium 77	78 Pt platinum 78	79 Au gold 79	80 Hg mercury 80	81 Tl thallium 81	82 Pb lead 82	83 Bi bismuth 83	84 Po polonium 84	85 At astatine 85	86 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						

1 H hydrogen 1

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.