

OXFORD CAMBRIDGE AND RSA EXAMINATIONS
GCSE

B712/01

GCSE GATEWAY SCIENCE
SCIENCE B

Science modules B2, C2, P2 (Foundation Tier)

THURSDAY 23 MAY 2013: Morning

DURATION: 1 hour 30 minutes
plus your additional time allowance

MODIFIED ENLARGED

Candidate forename		Candidate surname	
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Centre number						Candidate number				
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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)

READ INSTRUCTIONS OVERLEAF

INSTRUCTIONS TO CANDIDATES

- Write your name, centre number and candidate number in the boxes on the first page. 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).

INFORMATION FOR CANDIDATES

- Your quality of written communication is assessed in questions marked with a pencil () .
- A list of equations can be found on pages 4–5.
- The Periodic Table can be found on page 43.
- 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.
- Any blank pages are indicated.

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EQUATIONS

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

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

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

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

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

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

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

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

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

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

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

Answer ALL the questions.

SECTION A – MODULE B2

1 Look at the food web.

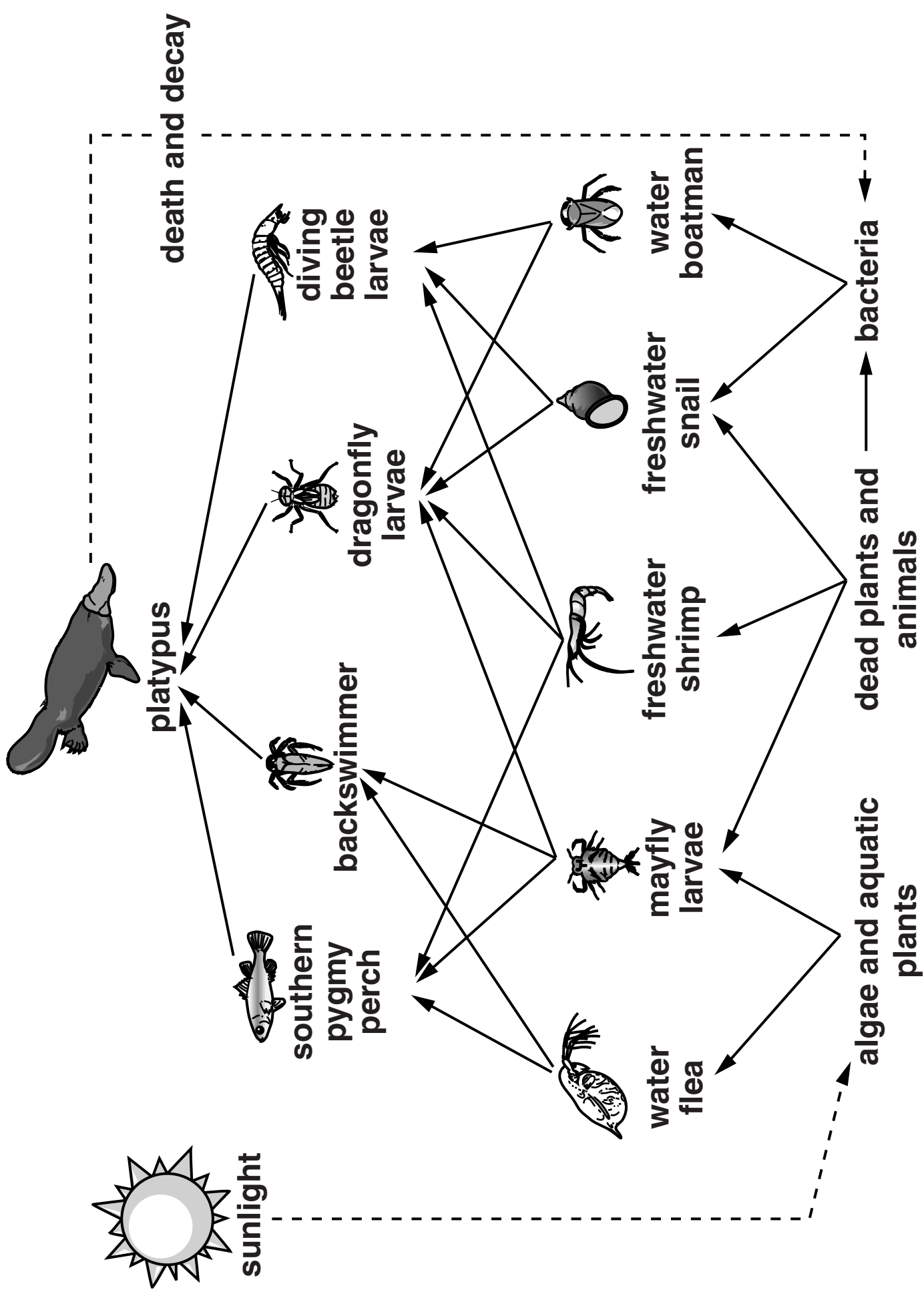
(a) Write down the name of one PRODUCER in the food web.

_____ **[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]

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QUESTION 2 BEGINS ON PAGE 10

- 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]

3 Read this information about red ruffed lemurs.

The red ruffed lemur lives in a rainforest in Madagascar. They can only be found in one rainforest, which is 2,300 square kilometres in size. Their population is said to be at a critical level.

Part of their habitat is protected by a small number of rangers. Some red ruffed lemurs live out of the protected area.

People will often enter the rainforest looking for rosewood. They can sell the rosewood for timber. This causes habitat destruction and disturbs the lemurs.

The local people use the rainforest for resources. These people cause very little disturbance to the lemurs. They also act as guides, taking people to see the lemurs.

- (a) A wildlife conservation trust is helping to set up a conservation programme for red ruffed lemurs. This includes protecting their habitat.**

The conservation programme could be both an advantage and a disadvantage to the people of Madagascar.

Use the information, and your scientific knowledge, to explain why there are advantages and disadvantages.



[6]

- (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]

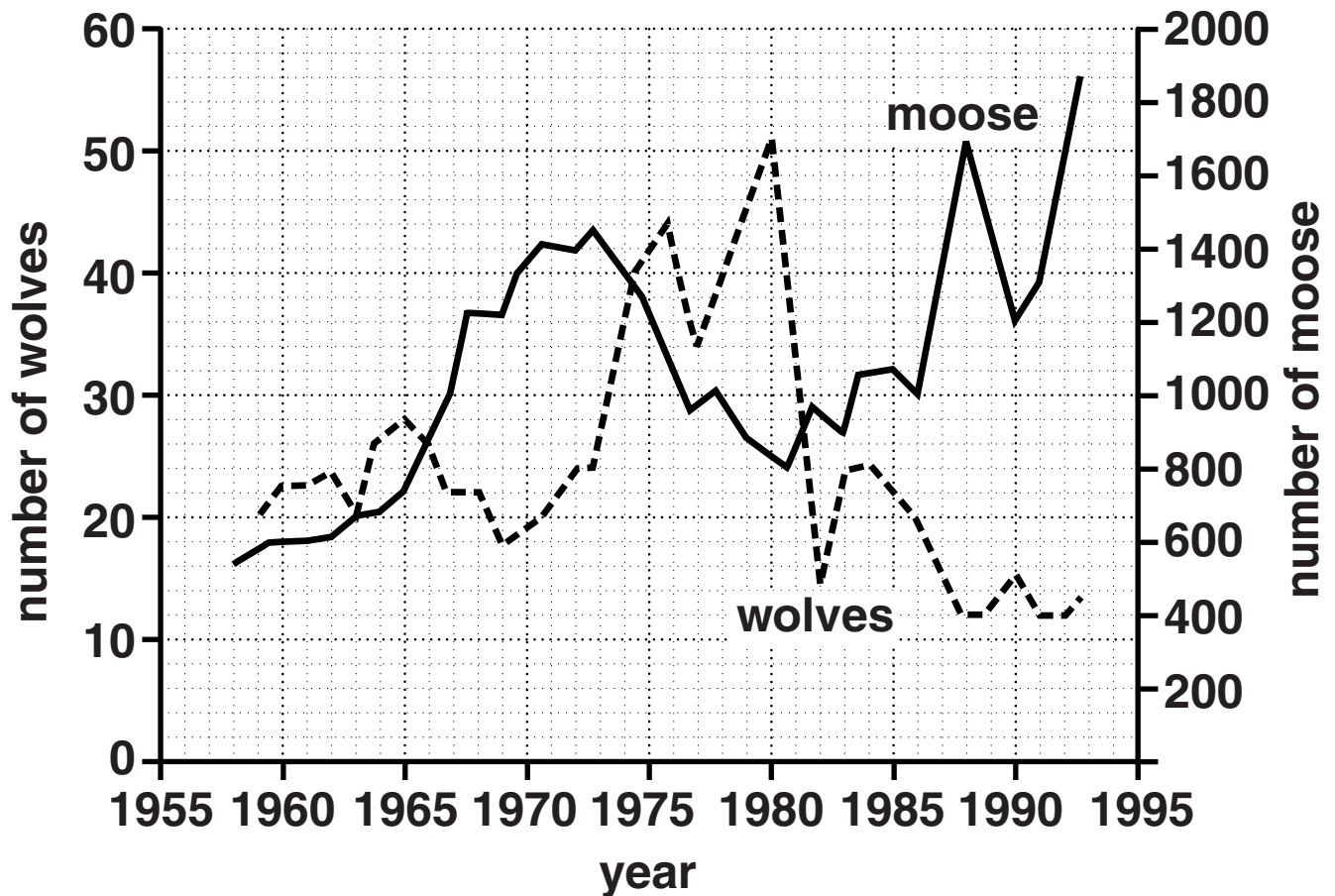
[TOTAL: 9]

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QUESTION 4 BEGINS ON PAGE 16

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 on the opposite page. [1]

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

Explain why.

[2]

[TOTAL: 5]

water

+

[illegible]

nitric acid

+

**potassium
hydroxide**

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/cm³	Relative electrical conductivity	Cost per tonne in £
aluminium	660	2.7	40	1350
copper	1083	8.9	64	3800
tin	232	5.7	9	10 000
silver	962	10.5	67	20 000
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]

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.

[6]

[TOTAL: 6]

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SECTION C BEGINS ON PAGE 26

SECTION C – MODULE P2

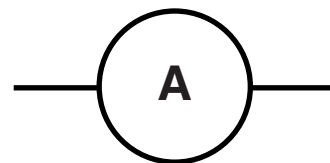
9 Amy has this equipment.



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, 900 MJ of energy from fuel is needed to make 420 MJ 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]

- 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. [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]

11 This question is about nuclear radiations.

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

Look at diagram 1 of his results on the opposite page.

He now puts the same absorbers into a different order.

Complete diagram 2, on the opposite page, to show where each radiation is stopped. [2]

(b) Nuclear radiation can be useful.

Write down ONE use of nuclear radiation.

_____ [1]

[TOTAL: 3]

DIAGRAM 1

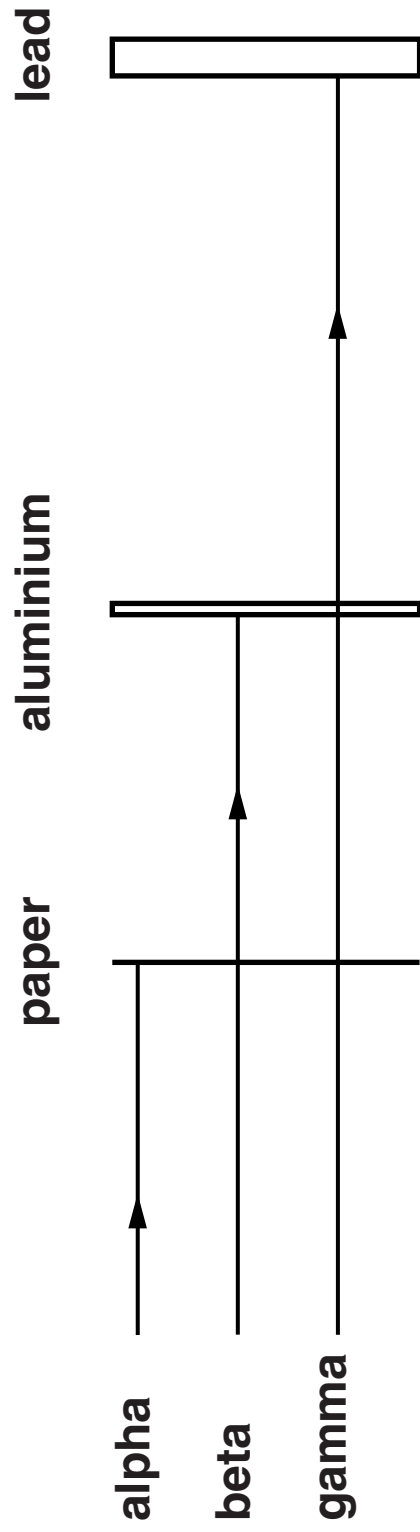
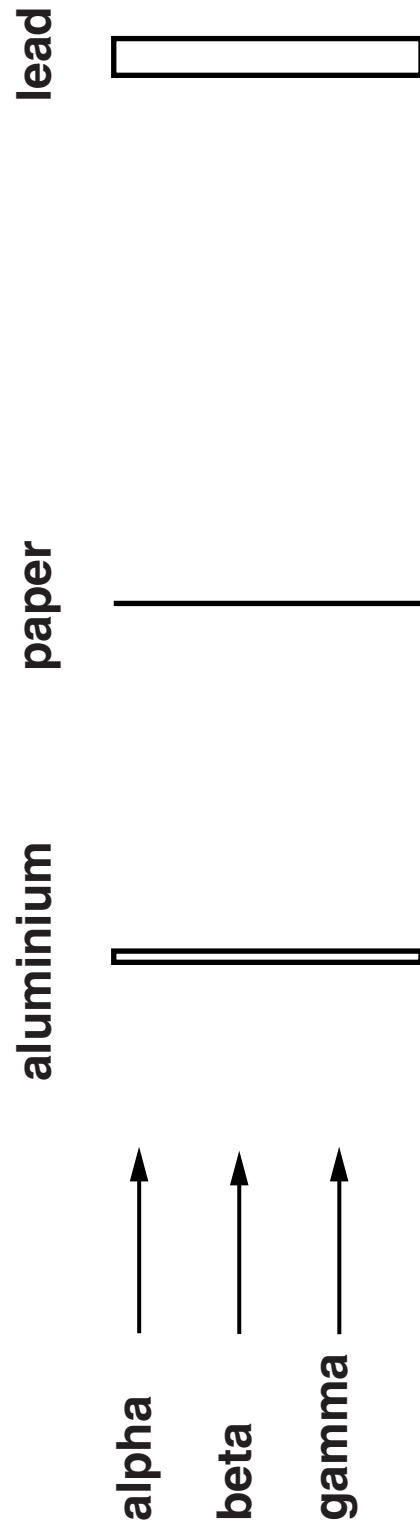


DIAGRAM 2



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.

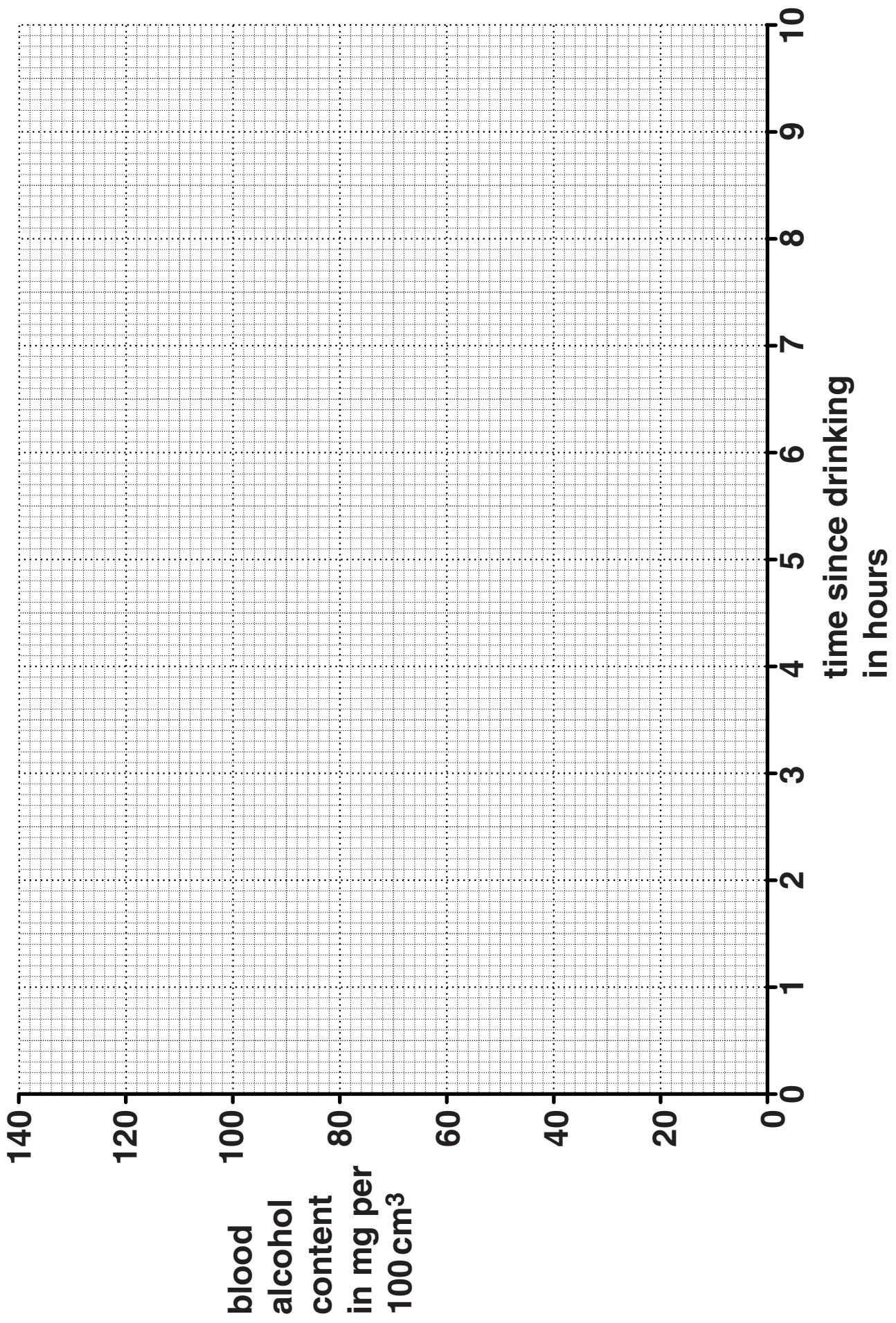
He was tested to find out how quickly the alcohol was removed from his blood.

Time since drinking in hours	Alcohol content of blood in mg per 100 cm³
0	130
1	115
2	100
3	85
4	70
5	55

(i) Plot these results on the grid on the opposite page. 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 on the opposite page.

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

- (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

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	_____

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The Periodic Table of the Elements

1	2	3	4	5	6	7	0

Key

relative atomic mass
atomic symbol
name
atomic (proton) number

1
H
hydrogen
1

* 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.

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