OXFORD CAMBRIDGE AND RSA EXAMINATIONS

GCSE

B712/01

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 24pt

Candidate forename		Candidate surname	

Centre number						Candidate number				

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

DC (NH/JG) 2552754316 83121/1 **R**

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 59.**
- **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.**

EQUATIONS

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

$$\text{GPE} = mgh$$

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

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

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.

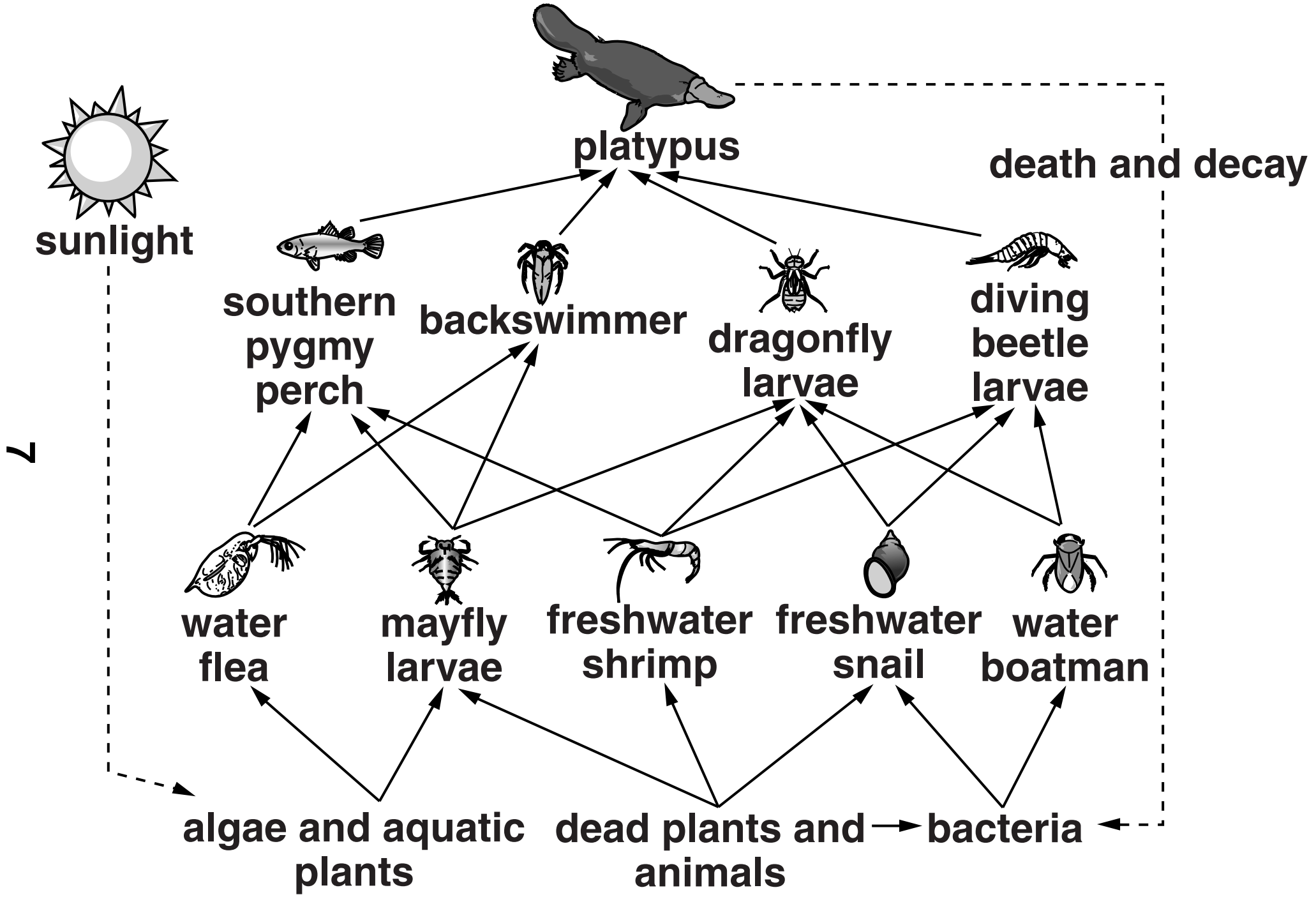
Use the food web to explain how energy in bacteria can reach the platypus.

_____

_____

_____

_____ **[2]**


platypus
death and decay
sunlight
southern pygmy perch
backswimmer
dragonfly larvae
diving beetle larvae
water flea
mayfly larvae
freshwater shrimp
freshwater snail
water boatman
algae and aquatic plants
dead plants and animals
bacteria

(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]

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, by 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.

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

[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]

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?

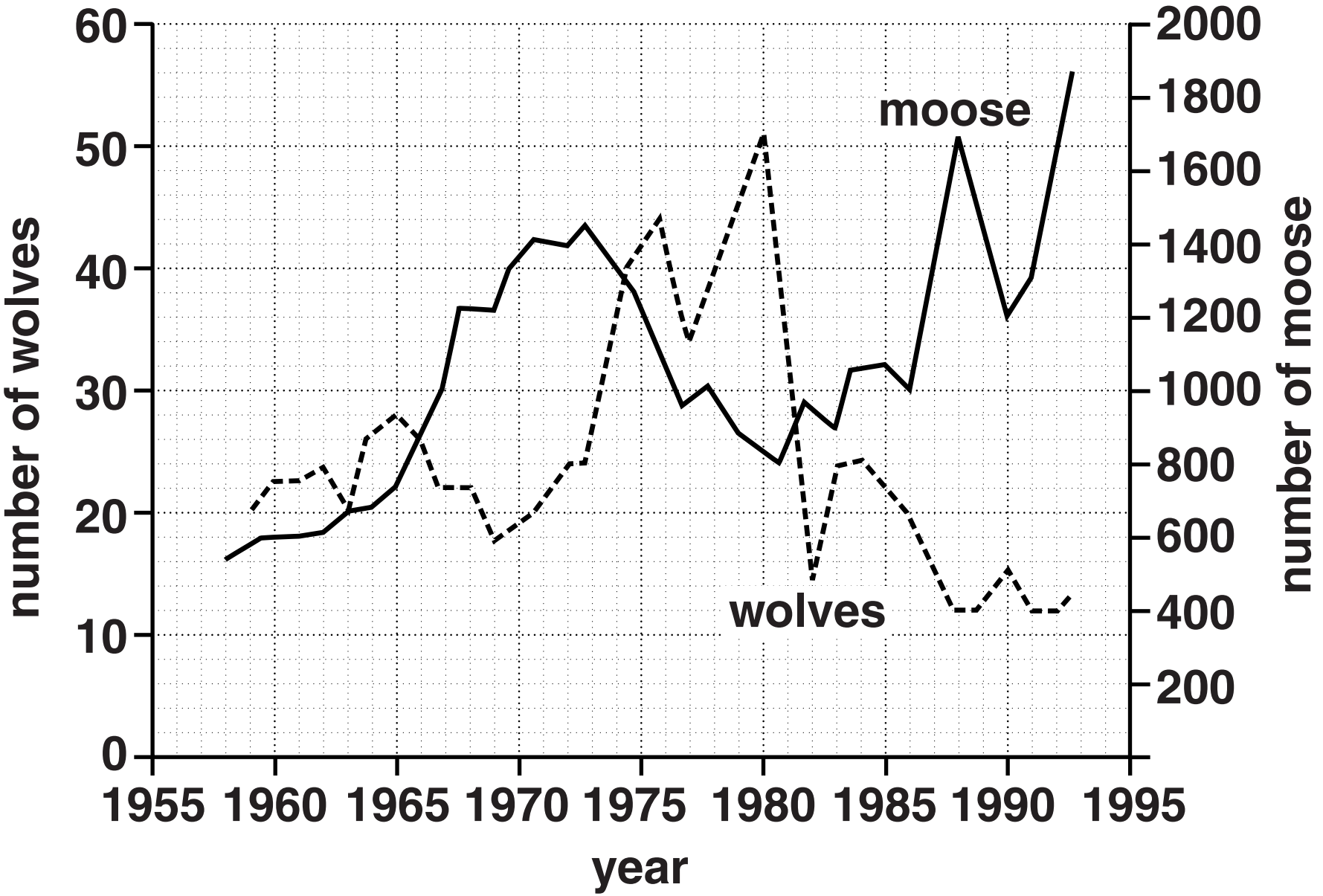
_____ **[1]**

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

_____

_____

_____ **[2]**


60
50
40
30
20
10
0
number of wolves
2000
1800
1600
1400
1200
1000
800
600
400
200
number of moose
moose
wolves
1955
1960
1965
1970
1975
1980
1985
1990
1995
year

(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, on the page opposite, to show the colour of litmus in acidic and alkaline solutions. [2]

23

Indicator	Colour in		
	Acidic solution	Neutral solution	Alkaline solution
Litmus	_____	purple	_____

(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.

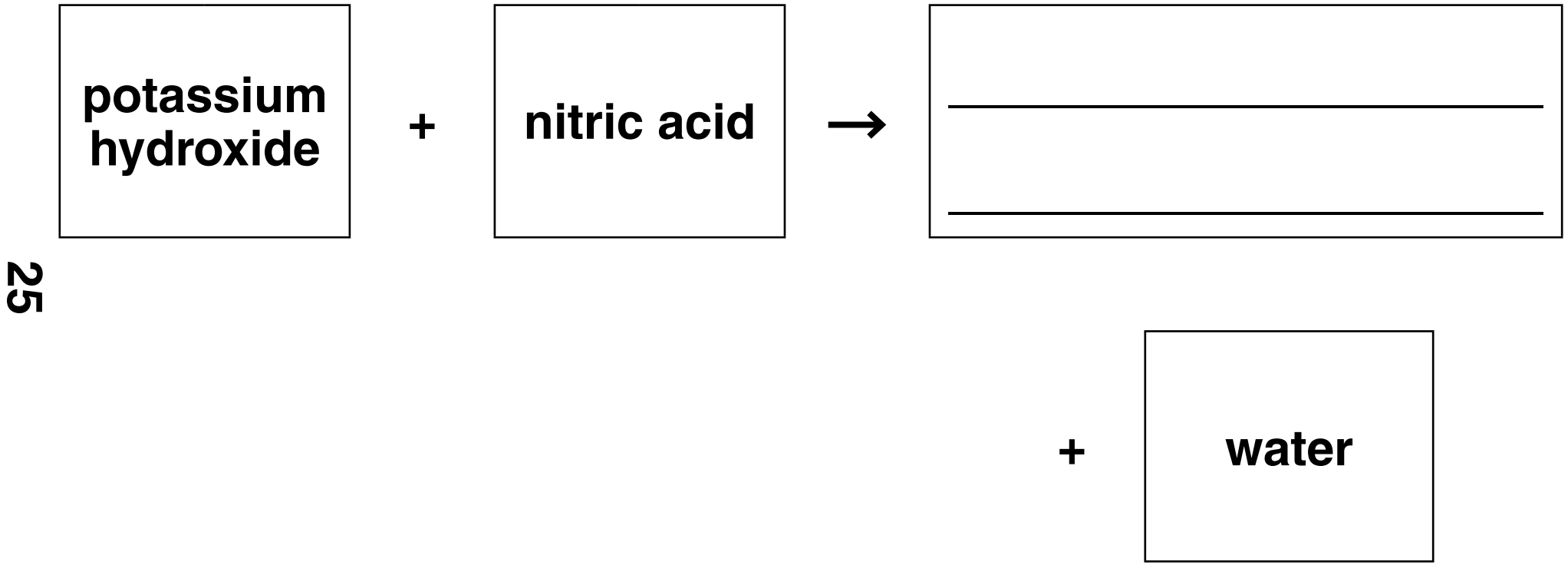
Explain why.

_____

_____

_____ **[2]**

[TOTAL: 5]



25

6 This question is about metals and alloys.

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

(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]**

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	10 000
silver	962	10.5	67	20 000
solder	188	8.2	20	6700
lead	328	11.3	5	1500

(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]

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QUESTION 7 BEGINS ON PAGE 30

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.

ethene + steam $\rightleftharpoons$ 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]

BLANK PAGE

QUESTION 8 BEGINS ON PAGE 34

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 $(NH_4)_3PO_4$.

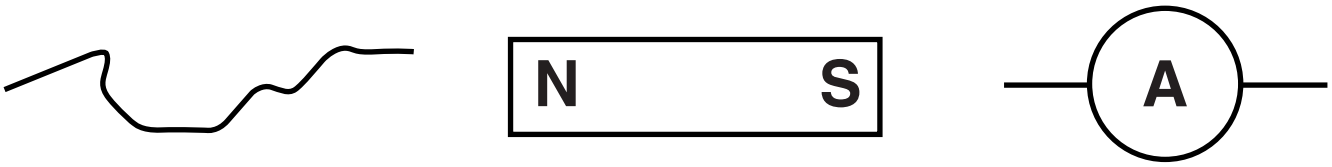
Write about why farmers use fertilisers and how fertilisers work.

Describe some DISADVANTAGES of using fertilisers.

The quality of written communication will be assessed in your answer to this question. [6]

[TOTAL: 6]

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]

QUESTION 10 BEGINS ON PAGE 40

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.

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.

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

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

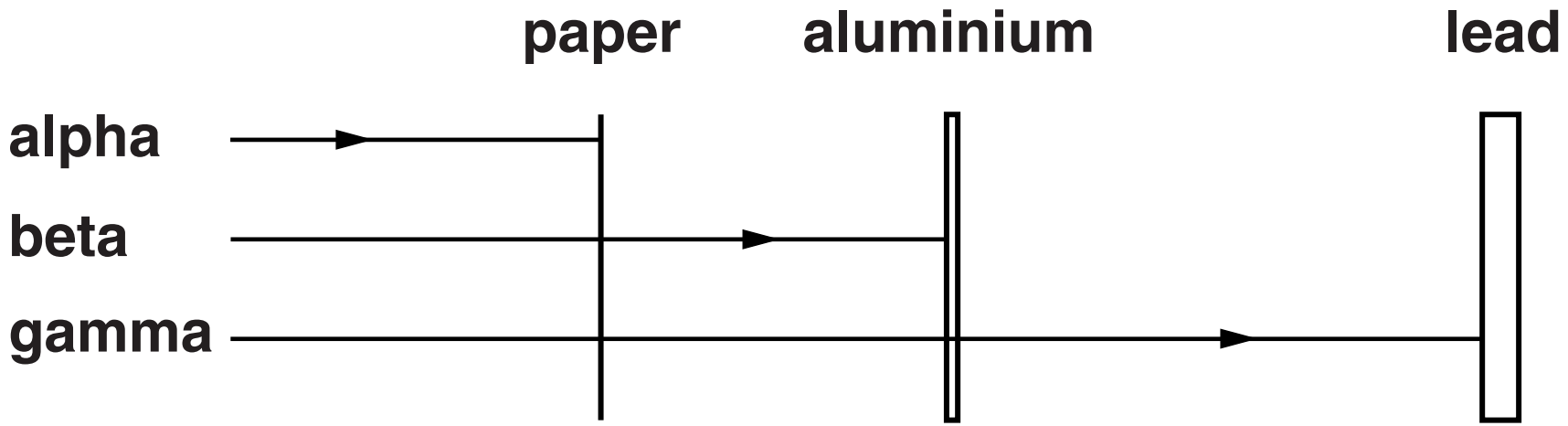
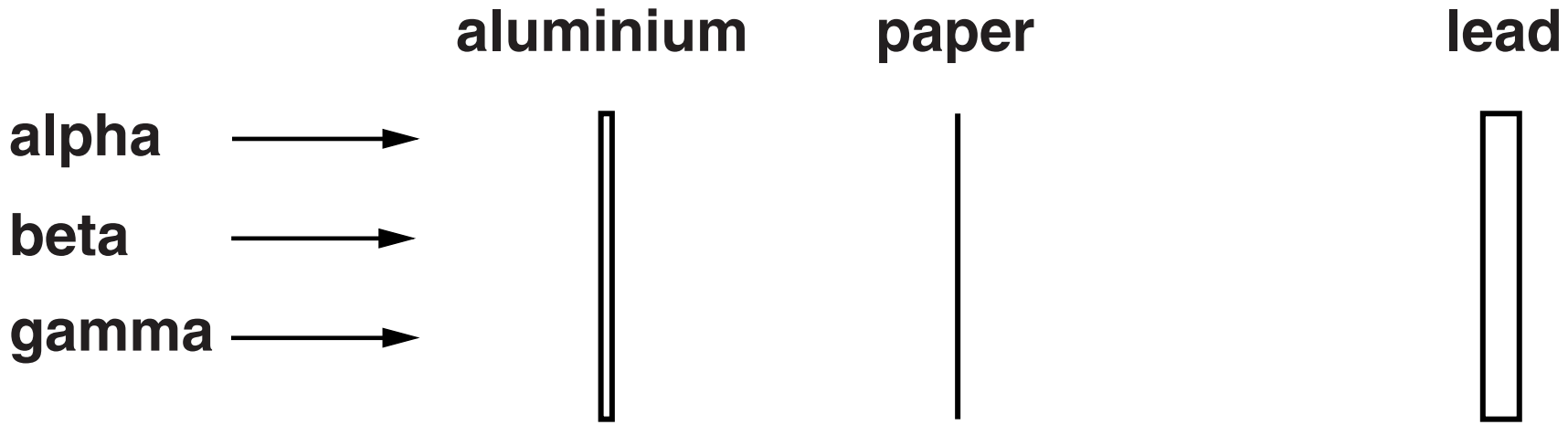


DIAGRAM 2



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]**

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QUESTION 14(b) BEGINS ON PAGE 54

(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]


blood alcohol content in mg per 100 cm3
140
120
100
80
60
40
20
0
0
1
2
3
4
5
6
7
8
9
10
time since drinking in hours
55

(c) Look at the table opposite.

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]

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	_____

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

_____

_____ **[1]**

[TOTAL: 10]

END OF QUESTION PAPER

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.