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Thursday 23 May 2013 – Morning

**GCSE GATEWAY SCIENCE
SCIENCE B**

B712/01 Science modules B2, C2, P2 (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

- Your 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 **28** pages. Any blank pages are indicated.

EQUATIONS

energy = mass × specific heat capacity × temperature change

energy = mass × specific latent heat

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

wave speed = frequency × wavelength

power = voltage × current

energy supplied = power × time

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

distance = average speed × time

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

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

force = mass × acceleration

weight = mass × gravitational field strength

work done = force × distance

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

power = force × speed

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

momentum = mass × velocity

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

GPE = mgh

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

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

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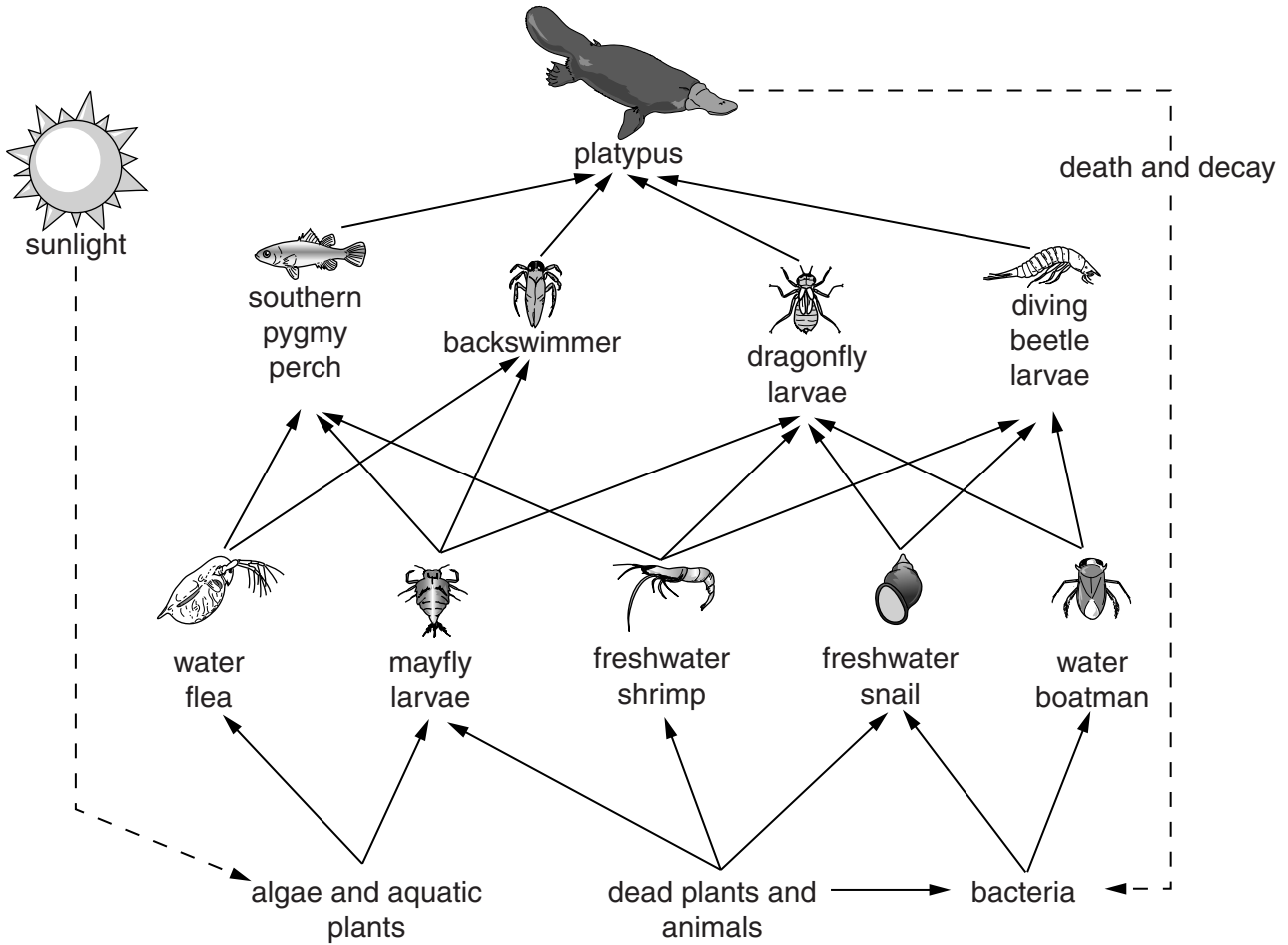
Question 1 begins on page 4

PLEASE DO NOT WRITE ON THIS PAGE

Answer **all** the questions.

SECTION A – Module B2

1 Look at the food web.



(a) Write down the name of one **producer** in the food web.

..... [1]

(b) Energy is passed through the food chain to the platypus.

Use the food web to explain how energy in bacteria can reach the platypus.

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

(c) Look at the picture of the dragonfly larvae.

Which class of arthropod does it belong to?

Choose from this list.

arachnid

crustacean

insect

myriapod

answer

[1]

(d) When a platypus dies it decomposes.

The decomposing platypus helps the other organisms in **this** food web.

Use the food web to explain how.

.....

.....

..... [2]

[Total: 6]

- 2 Sally and Ben investigate if one eye is better than two at judging distance.

They put two rulers side by side with their scales next to each other. They stick a pin vertically on to the scale of each ruler.

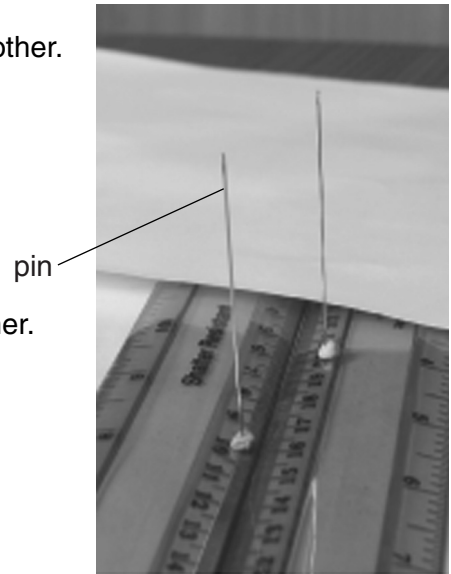
At the start, the pins on the rulers are not next to each other.

Sally looks at the pins with one eye, while Ben slides one ruler past the other.

He stops when Sally tells him that the pins are next to each other.

Ben then measures the actual distance the pins are apart.

They repeat the process with Sally using both eyes.



The table shows the results.

Distance between pins in mm						
	Attempt 1	Attempt 2	Attempt 3	Attempt 4	Attempt 5	Mean
One eye	12	15	18	16	14	15
Two eyes	3	2	0	2	3	

- (a) (i) Calculate the mean for two eyes.

mean = mm [1]

- (ii) What conclusion about judging distance can be made from the two means?

..... [1]

- (b) Ben says that you can **not** be certain of your conclusion when you have only tested one person.

Explain why.

..... [2]

[Total: 4]

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Question 3 begins on page 8

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(b) One reason lemurs are endangered is because of habitat destruction.

Write down **one other** reason why species become endangered.

..... [1]

(c) Madagascar has many different **species** of lemur.

(i) What is meant by the term species?

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

(ii) The different species evolved by natural selection.

Who developed the idea of natural selection?

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

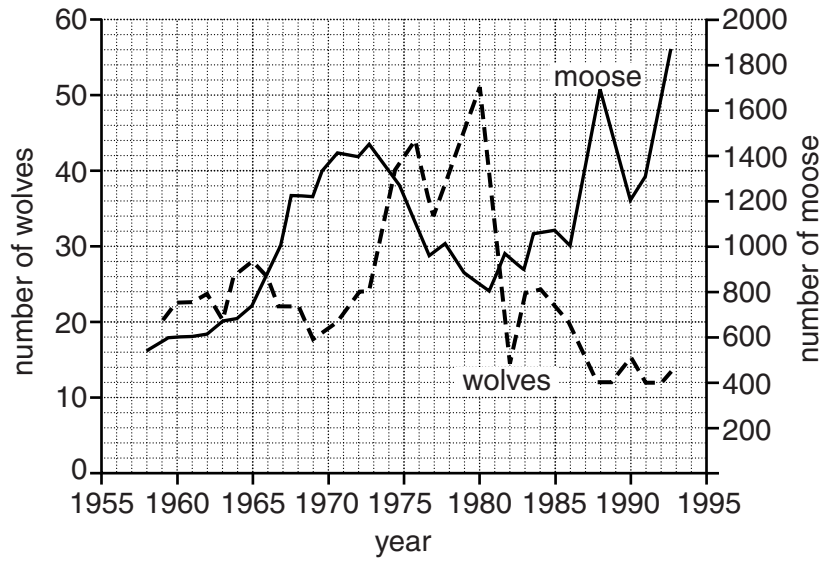
- Darwin
- Hooke
- Newton
- Pasteur

[1]

[Total: 9]

4 Look at the predator prey graph.

The wolf is the predator. The moose is the prey.



(a) (i) In which year did the population of wolves reach the highest?

..... [1]

(ii) Use the data to explain the change in the moose population between 1986 and 1988.

.....

 [2]

(b) Look at the picture of a moose.



Moose are adapted to avoid being eaten by wolves.

Explain ways in which moose are adapted to avoid being eaten.

.....

.....

.....

.....

.....

[3]
[Total: 6]

SECTION B – Module C2

5 Alfie is a scientist. He investigates neutralisation.

He adds dilute nitric acid to potassium hydroxide solution.

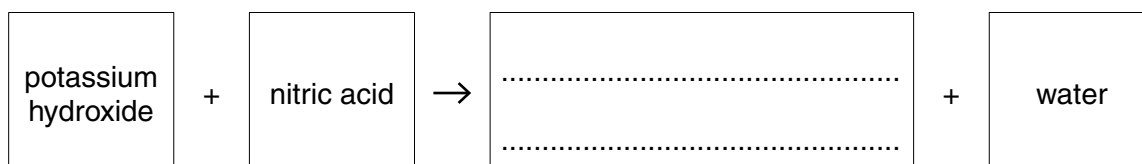
He uses an indicator called **litmus** to tell when the solution is neutral.

(a) Complete the table to show the colour of litmus in acidic and alkaline solutions.

Indicator	Colour in		
	Acidic solution	Neutral solution	Alkaline solution
Litmus	purple

[2]

(b) Complete the word equation for the reaction.



[1]

(c) Alfie's scientific work needs to be looked at by other scientists.

Explain why.

.....

.....

..... [2]

[Total: 5]

13
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Question 6 begins on page 14

6 This question is about metals and alloys.

Look at the table. It shows some properties of metals and alloys.

Metal or alloy	Melting point in °C	Density in g/cm ³	Relative electrical conductivity	Cost per tonne in £
aluminium	660	2.7	40	1350
copper	1083	8.9	64	3800
tin	232	5.7	9	10000
silver	962	10.5	67	20000
solder	188	8.2	20	6700
lead	328	11.3	5	1500

(a) Solder is an alloy. It is made from lead and tin.

The properties of solder are different from the properties of lead and tin.

Write about these differences.

.....

.....

.....

.....

..... [3]

(b) Which metal, or alloy, would be best to **join** electrical wires?

Choose from the table.

Explain your answer.

.....

..... [2]

(c) Which metal, or alloy, would be best for making aeroplane bodies?

Choose from the table.

Explain your answer.

.....

.....

.....

..... [3]

[Total: 8]

Question 7 begins on page 16

7 Many chemicals, like ammonia, are made in industrial processes.

Ethanol is another chemical made in an industrial process.

Ethene reacts with steam to make ethanol.



The conditions used are:

- a catalyst
- 300 °C
- a pressure of 70 atmospheres.

Look at the costs of making 1 tonne of ethanol.

Factor	Cost in £
energy	200
ethene	50
steam	10
wages	100
other costs	40

(a) Energy is one cost of making ethanol.

(i) What percentage of the total cost is for energy?

answer =% [2]

(ii) Suggest why this percentage is so high.

.....
 [1]

(b) The cost of making steam is much less than the cost of making ethene.

Suggest why.

.....
 [2]

(c) The reaction is **reversible**.

What is meant by a reversible reaction?

..... [1]

[Total: 6]

8 Farmers use fertilisers.

Potassium nitrate and ammonium phosphate are fertilisers.

The formula for potassium nitrate is KNO_3 .

The formula for ammonium phosphate is $(\text{NH}_4)_3\text{PO}_4$.

Write about why farmers use fertilisers and how fertilisers work.

Describe some **disadvantages** of using fertilisers.



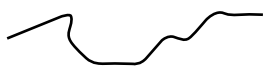
The quality of written communication will be assessed in your answer to this question.

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..... [6]

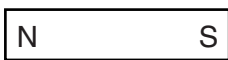
[Total: 6]

SECTION C – Module P2

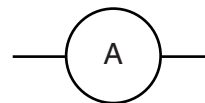
9 Amy has this equipment.



wire



magnet



ammeter

(a) How can she use the equipment to **generate** and **detect** an electric current?

Your answer **must** include a diagram of how she sets up the equipment.

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

(b) The electricity produced by a generator is AC.

What do the letters AC stand for?

..... [1]

(c) (i) In a power station, 900MJ of energy from fuel is needed to make 420MJ of electrical energy.

Calculate the percentage efficiency.

Give your answer to two significant figures.

.....
.....
.....

percentage efficiency =% [2]

- (ii) The steam given out from the turbines in this power station can be used to heat nearby offices.

This would improve the overall efficiency of the power station.

Explain why.

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

[Total: 6]


Question 10 begins on page 20

10 (a) An energy company wants to build a new power station in a remote area by the sea.

The table gives some information about energy sources used in power stations to make electricity.

Energy source	Transport of fuel	Availability of fuel	Waste / emission
1	thousands of tons by road and rail	reserves for hundreds of years	solid and gas
2	thousands of m ³ by pipeline	reserves for tens of years	gas
3	a few thousand kg by road and rail	reserves for one hundred years	no emissions but the waste is radioactive

Write about the advantages and disadvantages of each energy source, and decide which energy source, 1, 2 or 3, would be best for generating electricity in this remote area.

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

.....

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.....

.....

.....

..... [6]

(b) OCRA Electricity want to build a new wind farm.

Some local people are in favour of the wind farm, others are against it.

Identify **two different** opinions that might be held by people concerning the development of the wind farm.

.....

.....

.....

..... [2]

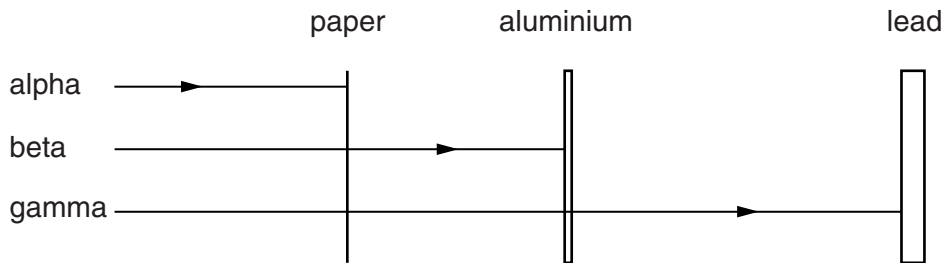
[Total: 8]

Question 11 begins on page 22

11 This question is about nuclear radiations.

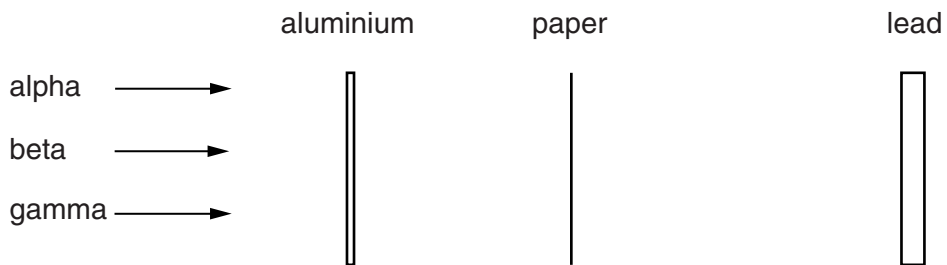
(a) Ben investigates the penetrating power of different radiations.

Look at the diagram of his results.



He now puts the same absorbers into a different order.

Complete the diagram to show where each radiation is stopped.



[2]

(b) Nuclear radiation can be useful.

Write down **one** use of nuclear radiation.

..... [1]

[Total: 3]

12 The Universe is made up of many different objects.

(a) One of these objects is a galaxy.

What is a galaxy?

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

(b) We often send radio signals from Earth to the outer planets of the Solar System.

It takes a long time for the radio signals to reach the outer planets.

Write down a reason for this.

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

(c) Another object in the Universe is an asteroid.

(i) What is an asteroid made from?

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





(ii) In the past asteroids have collided with Earth.

Write down **one** effect on Earth of a collision with a large asteroid.

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

[Total: 4]

13 Look at the information about electrical appliances in Claire's house.

Electrical appliance	Power in watts	Time used each day in hours
electric fire 	3000	4.0
lamp 	100	8.0
television 	400	6.0
tumble dryer 	2500	1.0

(a) The electric fire costs the most to use each hour.

Explain why.

.....
 [1]

(b) Claire's house has a 230V mains supply.

The highest current that the mains circuit can take is 30A.

Would it be possible to use all four appliances at the same time in the mains circuit?

Use a calculation to explain your answer.

.....

 [3]

[Total: 4]

SECTION D

14 This question is about the effect of drinking alcohol on driving ability.

A motoring organisation tested different drivers before and after drinking 4 units of alcohol.

They were tested on emergency stops.

Driver	Test	Reaction time in seconds	Stopping distance in metres
Peter	before drinks	0.62	32
	after drinks	0.86	41
Mike	before drinks	0.66	34
	after drinks	0.91	45
Lucy	before drinks	0.59	28
	after drinks	0.90	42
Emily	before drinks	0.59	28
	after drinks	0.76	36

(a) (i) Which driver was affected **most** by drinking 4 units of alcohol?

Explain your answer.

.....

.....

..... [2]

(ii) Suggest how the motoring organisation ensured that this test was done fairly.

.....

.....

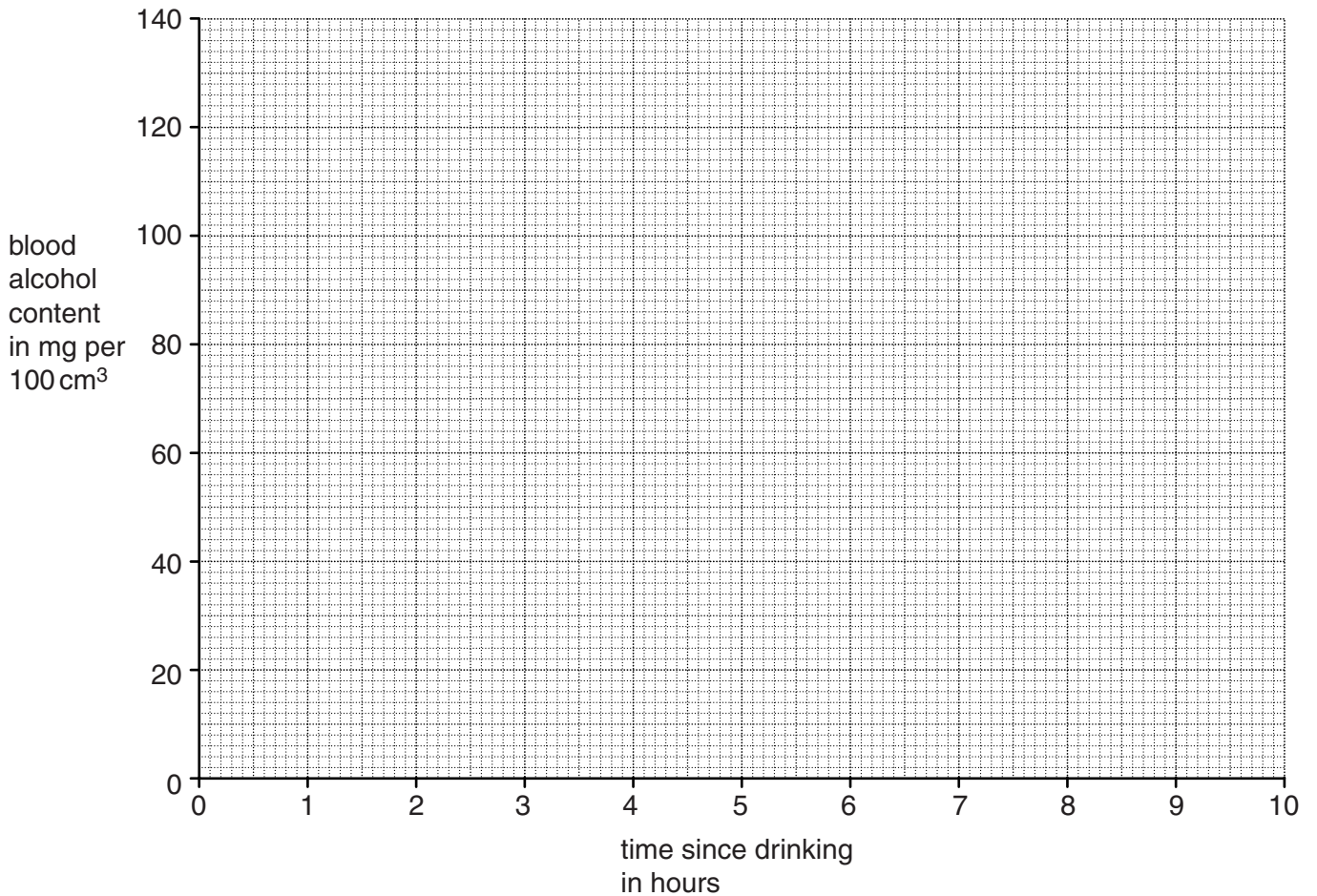
..... [2]

(b) Jeff has drunk 8 units of alcohol.

He was tested to find out how quickly the alcohol was removed from his blood.

Time since drinking in hours	Alcohol content of blood in mg per 100 cm ³
0	130
1	115
2	100
3	85
4	70
5	55

(i) Plot these results on the grid. Draw the best line through the points.



[2]

(ii) How long would it take for **all** of the alcohol to be removed from Jeff's blood?

answer =hours

[1]

(c) Look at the table.

It shows the legal alcohol limit, and data on the number of deaths due to road accidents in 2004, in the UK and Hungary.

Country	Number of deaths due to road accidents in 2004	Population in 2004 in millions	Legal alcohol limit (%)	Deaths due to road accidents per million of population in 2004
UK	3221	60.3	0.08
Hungary	1296	10.0	0.00

(i) Calculate the deaths per million of population in the UK and Hungary due to road accidents in 2004.

Use the equation

$$\text{deaths per million of population} = \frac{\text{number of deaths}}{\text{population in millions}}$$

Write your answers in the table.

[2]

(ii) Comment on the relationship between the legal alcohol limit and your answers to (c)(i).

.....
 [1]

[Total: 10]

END OF QUESTION PAPER



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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 Mg magnesium 12	13 Al aluminium 13	14 N nitrogen 7	15 P phosphorus 15	16 O oxygen 8	17 F fluorine 9	18 Ne neon 10
	19 K potassium 19	20 Ca calcium 20	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
	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 43	44 Ru ruthenium 44	45 Rh rhodium 45	46 Pd palladium 46
	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
	[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
	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
	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
	131 Xe xenon 54	131 Xe xenon 54	112 Cd cadmium 48	108 Ag silver 47	108 Ag silver 47	112 Cd cadmium 48	119 In indium 49	122 Sb antimony 51	127 I iodine 53	128 Te tellurium 52
	84 Kr krypton 36	84 Kr krypton 36	75 As arsenic 33	73 Ge germanium 32	73 Ge germanium 32	75 As arsenic 33	79 Se selenium 34	80 Br bromine 35	85 At astatine 85	86 Rn radon 86
	40 Ar argon 18	40 Ar argon 18	31 P phosphorus 15	32 S sulfur 16	32 S sulfur 16	31 P phosphorus 15	35.5 Cl chlorine 17	35.5 Cl chlorine 17	[210] At astatine 85	[222] Rn radon 86
	2 He helium 2	2 He helium 2	2 He helium 2	2 He helium 2	2 He helium 2	2 He helium 2	2 He helium 2	2 He helium 2	2 He helium 2	2 He helium 2
	1 H hydrogen 1	1 H hydrogen 1	1 H hydrogen 1	1 H hydrogen 1	1 H hydrogen 1	1 H hydrogen 1	1 H hydrogen 1	1 H hydrogen 1	1 H hydrogen 1	1 H hydrogen 1
	11 B boron 5	12 C carbon 6	13 Al aluminium 13	14 N nitrogen 7	15 P phosphorus 15	16 O oxygen 8	17 F fluorine 9	18 Ne neon 10	19 F fluorine 9	20 Ne neon 10
	27 Al aluminium 13	28 Si silicon 14	27 Al aluminium 13	28 Si silicon 14	27 Al aluminium 13	28 Si silicon 14	27 Al aluminium 13	28 Si silicon 14	27 Al aluminium 13	28 Si silicon 14
	70 Ga gallium 31	73 Ge germanium 32	70 Ga gallium 31	73 Ge germanium 32	70 Ga gallium 31	73 Ge germanium 32	70 Ga gallium 31	73 Ge germanium 32	70 Ga gallium 31	73 Ge germanium 32
	204 Tl thallium 81	207 Pb lead 82	204 Tl thallium 81	207 Pb lead 82	204 Tl thallium 81	207 Pb lead 82	204 Tl thallium 81	207 Pb lead 82	204 Tl thallium 81	207 Pb lead 82
	209 Bi bismuth 83	209 Po polonium 84	209 Bi bismuth 83	209 Po polonium 84	209 Bi bismuth 83	209 Po polonium 84	209 Bi bismuth 83	209 Po polonium 84	209 Bi bismuth 83	209 Po polonium 84
	201 Hg mercury 80	201 Hg mercury 80	201 Hg mercury 80	201 Hg mercury 80	201 Hg mercury 80	201 Hg mercury 80	201 Hg mercury 80	201 Hg mercury 80	201 Hg mercury 80	201 Hg mercury 80
	[272] Rg roentgenium 111	[272] Rg roentgenium 111	[272] Rg roentgenium 111	[272] Rg roentgenium 111	[272] Rg roentgenium 111	[272] Rg roentgenium 111	[272] Rg roentgenium 111	[272] Rg roentgenium 111	[272] Rg roentgenium 111	[272] Rg roentgenium 111
	Elements with atomic numbers 112-116 have been reported but not fully authenticated									

* 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.