

Candidate forename						Candidate surname					
Centre number						Candidate number					

OXFORD CAMBRIDGE AND RSA EXAMINATIONS
GCSE

B624/02

GATEWAY SCIENCE
ADDITIONAL SCIENCE B

Unit 2 Modules B4 C4 P4 (Higher Tier)

MONDAY 21 MAY 2012: Morning

DURATION: 1 hour
plus your additional time allowance

MODIFIED ENLARGED

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

- **The number of marks is given in brackets [] at the end of each question or part question.**
- **A list of physics equations is printed on page three.**
- **An enlarged copy of the Periodic Table will be provided.**
- **The total number of marks for this paper is 60.**

EQUATIONS

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

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

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

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

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

$$\text{kinetic energy} = \frac{1}{2} mv^2$$

$$\text{potential energy} = mgh$$

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

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

Answer ALL the questions.

SECTION A – MODULE B4

- 1 Large areas of Canada are covered by forests containing pine trees.**

- (a) Many of the pine trees in Canada are being killed by small beetles.**

The mountain pine beetle feeds from the tubes in the tree that transport sugar.

The beetle also infects the tree with a fungus.

This fungus blocks up the xylem vessels in the tree trunk.

This kills the tree.

- (i) Write down the name of the tubes from which the beetle feeds.**

_____ **[1]**

- (ii) The leaves (needles) of the infected pine trees often change colour because they become short of minerals.**

Explain why they become short of minerals.

_____ **[1]**

(iii) The leaves often die because they lack water.

This lack of water causes the stomata to close.

Explain the mechanism that causes the stomata to CLOSE.

[3]

(iv) Biomass, such as dead trees, may be used in many ways.

These dead trees are used for fuel and burned AS SOON AS POSSIBLE.

Suggest why it is important that these trees are burned as soon as possible.

[1]

- (b) Many of the beetles are killed if temperatures drop below -6°C in November.**

The graph opposite shows the lowest November temperature in the pine forest each year from 1984 to 2009.

- (i) In 1988 there was a large outbreak of the beetle but they soon decreased in number.**

Use the graph to work out in which year the next major outbreak started.

_____ **[1]**

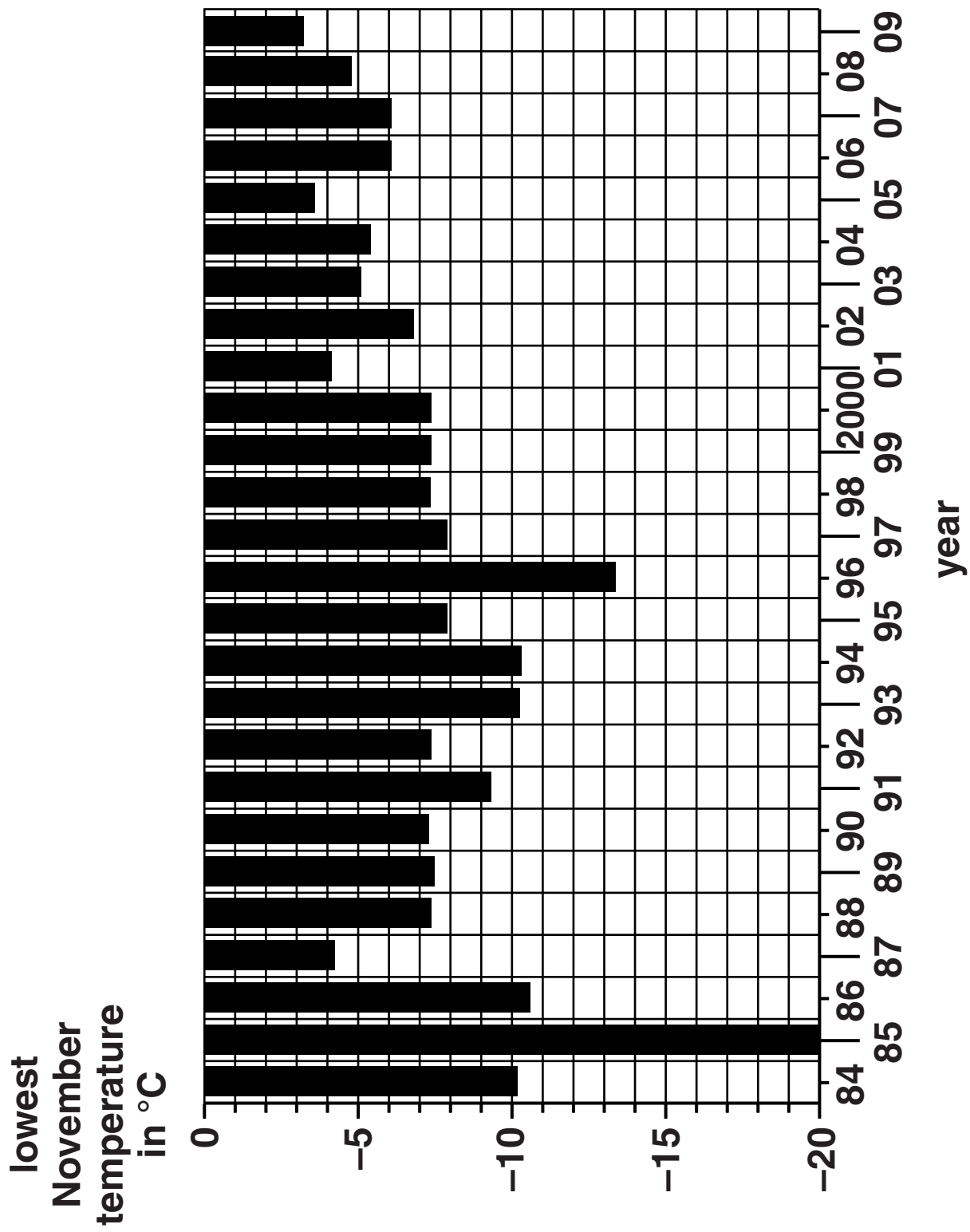
- (ii) The recent outbreak has lasted for a number of years.**

Scientists are worried that it might continue for many more years.

Use the graph to suggest why.

_____ **[2]**

[Total: 9]



2 Bill grows lettuces on his farm.

(a) He finds that the lettuces are being eaten by slugs and birds.

The slugs are being eaten by hedgehogs.

Sketch a PYRAMID OF BIOMASS to represent these feeding relationships.

Write the names of the organisms in the correct boxes in the pyramid.

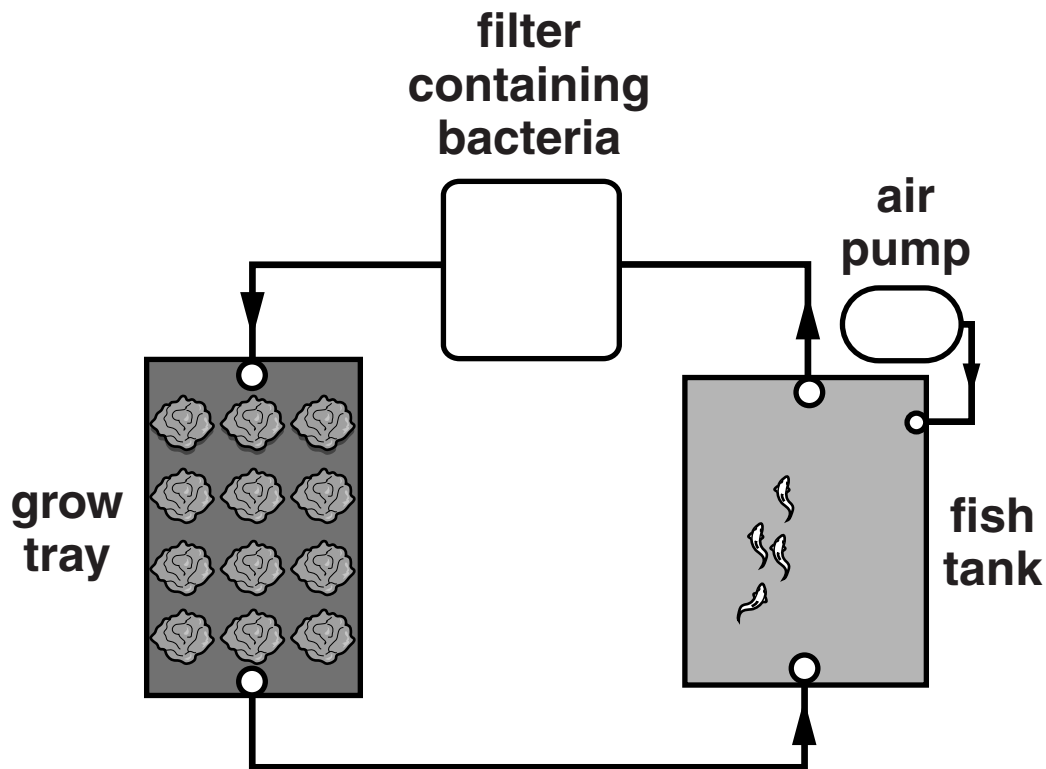
[2]

(b) Bill investigates a new way of growing lettuces.

This involves growing them in tanks without soil.

Water containing minerals is pumped through the tanks.

The diagram shows the equipment that Bill uses.



He keeps fish in a tank and then circulates the water through a filter containing bacteria.

The fish make ammonia. The bacteria convert the ammonia into nitrates.

(i) What type of bacteria would be used in the filter?

_____ [1]

- (ii) As well as nitrates, the lettuces need magnesium.

Why do plants need magnesium?

_____ [1]

- (iii) The air pump adds oxygen to the circulating water.

Oxygen is needed by the fish and the bacteria.

It is also needed by the lettuce roots.

Complete these sentences to describe why oxygen is needed by the roots.

Plant roots use oxygen in the process of

_____ to release energy.

Some of this energy is used to absorb minerals by a process called

_____ .

The energy is needed because the minerals are absorbed against a

_____ .

[3]

[Total: 7]

BLANK PAGE

3 Read this information about preserving food.

In the 18th century, Napoleon was travelling in hot countries with his army.

The hot conditions meant that their food rotted faster.

The food could be preserved by adding salt but this made the soldiers thirsty.

The French government offered a large sum of money to anybody who could find a solution.

Nicolas Appert solved the problem.

He put food into glass bottles and used steam to heat the bottles to high temperatures.

He then removed the steam and quickly sealed each bottle with a cork and wax.

Appert won the prize and set up his own factory.

(a) Napoleon's food was being rotted or decomposed by microbes.

(i) What name is used to describe the type of nutrition shown by these microbes?

_____ **[1]**

(ii) Explain why food rots much faster in hot countries.

_____ **[1]**

(b) Before Appert devised his method, food could be preserved by adding salt.

How does adding salt preserve food?

[2]

[Total: 4]

SECTION B – MODULE C4

4 Miles is doing the washing.

He washes a shirt.

(a) Miles washes his shirt at a low temperature.

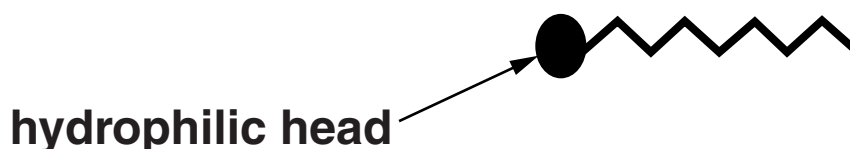
This saves him money.

Write down one OTHER ADVANTAGE of washing clothes at lower temperatures.

_____ [1]

(b) Miles uses a washing powder containing a detergent.

Look at the diagram of a detergent molecule.



Write about how the detergent removes grease from clothes.

Use ideas about the structure of the detergent molecule.

You may wish to draw a LABELLED diagram.

[3]

(c) Miles wants to clean his best suit.

He decides to have it dry cleaned.

(i) What is meant by DRY CLEANING?

[1]

(ii) Explain why dry cleaning is used.

[1]

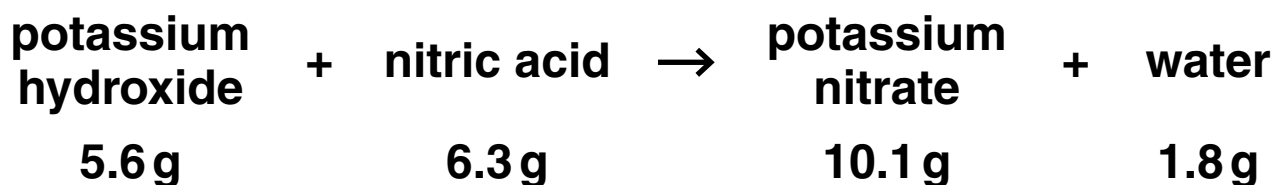
[Total: 6]

5 Kylie makes a fertiliser called potassium nitrate.

She adds an alkali called potassium hydroxide to nitric acid.

(a) Kylie uses 5.6 g of potassium hydroxide and 6.3 g of nitric acid.

She makes 10.1 g of potassium nitrate.



Kylie does the experiment again.

This time she uses 16.8 g of potassium hydroxide and 18.9 g of nitric acid.

Calculate the mass of potassium nitrate she will make.

answer _____ g [1]

(b) Kylie does the experiment a third time.

She expects to make 5.5 g of potassium nitrate.

She actually makes 4.4 g.

Show by calculation that her percentage yield is 80%.

[2]

(c) Kylie makes another fertiliser called ammonium sulfate.

Look at the word and symbol equations for this reaction.

ammonia + sulfuric acid \rightarrow ammonium sulfate



Calculate the mass of ammonium sulfate that can be made from 3.4 g of ammonia.

Relative atomic masses, A_r

N = 14, H = 1, S = 32, O = 16.

answer _____ g [3]

(d) Most fertilisers contain the essential element nitrogen.

The nitrogen in fertilisers helps crops grow bigger.

Explain HOW nitrogen in fertilisers helps crops grow bigger.

[2]

[Total: 8]

6 Look at the diagrams opposite.

They show the structures of diamond, graphite and buckminsterfullerene.

(a) Diamond and graphite are giant structures.

Diamond and graphite have HIGH MELTING POINTS.

Explain why they have high melting points. Use the diagrams to help you.

_____ [1]

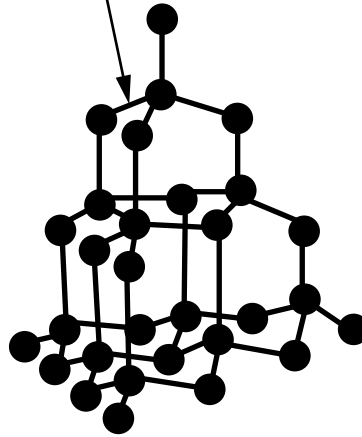
(b) Graphite is used to make pencil leads.

Explain why.

_____ [2]

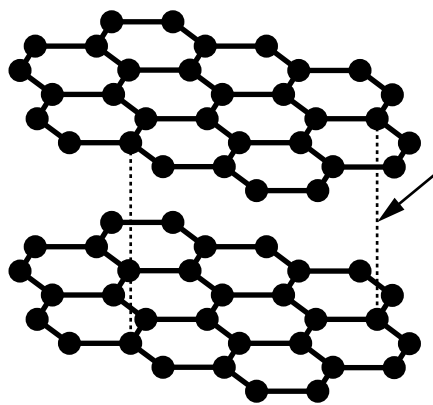
● = carbon atom

strong bond

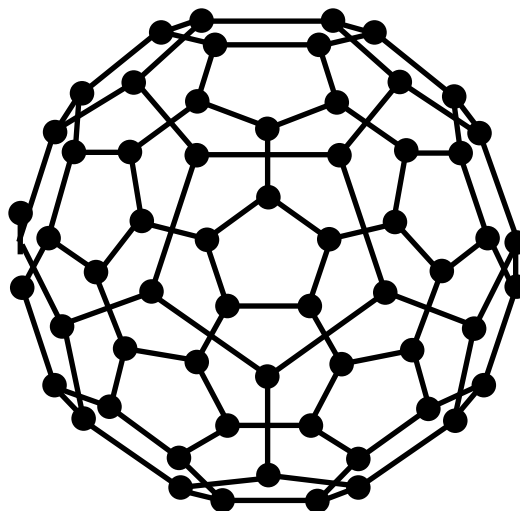


diamond

weak bond



graphite



buckminsterfullerene

(c) Buckminsterfullerene has the formula C_x .

Write down the value of x.

Choose from

20

40

60

80

100

120

answer _____ [1]

(d) Buckminsterfullerene can be made into NANOTUBES.

Write down two USES of nanotubes.

1 _____

2 _____ [2]

[Total: 6]

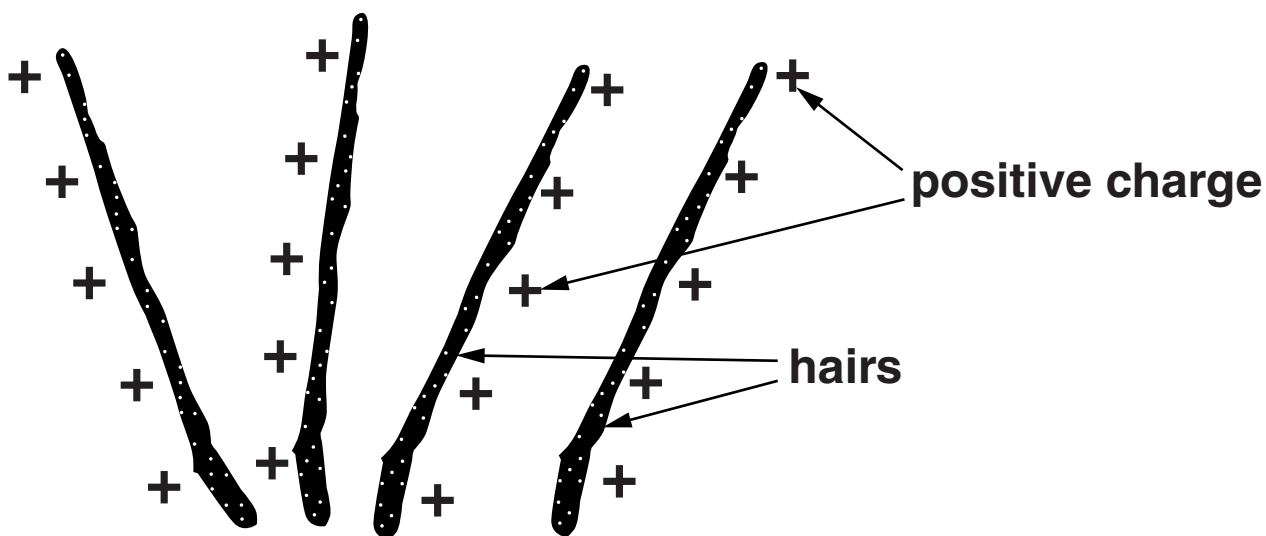
BLANK PAGE

SECTION C – MODULE P4

7 This question is about static electricity.

Danni combs her hair.

Hairs become positively charged by friction and repel each other.



(a) (i) Why do the hairs repel each other?

_____ [1]

(ii) How have the hairs become charged POSITIVELY?

_____ [1]

(b) What charge does the comb have after Danni combs her hair?

answer _____

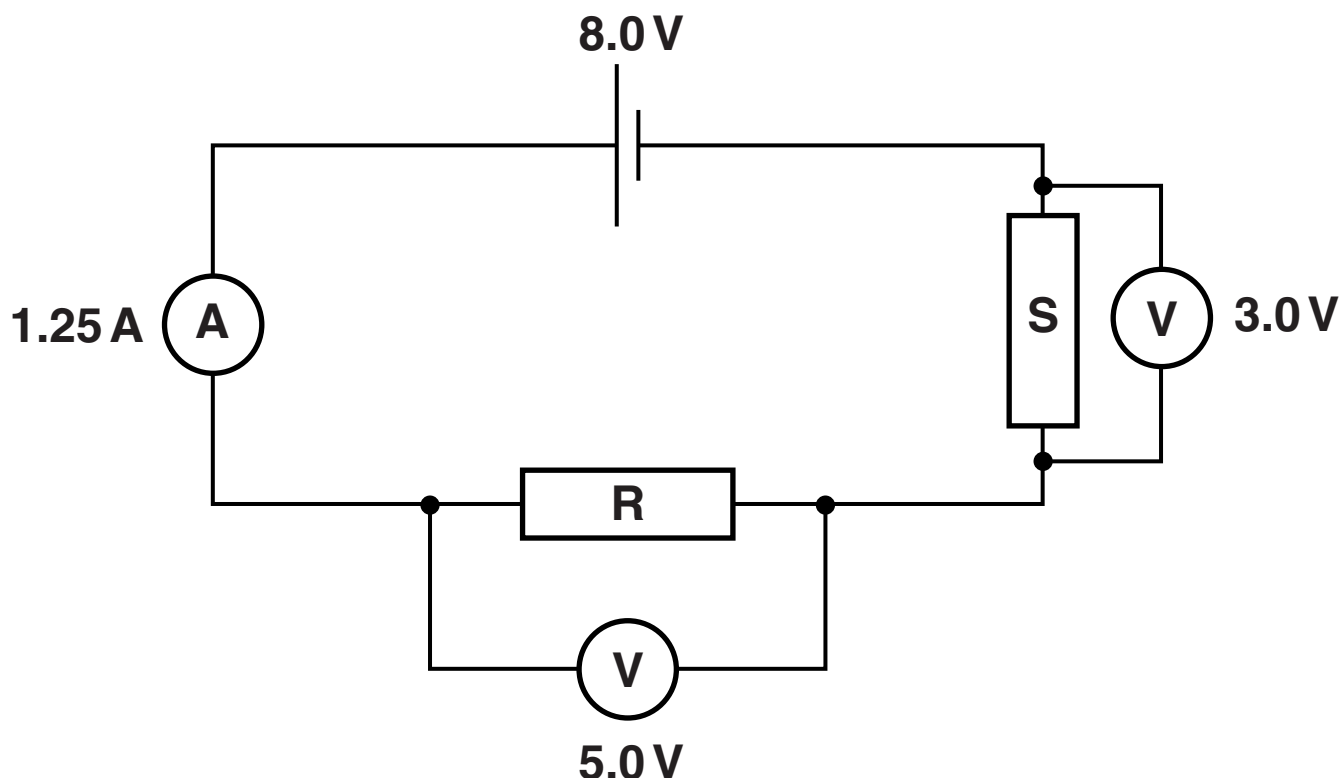
Explain your answer.

[2]

[Total: 4]

8 Ramiz is investigating electrical circuits.

He builds a circuit with two resistors in it.



(a) Ramiz measures

- the current in the circuit
- the voltage across each resistor.

Calculate the RESISTANCE of resistor R.

The equations on page 3 may help you.

resistance of R = _____ ohms (Ω) [2]

(b) (i) Ramiz adds another identical cell to his circuit.

This doubles the supply voltage.

This increases the current flowing through the resistor.

What happens to the VALUE of the VOLTAGE across resistor R?

_____ [1]

(ii) He adds a third resistor to the circuit.

It is placed in series with the other resistors.

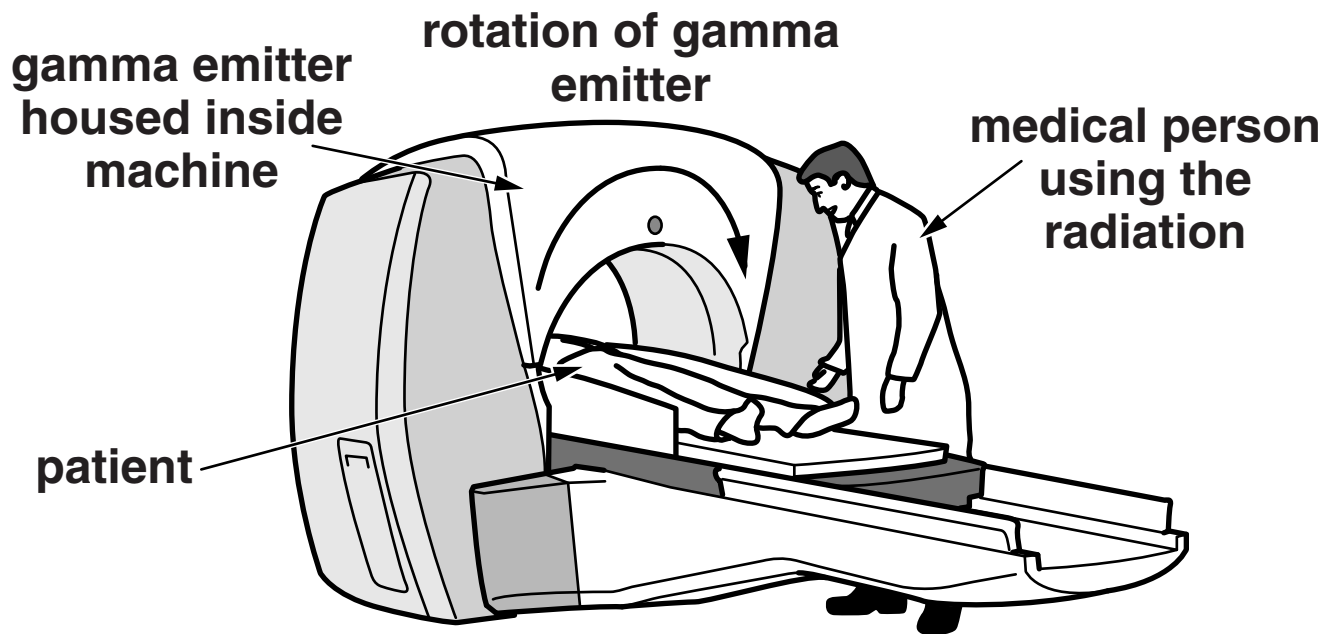
What happens to the current in the circuit?

_____ [1]

[Total: 4]

9 Some radioactive isotopes emit gamma rays.

They are used to treat cancerous tumours.



(a) Explain how the gamma rays are used to treat the cancerous tumour.

In your answer, include ideas about

- **the beam of gamma rays**
- **why the beam is rotated**
- **how damage to healthy human tissue is minimised.**

[3]

(b) Radioisotopes are used as TRACERS in hospitals.

These isotopes have a relatively short HALF-LIFE.

The graph opposite shows the decay of two radioisotopes with different half-lives.

Explain

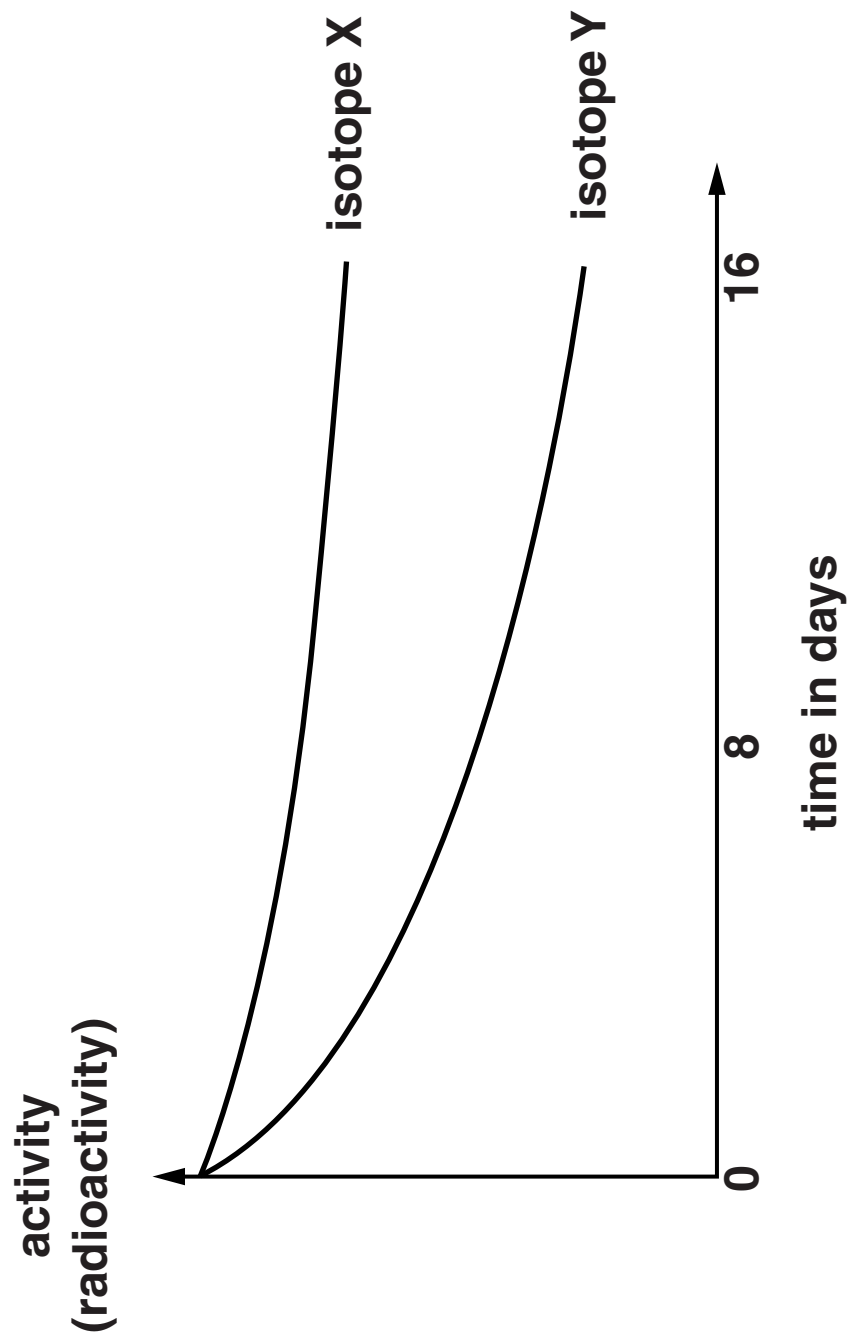
- **what is meant by half-life**
- **WHICH isotope would be the most suitable to use as a tracer AND WHY.**

The explanation has been started for you.

Half life is _____

Isotope _____ **is the MOST suitable because**

_____ **[2]**



- (c) (i) Complete the sentences using phrases from this list.

A BETA PARTICLE

A GAMMA RAY

AN X-RAY

AN ALPHA PARTICLE

An unstable atom emits a helium nucleus.

Scientists call this helium nucleus

_____ .

An unstable atom emits a fast moving electron.

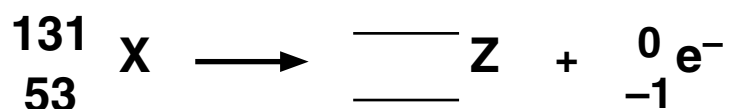
Scientists call this fast moving electron

_____ .

[2]

- (ii) When radioactive isotope X decays it emits a β particle to form a new element, Z.

Complete the nuclear equation for the decay of isotope X.



[1]

[Total: 8]

10 Doctors use ULTRASOUND to treat people with kidney stones.

There are two parts to the process.

First the doctor locates the kidney stones, then he carries out the treatment.

(a) Complete the sentences to describe what happens.

**The kidney stones are located by doing an
ultrasound _____. The waves
strike the kidney stones and
_____ to the detector outside
the body.**

**Different ultrasound waves are then focused on
the kidney stones to _____
the stones by vibrating them vigorously at a very
high _____. [2]**

(b) Humans CANNOT hear ultrasound.

Put a tick (✓) beside the reason why.

The ultrasound waves are not loud enough.

☐

The ultrasound waves travel as transverse waves.

☐

The ultrasound waves are just areas of air pressure changes.

☐

The ultrasound waves do not have enough energy.

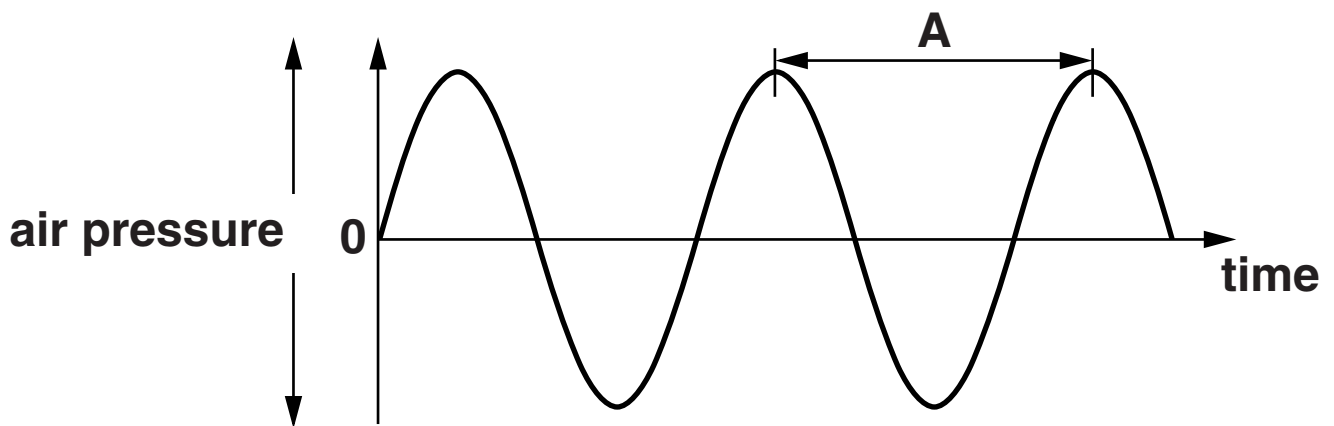
☐

The ultrasound frequency is above the range of human hearing.

☐

[1]

(c) Ultrasound waves can be shown as a wave diagram.



The wave feature shown by the letter A is the WAVELENGTH.

Describe what is meant by the FREQUENCY of a wave.

[1]

[Total: 4]

END OF QUESTION PAPER

Copyright Information

OCR is committed to seeking permission to reproduce all third-party content that it uses in its assessment materials. OCR has attempted to identify and contact all copyright holders whose work is used in this paper. To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced in the OCR Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download from our public website (www.ocr.org.uk) after the live examination series.

If OCR has unwittingly failed to correctly acknowledge or clear any third-party content in this assessment material, OCR will be happy to correct its mistake at the earliest possible opportunity.

For queries or further information please contact the Copyright Team, First Floor, 9 Hills Road, Cambridge CB2 1GE.

OCR is part of the Cambridge Assessment Group; Cambridge Assessment is the brand name of University of Cambridge Local Examinations Syndicate (UCLES), which is itself a department of the University of Cambridge.