OCR

F

Thursday 19 June 2014 – Afternoon

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 *

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. 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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

$$GPE = mgh$$

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

$$v = u + at$$

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

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

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

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

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

$$I_e = I_b + I_c$$

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

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

$$V_pI_p = V_sI_s$$

Answer **all** the questions.

SECTION A – Module B6

1 Insulin is a hormone.

It can be made in factories and used to treat people who have diabetes.

Boxes **A**, **B**, **C** and **D** show some steps in the production of insulin.

They are in the wrong order.

A Bacteria are grown in large tanks full of nutrients.	**B** The gene is taken from human cells.
C The gene is put into bacteria.	**D** Bacteria use the gene to make insulin.

(a) (i) Write down the correct order of the steps in the process.

One has been done for you.

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

(ii) What is the name of this process?

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

- DNA fingerprinting ☐
- fermenting ☐
- genetic engineering ☐
- pasteurising ☐ **[1]**

(b) Some friends are talking about the process.

Three friends are making statements which are based on scientific facts.

One friend is giving an opinion.

Which friend is giving an opinion?

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

[Total: 4]

2 Antibiotics are drugs that are used to kill microorganisms.

They are used to treat some diseases.

(a) Which **two** of these diseases could be successfully treated with antibiotics?

Put ticks (✓) in the boxes next to the **two** correct answers.

chickenpox	☐
cholera	☐
food poisoning	☐
influenza	☐

[1]

(b) Some bacteria are **resistant** to antibiotics.

What does this mean?

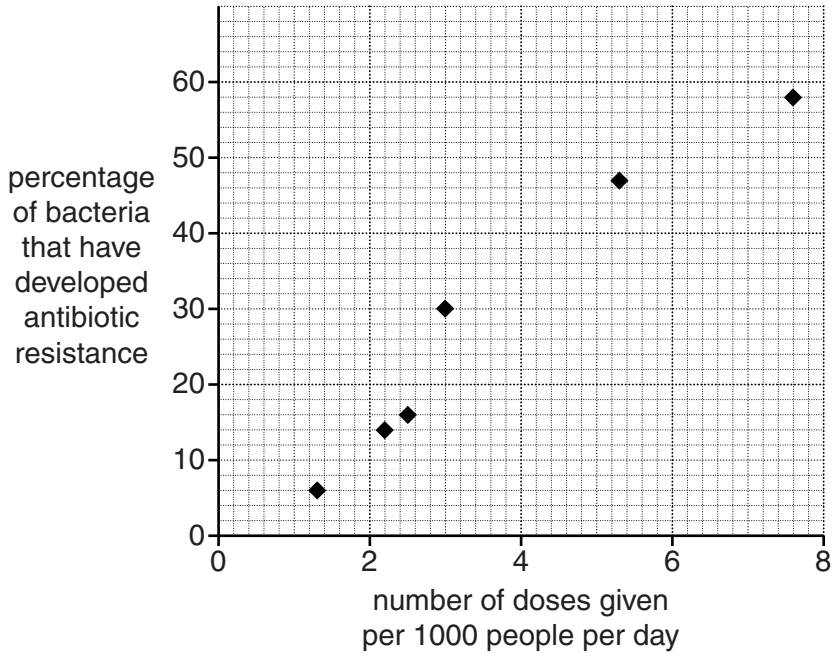
.....

.....

[1]

(c) The graph shows data about the use of one antibiotic in different countries.

It shows the percentage of bacteria that have developed resistance to the antibiotic.



Write about the pattern shown in the graph.

.....

.....

.....

[1]

[Total: 3]

3 This article appeared in a recent newspaper.

Worry over school in America

There has been concern recently about a school in America.

The school was built on top of an old rubbish dump.

The dump contained rubbish such as dead plants and animal waste.

Now gases from the dump have been detected in the school buildings.

Scientists say that the school is safe at the moment but they are monitoring the gases.

Some people are concerned about the gases detected in the school.

Write about how these gases may have been made and why some people are concerned.

.....

.....

.....

.....

..... **[3]**

[Total: 3]

BLANK PAGE

Question 4 begins on page 8

PLEASE DO NOT WRITE ON THIS PAGE

4 Tim has grown some peaches in his garden.

He gets peach juice from his peaches.

Tim knows that wine is usually made from grapes but he wants to make some wine using the peach juice.

This is possible because his peach juice contains sugar.

(a) Explain why sugar is needed for making wine.

.....

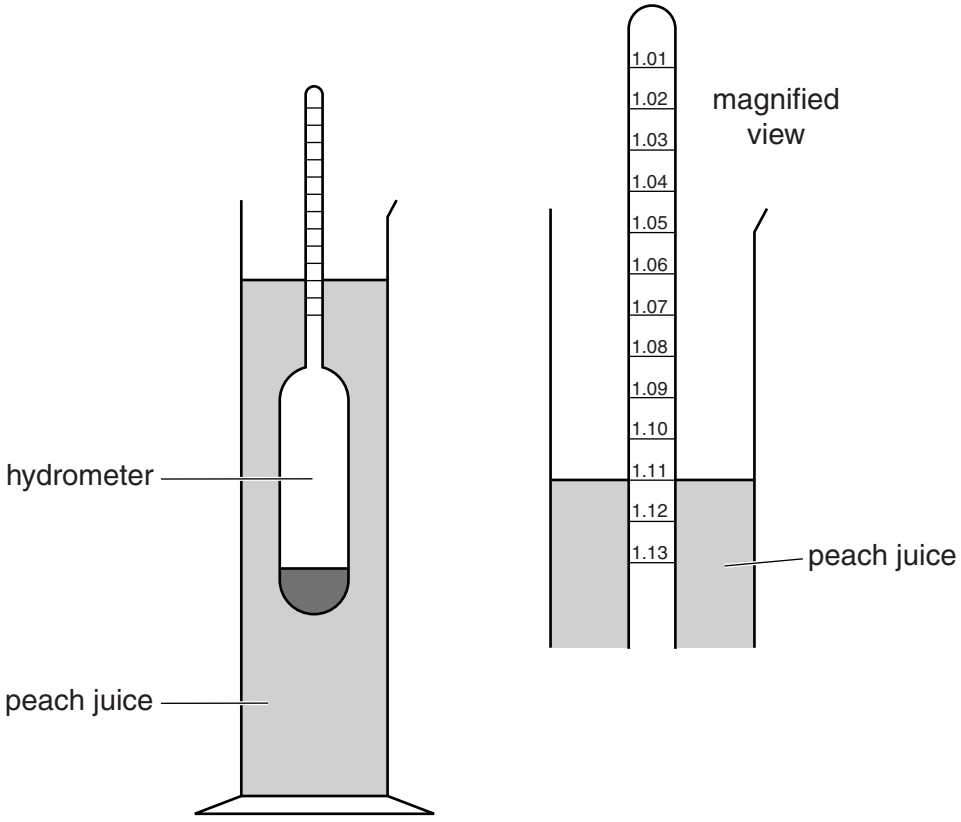
.....

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

(b) Tim wants to find out how much sugar is in his peach juice.

He uses a device called a hydrometer.

The hydrometer floats in a sample of the juice.



Tim can read from the scale the level of the hydrometer in the juice.

He can use this reading to find out about the juice and the wine he can make.

Look at the table.

It shows:

- the sugar content of the juice before making wine
- the maximum alcohol content of wine this juice can make.

Reading from hydrometer	Sugar content of juice in grams per litre	Maximum % alcohol content in the wine
1.07	183	9.2
1.08	208	10.6
1.09	240	12.0
1.10	265	13.4
1.11	290	14.9
1.12	315	16.3
1.13	340	17.7

What does the hydrometer reading shown in the diagram tell Tim about his juice and wine?

.....

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

(c) Tim makes his wine and waits until it stops fermenting.

He wants to know if all the sugar from the juice has turned to alcohol.

This means the maximum alcohol content has been reached.

He uses the hydrometer this time to test his wine.

The hydrometer reading this time is **1.02**.

The actual alcohol content can be worked out using this formula:

actual % alcohol = (hydrometer reading of juice – hydrometer reading of wine) × 131

Tim concludes that not all the sugar from the peach juice has turned to alcohol.

Use a calculation to find out if Tim is correct.

.....

.....

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

(d) Spirits can **not** be made by just using fermentation.

Explain how wine can be changed to make a spirit.

.....

.....

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

[Total: 8]

5 A factory uses sugar to make sweets.

The factory buys sucrose but turns it into other sugars to make the sweets.

(a) Why does the factory use other sugars and not sucrose in the sweets?

Put a tick (✓) in the box next to the correct reason.

The other sugars do not dissolve in water.	☐
The other sugars taste sweeter.	☐
The other sugars are different colours.	☐
The other sugars contain gel.	☐

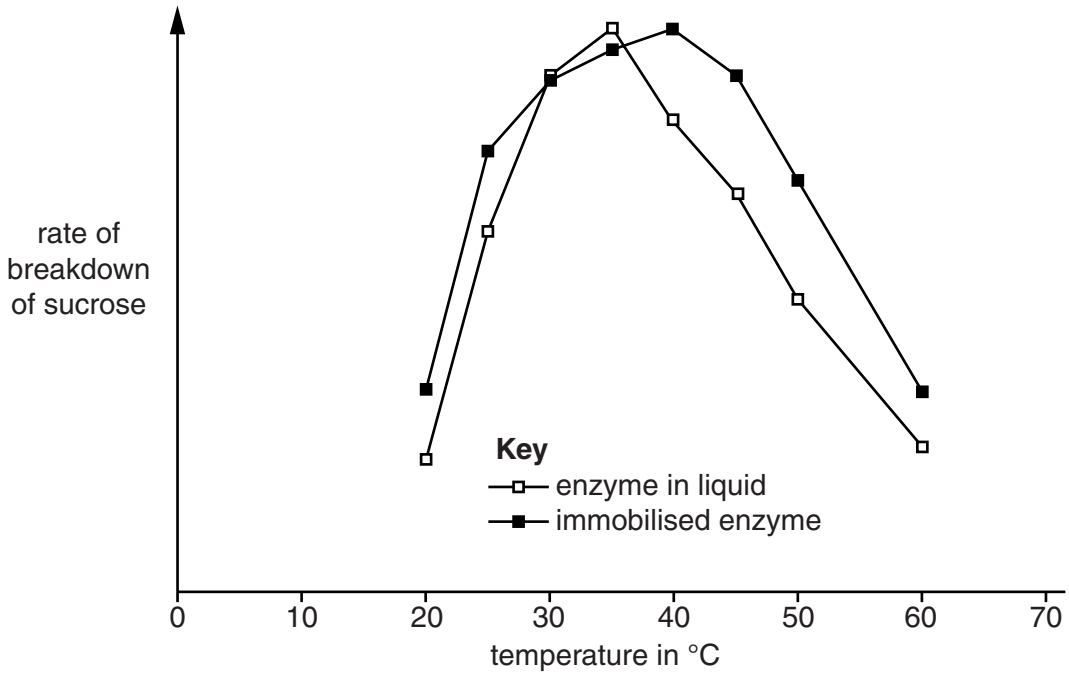
[1]

(b) The factory owners use an enzyme to turn sucrose into other sugars.

The enzyme can be used in a liquid or it can be immobilised.

Look at the graph.

It shows how temperature affects the breakdown of sucrose using each type of enzyme.



The factory owners want to:

- make lots of sugar that is as pure as possible
- use as little energy as possible to heat the reaction.

Write about how enzymes can be immobilised.

Discuss the advantages and disadvantages to the factory owners of using the **immobilised** enzyme.

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

.....

.....

.....

.....

.....

.....

.....

.....

.....

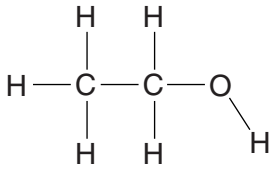
..... **[6]**

[Total: 7]

SECTION B – Module C6

6 This question is about ethanol.

Look at the displayed formula for ethanol.



(a) Ethanol is **not** a hydrocarbon.

Explain why.

.....

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

(b) Ethanol is used to make alcoholic drinks.

Write down two **other** uses of ethanol.

1 .....

2 .....

[2]

[Total: 3]

7 This question is about electrolysis.

Gina wants to electrolyse dilute sulfuric acid.

(a) Draw a labelled diagram of the apparatus that Gina can use.

Label the anode and the cathode clearly.

[3]

(b) Gina's teacher electrolyses some molten salts.

They are lead bromide, sodium chloride and calcium iodide.

Complete the table to show the substances made at the cathode and the anode.

One has been done for you.

Molten electrolyte	Substance made at	
	cathode	anode
lead bromide	lead	bromine
sodium chloride	.....	.....
calcium iodide	.....	.....

[2]

(c) **Solid** lead bromide cannot be electrolysed but **molten** lead bromide can be electrolysed.

Explain why.

.....

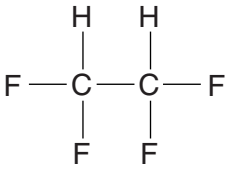
.....

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

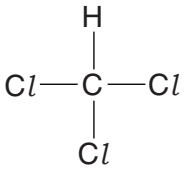
[Total: 7]

8 This question is about CFCs.

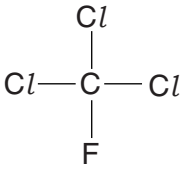
Look at the displayed formulas of some compounds.



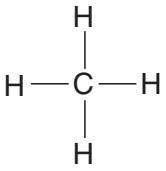
A



B



C



D

(a) Which compound is a CFC?

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

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

(b) How many different elements are there in compound **A**?

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

(c) Write down the molecular formula of compound **A**.

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

(d) CFCs were used as refrigerants and in aerosols.

Write down **two** properties of CFCs.

.....

.....

.....

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

[Total: 5]

9 Gill and Rob investigate the displacement reactions of four metals.

The metals are magnesium, zinc, copper and iron.

They dip the metals into solutions of metal salts and observe what happens.

Look at the table. It shows their results.

✓ = reaction
✗ = no reaction

Metal	Metal salt solution			
	magnesium sulfate	zinc sulfate	copper sulfate	iron(II) sulfate
magnesium	✗	✓	✓	✓
zinc	✗	✗	✓	✓
copper	✗	✗	✗	✗
iron	✗	✗	✓	✗

Write the four metals in order of their reactivity (most reactive first).

Use information in the table to explain how you reached this conclusion.

Write a **word** equation for the reaction between magnesium and copper sulfate solution.

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

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

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

[Total: 6]

10 Vegetable oils are important raw materials for the chemical industry.

Write down **two** uses for vegetable oils.

.....

.....

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

[Total: 2]

11 In a fuel cell hydrogen, H_2, reacts with oxygen, O_2.

Water, H_2O, is the only product made.

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

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

[Total: 2]

SECTION C – Module P6

12 There are many different types of electronic components.

(a) Capacitors are electronic components.

(i) Draw the symbol for a capacitor.

[1]

(ii) What does a capacitor do?

.....

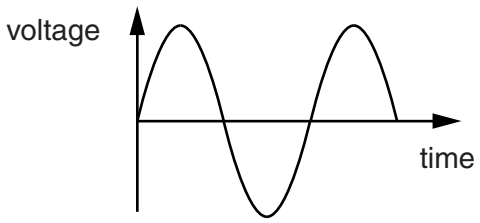
.....

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

(b) Diodes can also be used in circuits.

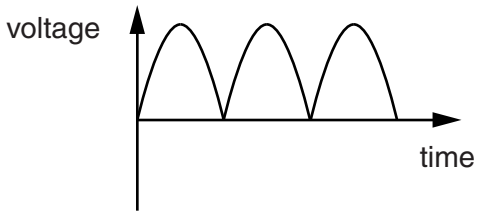
Look at the diagrams.

This diagram shows how an AC voltage changes with time.



Diodes can be used to change the AC voltage.

This diagram shows how the voltage is changed by an arrangement of four diodes.



Describe and name the process shown by these diagrams.

.....

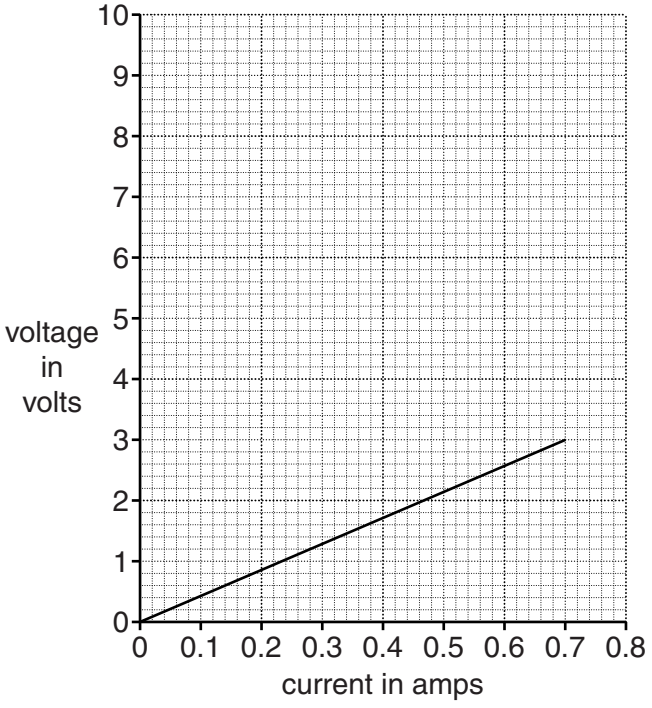
.....

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

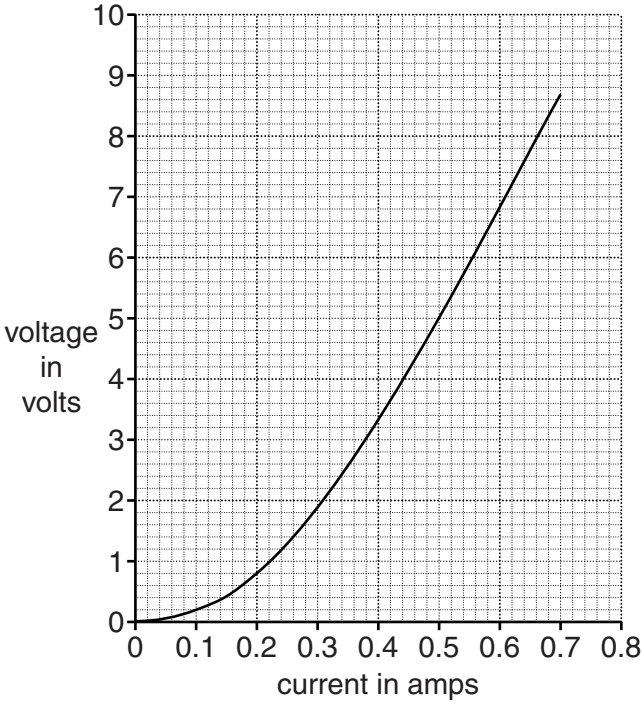
[Total: 5]

13 This question is about the voltage-current characteristics of two conductors.

Look at the voltage-current graphs.



graph for conductor A



graph for conductor B

Describe how the voltage varies with current for each conductor.

Use this to compare the resistances of **A** and **B** as the current changes and identify each conductor.

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

.....

.....

.....

.....

.....

.....

.....

.....

.....

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

[Total: 6]

BLANK PAGE

Question 14 begins on page 22

PLEASE DO NOT WRITE ON THIS PAGE

14 Many electronic devices contain logic gates.

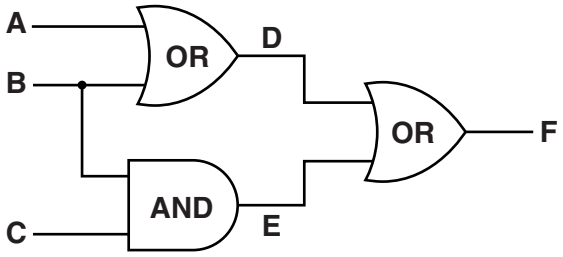
(a) Look at the truth table.

Input	Output
1	0
0	1

Write down the name of the logic gate that produces this truth table.

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

(b) Logic gates can be combined together.



(i) Which letters represent the **input** signals to the **AND** gate?

Choose from

A and B **A and C** **B and C** **C and D** **C and E**

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

(ii) Complete the sentence.

The three letters that represent **output** signals from the gates are

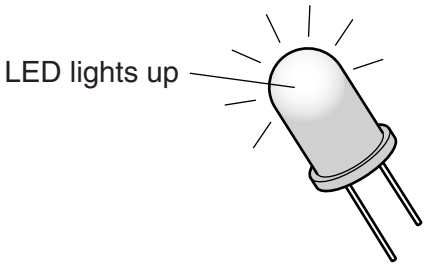
..... and ..... and ..... . **[1]**

(iii) Here is part of the truth table for the combination of gates shown.

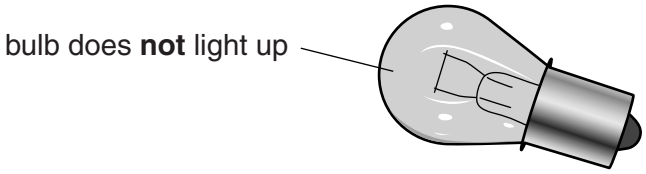
A	B	C	D	E	F
0	0	0	0	0	0
0	0	1	0	0	0
0	1	1			
1	1	1			

Complete the truth table. **[2]**

(c) A light-emitting diode (LED) is connected to the output from a logic gate on a microchip.



The LED is removed and a bulb is connected to the same output from the logic gate.



(i) Explain why the bulb does **not** light up.

.....

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

(ii) The output from the logic gate is used to light a bulb in a separate circuit.

What component is needed between the output of the logic gate and the separate circuit to make the bulb work?

Choose from

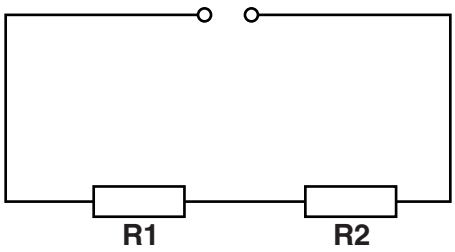
capacitor **LDR** **relay**

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

[Total: 7]

15 Louise wants to find out how resistors and potential dividers work.

(a) She connects a circuit with two resistors in series. Louise keeps **R1** the same but changes **R2**.

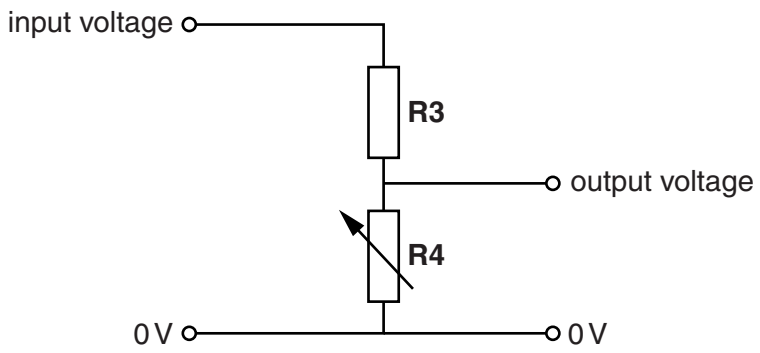


Complete the table and use it to describe the relationship between **R1**, **R2** and the **total resistance, R_T**.

R1 in Ω	**R2 in Ω**	**R_T in Ω**
3.6	3.2	6.8
3.6		6.6
3.6	3.6	

The relationship between **R1**, **R2** and **R_T** is ……..... **[2]**

(b) Louise connects a circuit for a potential divider.



Write down the name of component **R4** and describe how it changes the output voltage.

.....

.....

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

(c) Louise changes **R4** for a light dependent resistor (LDR).

The resistance of an LDR changes as the light level changes.

Look at the information for one type of LDR.

Light level in lux	Resistance in MΩ
100	10.0
200	5.0
800	1.0
900	0.5
1000	0.4

Write about how the resistance changes with light levels, and why this LDR is less useful at high light levels.

.....

.....

.....

.....

..... **[3]**

[Total: 7]

SECTION D

16 Some bacteria and fungi make useful products and some make harmful products.

(a) One **useful** product is yoghurt.

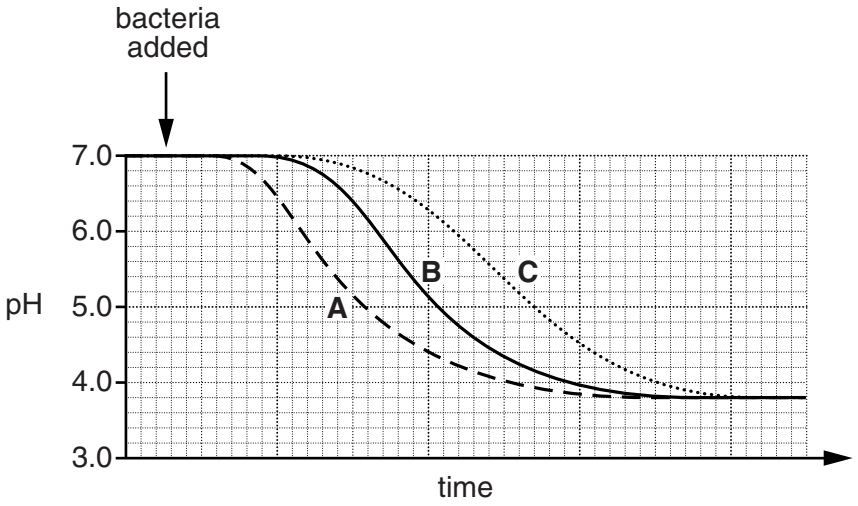
Yoghurt is made by adding bacteria to milk.

The bacteria change the sugar in milk into lactic acid.

Bacteria **A**, **B** and **C** can all be used to make yoghurt from milk.

Look at the graph.

It shows how bacteria **A**, **B** and **C** change the pH of milk.



(i) What is the pH of milk before bacteria are added?

pH = ... **[1]**

(ii) Adding bacteria changes the pH of the milk over time.

Look at the graph.

Describe the change in the pH of the milk after bacteria **B** is added.

.....

.....

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

(iii) Ali wants to change milk into yoghurt as quickly as possible.

Use the graph to suggest which bacteria, **A**, **B** or **C**, he should use.

answer .....

Explain your answer.

.....

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

(b) A **harmful** product of a fungus is a chemical called aflatoxin.

Aflatoxin is sometimes found in contaminated animal food.

If the animal eats this food, aflatoxin slowly builds up in its tissues.

However, aflatoxin rapidly appears in the milk of cows after eating contaminated food.

Aflatoxin slowly breaks down in the animal.

The table shows the maximum concentration of aflatoxin allowed in animal food.

Type of animal	Mass of the animal in kilograms	Aflatoxin allowed in animal food in parts per billion
pigs	120	200
chickens	2	100
cows used for meat	700	300
cows used for milk	700	20

Look at the data in the table.

Describe the trend shown in the **first three** rows.

Explain why the aflatoxin allowed for '**cows used for milk**' does not fit this trend.

.....

.....

.....

.....

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

(c) When humans drink contaminated milk they take in aflatoxin.

The allowed concentration for aflatoxin in milk is **0.50** parts per billion (ppb).

Scientists think that adding bacteria **A**, **B** or **C** can make milk safer to drink.

Bacteria **A**, **B** and **C** were added to samples of milk that contained **1.00** ppb of aflatoxin.

After some time, the aflatoxin levels in the milk were measured.

The experiment was carried out 3 times with each type of bacteria.

The results are shown in the table.

	Concentration of aflatoxin in ppb			
Bacteria	**First trial**	**Second trial**	**Third trial**	**Mean**
A	0.45	0.35	0.55	0.45
B	0.50	0.48	0.58	.....
C	0.49	0.56	0.51	0.52

(i) Calculate the mean (average) concentration after treatment with bacteria **B**.

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

(ii) The results of this experiment are useful for farmers who want to sell the milk from their cows.

Explain why.

.....

.....

.....

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

[Total: 10]

END OF QUESTION PAPER

BLANK PAGE

PLEASE DO NOT WRITE ON THIS PAGE

BLANK PAGE

PLEASE DO NOT WRITE ON THIS PAGE

PLEASE DO NOT WRITE ON THIS PAGE

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.