

OXFORD CAMBRIDGE AND RSA EXAMINATIONS
GCSE GATEWAY SCIENCE

B712/01

SCIENCE B

Science modules B2, C2, P2
(Foundation Tier)

FRIDAY 6 JUNE 2014: Afternoon

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:

Periodic Table

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

The quality of written communication is assessed in questions marked with a pencil ().

A list of equations can be found on pages 4 and 5.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

$$\text{GPE} = mgh$$

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

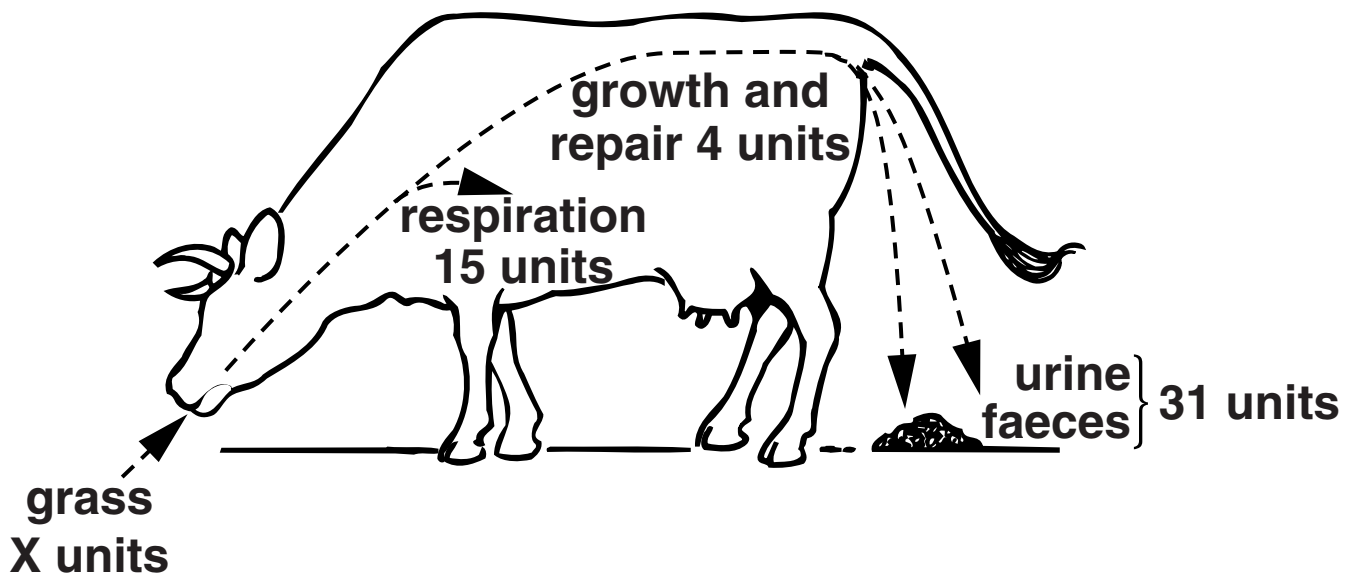
$$\text{resistance} = \frac{\text{voltage}}{\text{current}}$$

Answer ALL the questions.

SECTION A – Module B2

1 Cows eat grass. Look at the diagram.

It shows how a cow uses the energy it gets from the grass it eats.



(a) (i) X is the total units of energy in the grass that the cow eats.

Calculate the value of X.

_____ units

[1]

(ii) Some humans eat cows.

What percentage of the energy in the grass could be passed on to humans?

Put a ring around the correct answer.

8%

30%

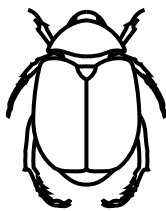
38%

50%

[1]

(b) Dung beetles feed on the faeces from cows.

Look at the picture of a dung beetle.



Dung beetles belong to a class of arthropods.

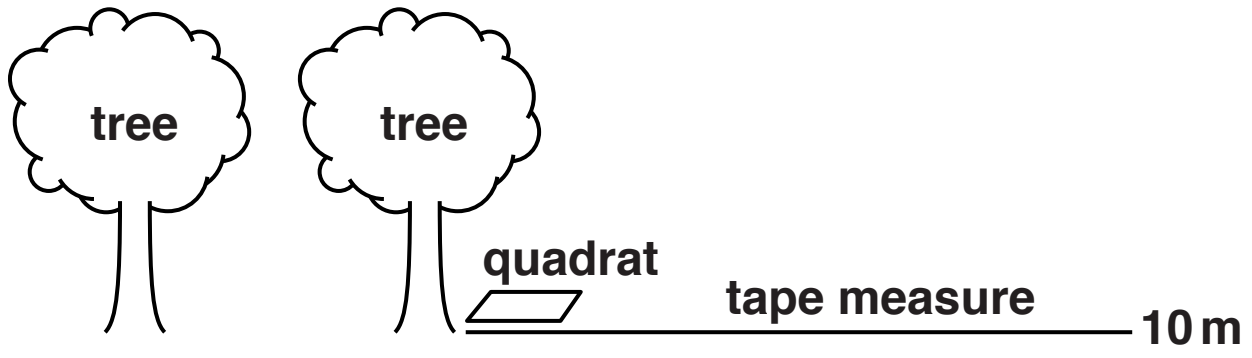
Use the picture to explain which class of arthropods dung beetles belong to.

_____ **[2]**

[TOTAL: 4]

2 Jerry investigates plants growing near a tree on the edge of a wood.

He places a tape measure on the ground, marking a distance of 10m from the tree.



Jerry uses a square frame called a quadrat.

He puts the quadrat next to the START of the tape measure under the tree.

He counts the number of different plant species he finds inside the quadrat.

Jerry then repeats this every metre until he reaches the end of the tape.

The table shows his results.

Distance from tree in m	Number of different plant species
0	0
1	1
2	1
3	2
4	2
5	3
6	4
7	5
8	5
9	5
10	5

(a) Describe the patterns in Jerry's results.

[2]

- (b) Jerry suggests there are no plants growing close to the tree because they would need to compete with the tree for resources.**

Plants compete for minerals.

Write down TWO OTHER resources plants compete for.

[2]

- (c) Jerry makes this statement about his results.**

He says, ‘I put the tape out to the right of the tree. If I put it on the OTHER SIDE I will get the same pattern in my results.’

Is Jerry’s statement correct? _____

Explain your answer.

[2]

(d) In autumn the leaves from the tree fall to the ground.

Nitrogen compounds in these leaves can be used again by the tree for growth.

Explain how.

[2]

[TOTAL: 8]

3 Look at the picture of deer-like animals called caribou.



(a) Caribou have eyes on the side of their heads.

Explain how this helps them survive.

_____ [1]

(b) Caribou live in cold climates where there is a lot of snow.

Suggest and explain ONE way their bodies are adapted to reduce heat loss.

_____ [2]

(c) Read the information about caribou.

Caribou live in large groups.

They live in Alaska and feed on lichen which grows on the ground.

Every year large groups of caribou walk thousands of miles following the same migration pattern.

They spend the spring in the north of Alaska. Here the caribou give birth to their calves. There is plenty of food and few predators.

During the summer they move south. They then spend the winter in areas where there is less snowfall.

Explain how caribou behaviour helps the species survive.

Include ideas about how their behaviour protects the whole species from predators and why they migrate.



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

[6]

[TOTAL: 9]

4 Zebras are mammals, like horses, with striped bodies.

There are many theories why zebras have stripes.

One theory is that the stripes stop flies sucking their blood.

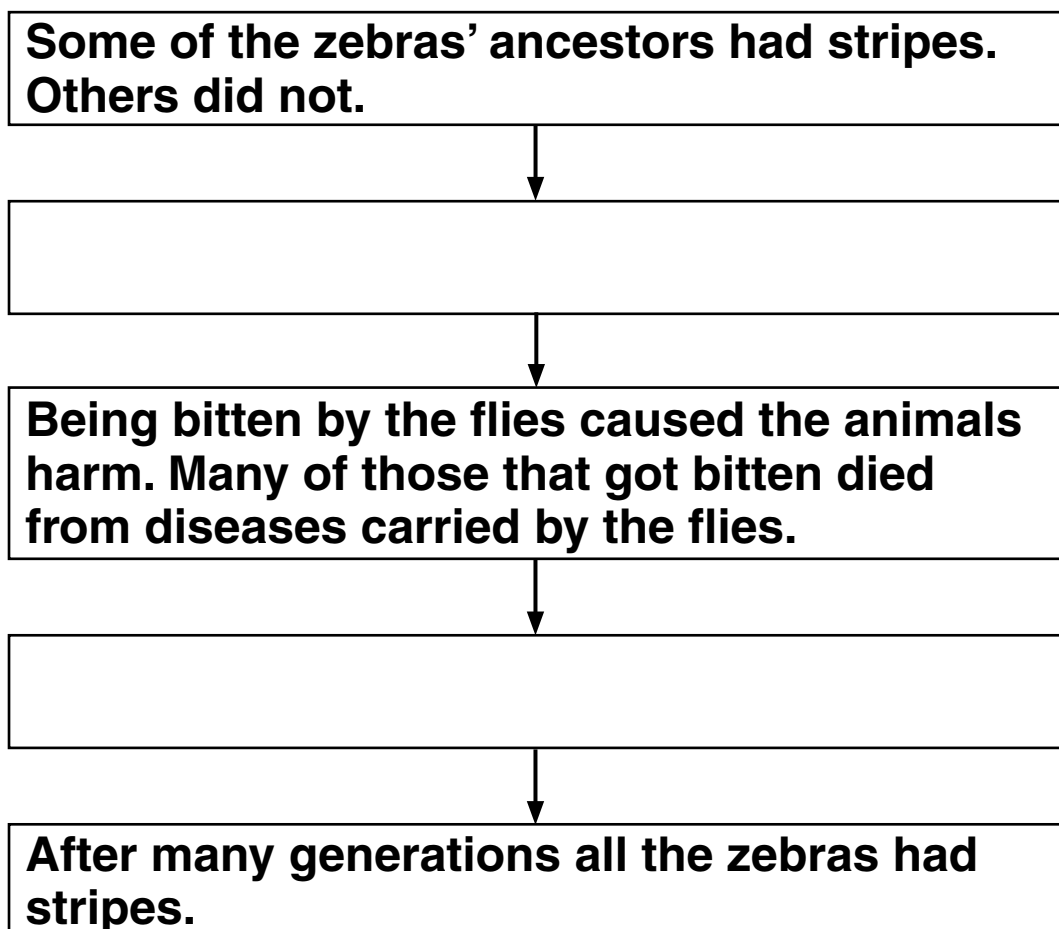
The stripes make the zebras less attractive to the flies.

(a) Darwin's theory of evolution explains how zebras evolved to have stripes.

Read the information in the flow chart.

There are two stages missing.

Finish the flow chart.



[2]

(b) A group of scientists investigated whether stripes were a defence against the flies.

They used four models of zebra each with different coat patterns.

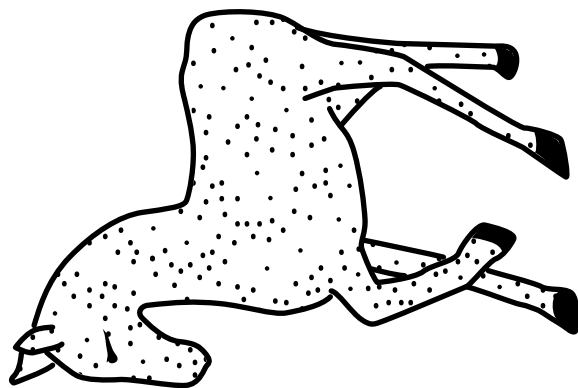
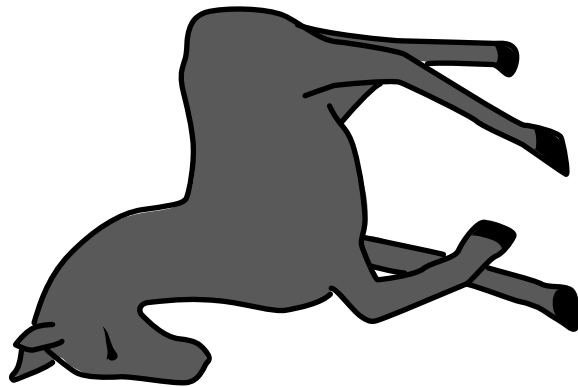
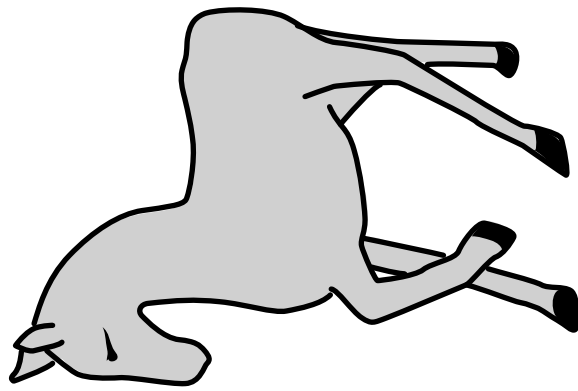
All the models were covered in sticky glue.

The diagram opposite shows the models.

The scientists observations supported the theory that stripes are a defence against flies.

(i) Suggest ONE observation the scientists could have made.

[1]



- (ii) Other people have different theories about the stripes.**

What would allow this theory about flies to be accepted by more people?

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

Other scientists try the experiment with different coloured zebras.

☐

Other scientists repeat the experiment and they get similar results.

☐

Repeat the experiment with different sized zebras.

☐

Repeat the experiment in winter when there are fewer flies.

☐

[1]

[TOTAL: 4]

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SECTION B – Module C2

5 This question is about metals and alloys.

Look at the word equation for the rusting of iron.

iron + oxygen + water → hydrated iron(III) oxide

(a) Rusting is an example of OXIDATION.

Explain how you can tell this from the word equation.

_____ [1]

(b) Iron and aluminium are used to make car bodies.

One PROPERTY of both iron and aluminium is that they are strong.

Write about the SIMILARITIES and DIFFERENCES between other properties of iron and aluminium.

_____ [3]

(c) Alloys are mixtures that contain a metal.

Draw a straight line from each ALLOY on the left to its USE on the right.

ALLOY	USE
amalgam	joining electrical wires
solder	making musical instruments
brass	fillings for teeth

[2]

[TOTAL: 6]

6 Chris is a gardener.

He uses different compounds in his garden.

Look at the table. It shows information about some of these compounds.

Compound	Formula	Solubility in water	Use
calcium hydroxide	$\text{Ca}(\text{OH})_2$	slightly soluble	soil conditioner
glyphosate	$\text{C}_3\text{H}_8\text{NO}_5\text{P}$	highly soluble	weedkiller
ammonium phosphate	$(\text{NH}_4)_3\text{PO}_4$	highly soluble	fertiliser
sodium nitrate	NaNO_3	highly soluble	fertiliser

(a) How many different ELEMENTS are in glyphosate?

answer _____ [1]

(b) What is the TOTAL number of ATOMS in the formula for sodium nitrate?

answer _____ [1]

(c) Which compound could Chris use to neutralise an acid soil?

Explain why.

_____ [2]

(d) Fertilisers contain elements that are ESSENTIAL for plant growth.

(i) Which compound does NOT contain any of these essential elements?

_____ **[1]**

(ii) Chris thinks that ammonium phosphate is a better fertiliser than sodium nitrate.

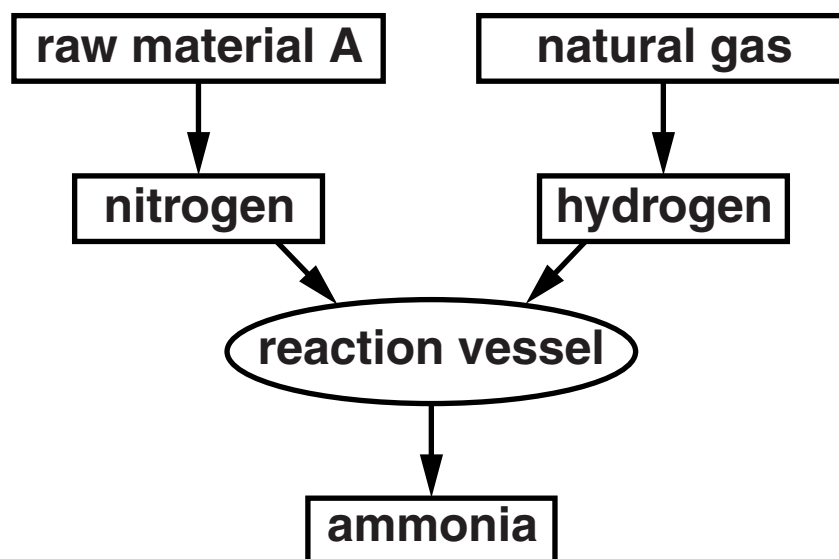
Suggest why.

_____ **[1]**

[TOTAL: 6]

- 7 This question is about the Haber process for making ammonia.

Look at the flow chart.



- (a) Write down the name of raw material A.

_____ [1]

- (b) In the reaction vessel, nitrogen, N_2 , reacts with hydrogen, H_2 , to make ammonia, NH_3 .

Write a **BALANCED SYMBOL** equation for this reaction.

_____ [2]

(c) Ammonia is a useful chemical.

Write down TWO uses of ammonia.

[2]

[TOTAL: 5]

8 Look at the table. It shows the properties of some construction materials.

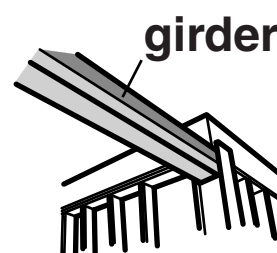
Material	Effect of water	Density in g/cm³	Relative hardness (1=soft 10=very hard)	Relative strength (1=weak 500=very strong)	Cost per tonne in £
A	absorbs water	2.0	6	3	210
B	corrodes	7.7	6	400	440
C	no effect	2.9	7	23	2000
D	no effect	2.7	5	15	1500
E	corrodes very slowly	8.9	3	200	3800
F	absorbs water	0.9	0.8	1	1600

(a) Sam is building a house.

Sam needs to choose suitable materials to use for:

a girder to support the roof

a kitchen worktop.



Write about the properties of the materials needed for each of these jobs.

Which materials would you use and why?



[6]

(b) Many of the materials needed to build houses come from ores.

Ores are dug out of the Earth's crust by quarrying.

Write about one DISADVANTAGE and one ADVANTAGE of quarrying.

[2]

[TOTAL: 8]

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SECTION C – Module P2

9 This question is about producing electricity.

(a) Complete the table by putting a tick (✓) in the correct box to show the type of electricity produced by each device.

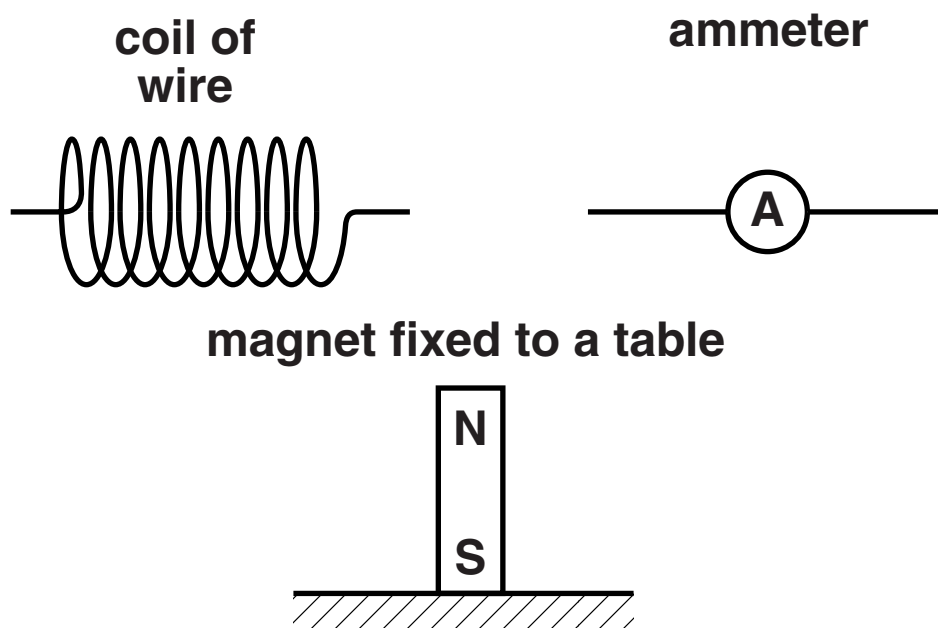
Device	Alternating current	Direct current
battery		
generator in power station		
photocell		

[2]

(b) Lisa investigates how to produce electricity in her science lesson.

Her teacher gives her a bar magnet, an ammeter and a coil of wire.

The magnet is fixed to a table.



Describe how she can use this equipment to produce an electric current.

You may use a labelled diagram to help your answer.

[2]

[TOTAL: 4]

10 This question is about the greenhouse effect.

(a) Methane is a GREENHOUSE GAS.

(i) Write down the name of one OTHER greenhouse gas.

_____ **[1]**

(ii) What is meant by a greenhouse gas?

_____ **[2]**

(b) Look at the information about a floodlight.

Voltage	230V
Current	0.87 A
Time used in one year	2000 hours
Cost of electricity per kWh (unit)	£0.15

Calculate the power of the floodlight IN kW and the cost of electricity used in one year.

Power _____ **kW**

Cost of electricity used in one year: £ _____ **[3]**

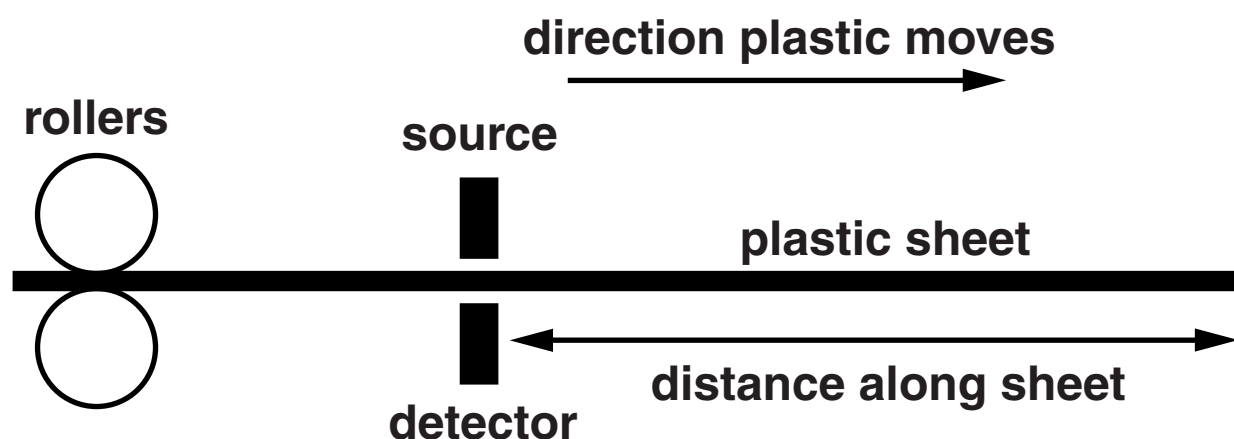
[TOTAL: 6]

11 Mike manufactures plastic sheets.

He uses nuclear radiation to monitor the thickness of the sheet.

The plastic sheet moves between the radioactive source and the detector.

Look at the diagram.



He tries out three different types of radiation and collects some data.

Look at his results opposite for a 100 cm length of the sheet.

distance along sheet in cm	0	10	20	30	40	50	60	70	80	90	100
count rate for alpha radiation	0	0	0	0	0	0	0	0	0	0	0
count rate for beta radiation	420	420	421	420	300	305	310	420	420	601	603
count rate for gamma radiation	975	974	976	975	975	976	974	975	975	976	974

Mike decides to use a BETA source to monitor the thickness of the plastic sheet.

Explain why beta radiation is the best choice and use the data to describe how the thickness of the plastic sheet changes between 0 cm and 100 cm.



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

[6]

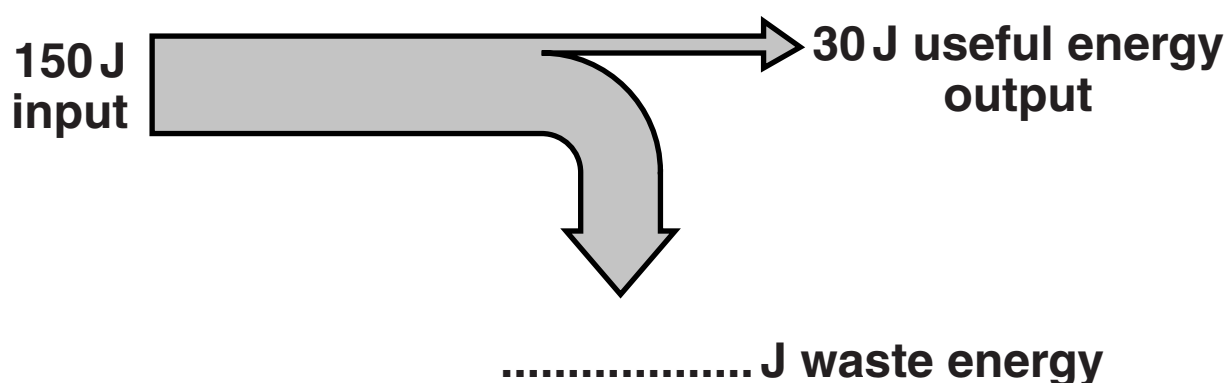
[TOTAL: 6]

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- 12 (a) A town council uses a solar panel to power a road sign.

In sunny weather the solar panel absorbs 150 J of light energy each second and produces 30 J of electrical energy.

Complete the Sankey diagram to show the energy wasted and calculate the efficiency of this way of producing electricity.



answer _____

[2]

(b) There are other ways that the Sun's energy can be harnessed.

Write down TWO other ways that the Sun's energy can be harnessed.

[2]

[TOTAL: 4]

13 (a) Several million years ago, a large object from space collided with the Earth.

A large crater was formed on the Earth's surface.

This collision caused climate change and some species became extinct.

What type of object collided with the Earth?

Choose from:

asteroid

black hole

comet

star

answer _____

[1]

(b) Scientists think that the Moon was formed when an object collided with the Earth.

What type of object collided with the Earth to form our Moon?

Choose from:

asteroid

comet

galaxy

planet

answer _____ [1]

(c) Black holes do not give out light.

Explain why.

_____ **[1]**

(d) Look at the information about planets.

Planet	Distance from Sun in millions of km	Time to orbit Sun in days	Average surface temperature in °C
Earth	150	365	14
Mars	228	687	−63
Saturn	1430	10 760	−130
Neptune	4500	60 200	−200

Scientists wanting to explore Neptune will have to use unmanned spacecrafts.

Suggest reasons why.

[2]

[TOTAL: 5]

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SECTION D

14 Copper is a very important metal.

Look at the bar chart opposite.

It shows how much copper was used each year in different parts of the world.

- (a) (i) How much copper was used in Europe in 2004?

answer _____ thousand tonnes [1]

- (ii) Describe the general trend in the TOTAL amount of copper used between 2000 and 2010.

_____ [1]

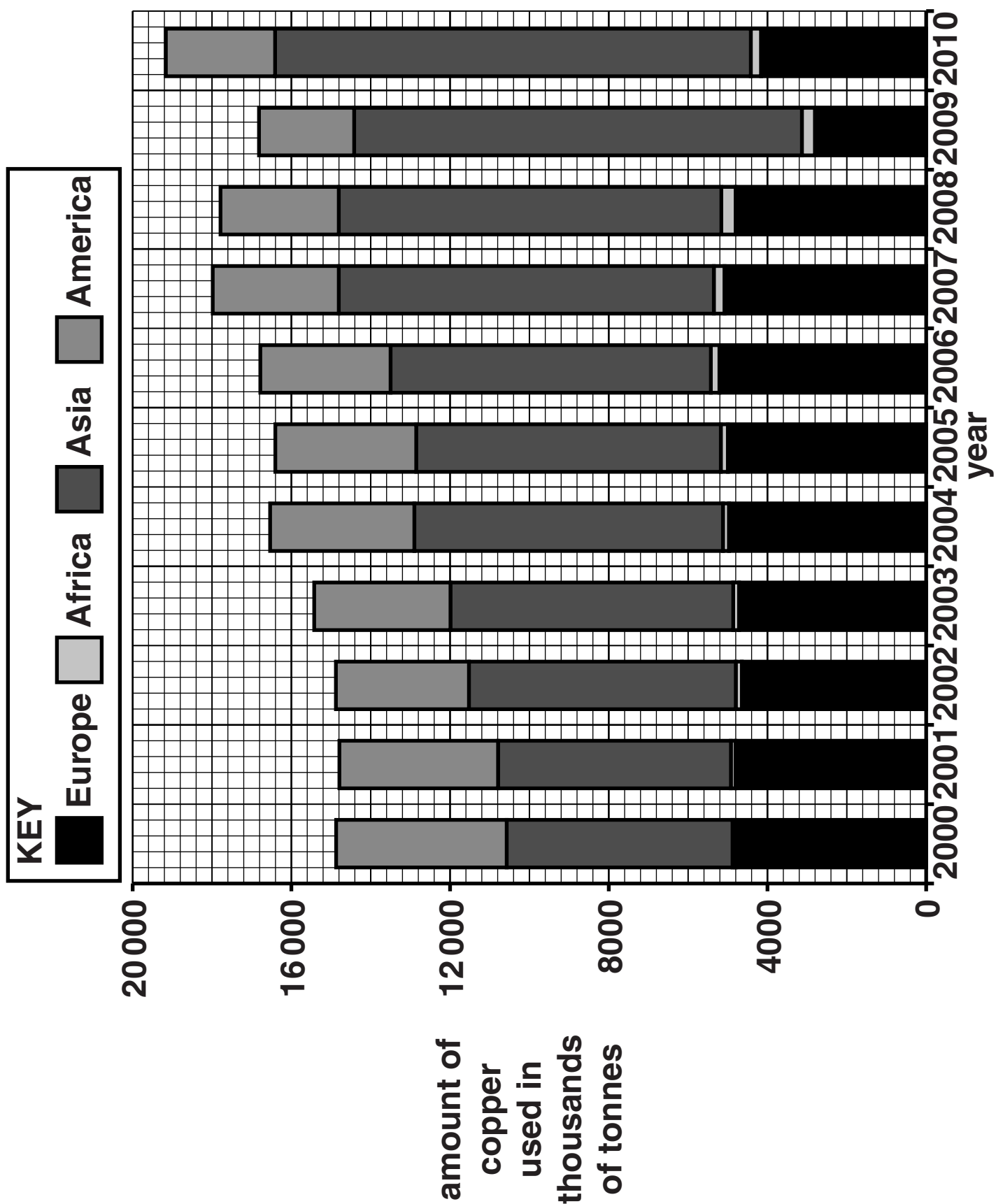
- (iii) How did the amount of copper used change in:

Asia

America

between 2000 and 2010?

_____ [2]



(b) Look at the table.

It shows the amount of copper produced between 2008 and 2012.

Amount of copper produced in thousands of tonnes					
Area of world	2008	2009	2010	2011	2012
China	3780	4250	4800	5120	5430
Europe	3710	3560	3610	3660	3760
Asia (not including China)	4340	4030	4100	4160	4210
North America	2210	2060	2080	2110	2140
Rest of World	4720	4820	5010	5200	5500
Total	18 760	18 720	19 600	20 250	21 040

- (i) Which area of the world has shown the GREATEST INCREASE in the amount of copper produced between 2008 and 2012?**

Explain your answer using the data in the table.

Suggest why this increase has happened.

[3]

(ii) Look at the data for 2012.

How much copper was produced in China in 2012?

_____ thousand tonnes

What percentage is this of the TOTAL amount of copper produced in the world in 2012?

answer _____ %

[2]

(iii) The percentage of the world's copper USED by China in 2012 was 34.5%.

Compare this value with your answer to part (ii).

Write down one problem this causes for China.

_____ **[1]**

[TOTAL: 10]

END OF QUESTION PAPER



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