Candidate Forename		Candidate Surname	

Centre Number						Candidate Number				

OXFORD CAMBRIDGE AND RSA EXAMINATIONS
GENERAL CERTIFICATE OF SECONDARY EDUCATION

B623/02

GATEWAY SCIENCE

ADDITIONAL SCIENCE B
Unit 1 Modules B3 C3 P3 (Higher Tier)

WEDNESDAY 26 MAY 2010: Morning
DURATION: 1 hour

SUITABLE FOR VISUALLY IMPAIRED CANDIDATES

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/SW) MEP60384 30331/1

INSTRUCTIONS TO CANDIDATES

- **Write your name clearly in capital letters, your Centre Number and Candidate Number in the boxes on the first page.**
- **Use black ink. Pencil may be used for graphs and diagrams only.**
- **Read each question carefully and make sure that you know what you have to do before starting your answer.**
- **Answer ALL the questions.**
- **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.**
- **The Periodic Table is provided separately.**
- **The total number of marks for this paper is 60.**

EQUATIONS

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

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

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

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

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

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

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

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

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

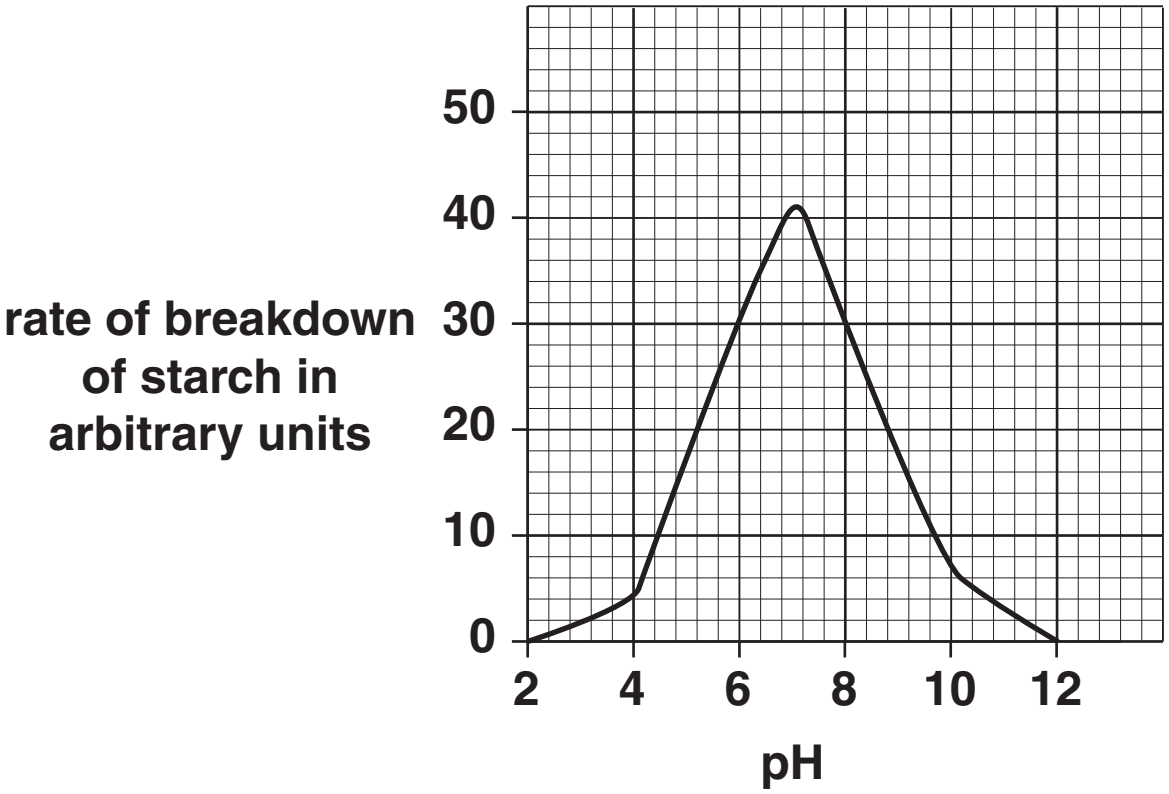
Answer <u>ALL</u> the questions.

<u>SECTION A – MODULE B3</u>

1 In the digestive system, the carbohydrate starch is broken down into sugar.

This begins in the mouth and uses the enzyme amylase.

(a) The graph shows how the rate of breakdown of starch by amylase changes as the pH increases.



Look at the graph.

(i) Describe how the rate of breakdown of starch changes as the pH increases.

_____

_____

_____ **[2]**

(ii) Write down the optimum pH of amylase.

_____ **[1]**

(iii) Food passes from the mouth to the stomach and then to the small intestine.

The table shows the pH at these different parts of the digestive system.

PART OF THE DIGESTIVE SYSTEM	TYPICAL pH
mouth	7
stomach	2
small intestine	6

Some amylase is made in the mouth.

Amylase is also made in the pancreas and passed into the small intestine.

Suggest why more amylase has to be made in the pancreas.

_____

_____

_____ **[2]**

(b) Sugar is absorbed from the small intestine into the blood.

(i) Write down the name of this absorption process.

_____

What causes sugar to be absorbed by this process?

_____

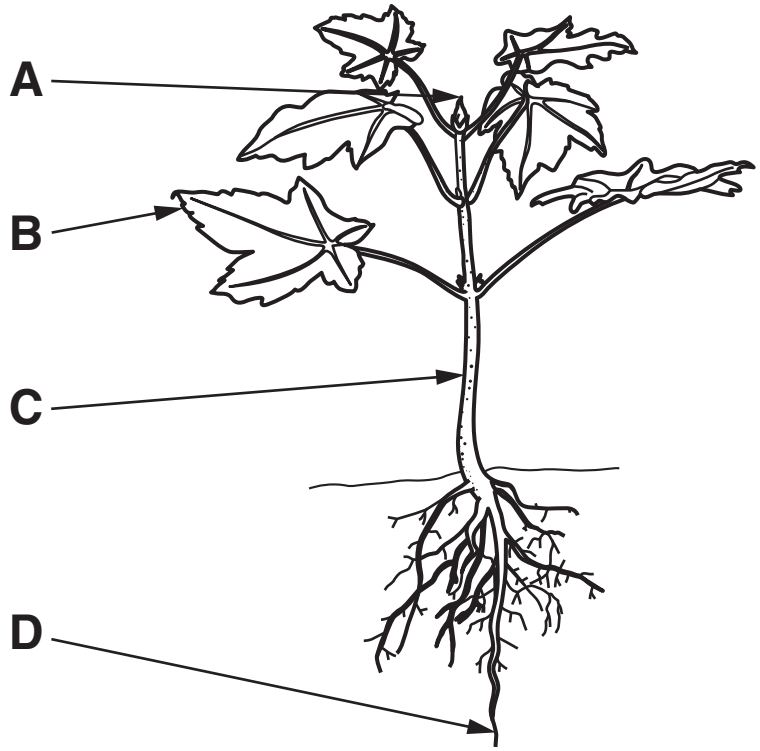
_____ **[2]**

(ii) Which part of the blood transports sugar?

_____ **[1]**

[Total: 8]

2 The diagram shows a growing geranium plant.



(a) (i) One way in which plants grow is by <u>CELL DIVISION</u>.

In which two parts of a plant does <u>MOST</u> cell division occur?

Look at the diagram.

Choose <u>TWO</u> from A, B, C and D.

_____ and _____ [1]

(ii) Write down the name of this type of cell division.

_____ [1]

(b) The shoot and root of a plant grow differently in response to light and gravity.

Put <u>FOUR</u> ticks (✓) in the table to show the responses shown by a shoot and a root.

	positive geotropism	negative geotropism	positive phototropism	negative phototropism
shoot				
root				

[2]

(c) Paul wants to grow more geranium plants by tissue culture.

He uses very small pieces of the shoot to grow into new plants.

(i) New plants can be grown by tissue culture.

Animals like sheep <u>CANNOT</u> be grown by tissue culture.

Explain why sheep cannot be grown by tissue culture.

_____

_____ **[1]**

(ii) Paul can also grow new geranium plants from seeds.

Write down <u>ONE ADVANTAGE</u> of growing new geranium plants by tissue culture rather than by using seeds.

_____

_____ **[1]**

[Total: 6]

BLANK PAGE

3 Liz has diabetes.

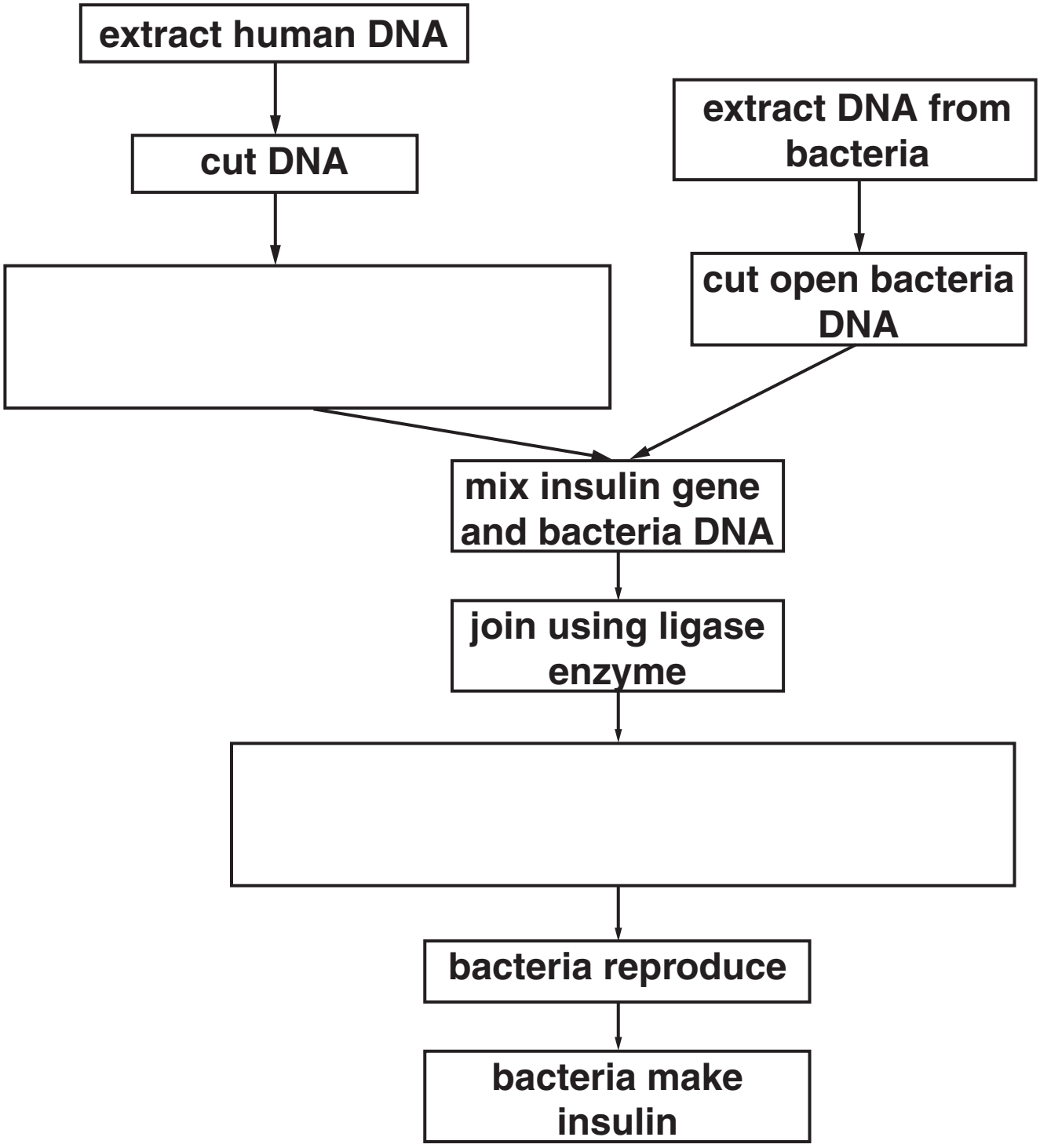
The cells in her pancreas do NOT make the hormone insulin.

She has to inject herself regularly with insulin.

She uses insulin from genetically engineered bacteria.

(a) The flow chart shows how bacteria are genetically engineered to make insulin.

(i) Complete the flow chart opposite by writing in the TWO boxes.


extract human DNA
cut DNA
extract DNA from bacteria
cut open bacteria DNA
mix insulin gene and bacteria DNA
join using ligase enzyme
bacteria reproduce
bacteria make insulin

[2]

(ii) The insulin that the bacteria make is identical to the insulin that humans make.

Explain why.

_____

_____ **[1]**

(iii) Some people object to genetic engineering.

Write down <u>ONE</u> reason why.

_____

_____ **[1]**

(b) When bacteria cells grow to a certain size, they divide into smaller cells.

This is because if they get too big they cannot survive.

Explain why cells that are too big <u>CANNOT</u> survive.

_____

_____

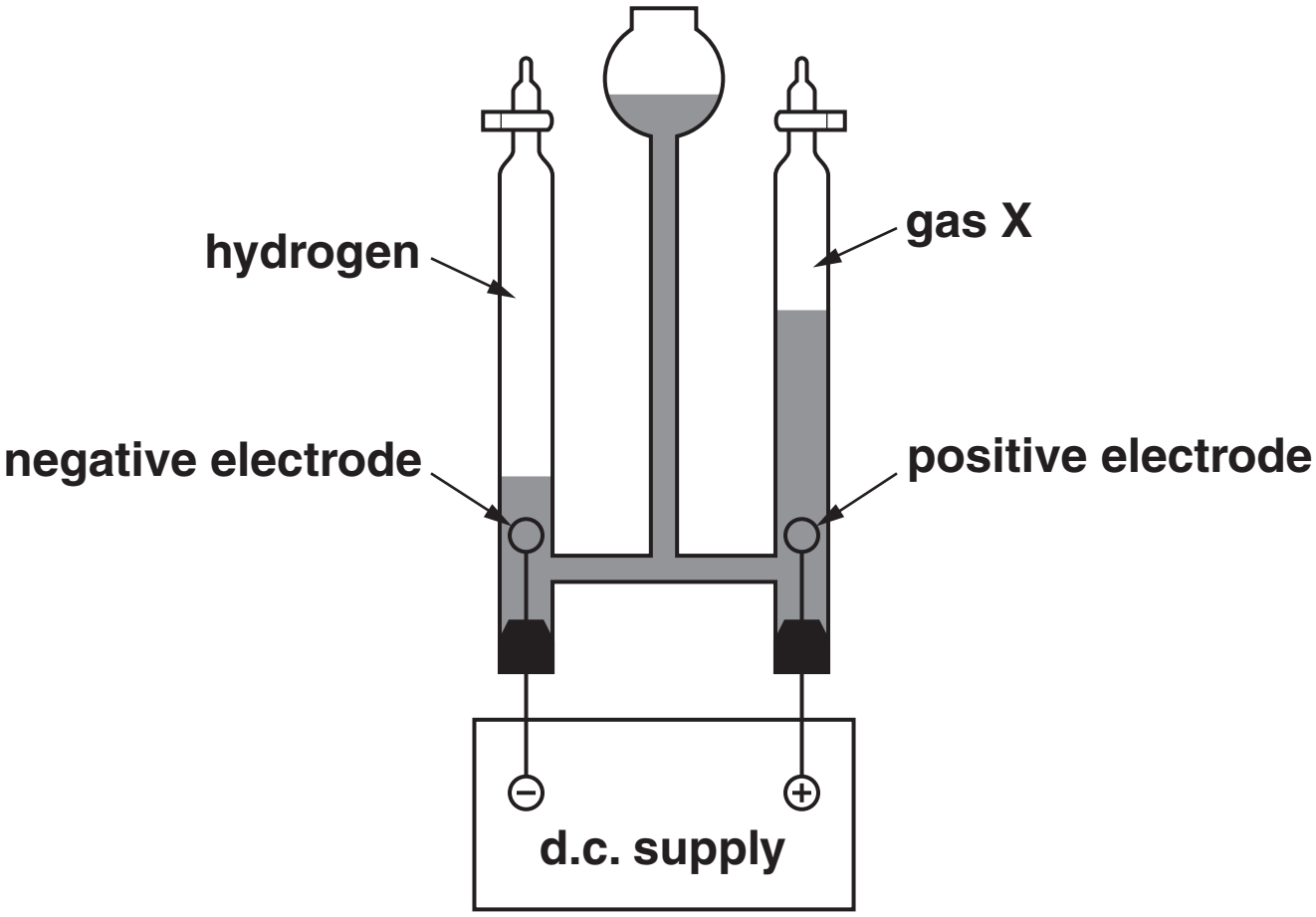
_____ **[2]**

[Total: 6]

BLANK PAGE

SECTION B – MODULE C3

4 Look at the diagram. It shows the apparatus used to electrolyse dilute sulfuric acid.



(a) Gas X is made at the positive electrode.

(i) Write down the name of gas X.

_____ **[1]**

(ii) Hydrogen is made at the negative electrode.

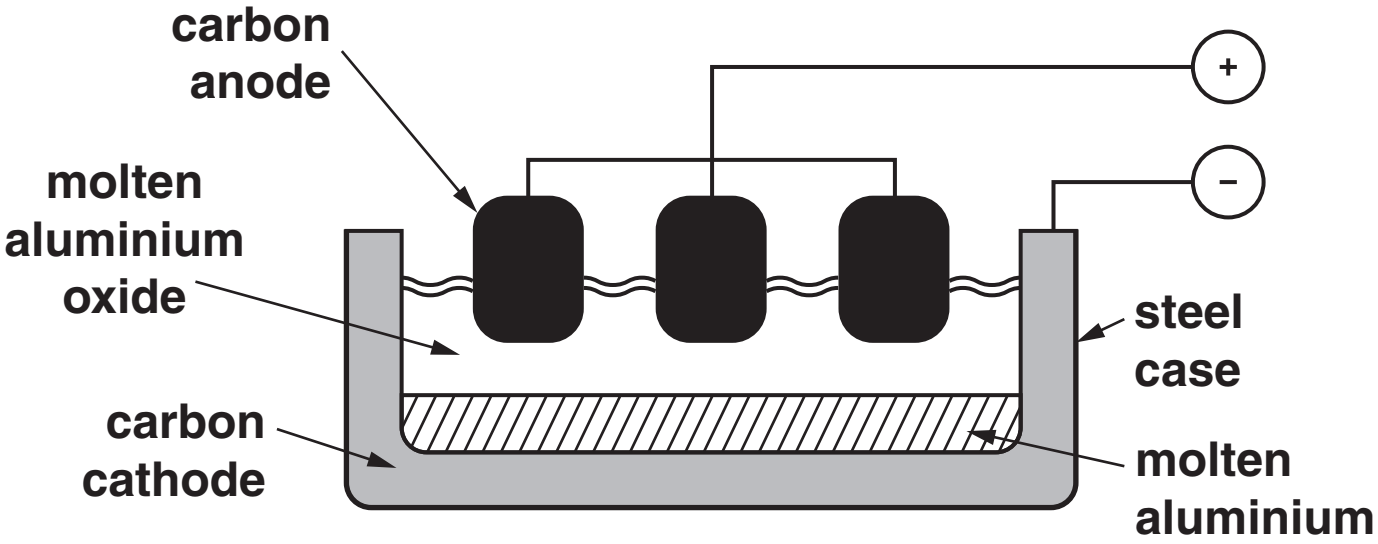
Hydrogen ions, H^+, gain electrons, e^-, to make a hydrogen molecule, H_2.

Write a balanced <u>SYMBOL</u> equation for this reaction.

_____ **[2]**

(b) Electrolysis is also used to make aluminium.

Look at the diagram. It shows the equipment that is used.



(i) Aluminium is made at one of the electrodes.

Which one?

_____ **[1]**

(ii) The electrolyte is aluminium oxide mixed with cryolite.

Why is cryolite mixed with the aluminium oxide?

_____ **[1]**

(iii) Aluminium is a very expensive metal to make.

Explain why.

_____

_____ **[1]**

[Total: 6]

BLANK PAGE

5 Alice and Jamie investigate some reactions of the Group 7 elements.

Chlorine and bromine are Group 7 elements.

(a) Look at the table.

It shows what is made when Group 7 elements react with Group 1 elements.

Complete the table.

	NAME OF COMPOUND MADE IN REACTION WITH	
	chlorine	**bromine**
sodium	**sodium chloride**	_____
potassium	_____	**potassium bromide**

[2]

(b) Write a word equation for the reaction of sodium with chlorine.

_____ **[1]**

(c) The Group 7 elements have 7 electrons in their outer shell.

Chlorine is more reactive than bromine.

Explain why. Use ideas about the gain of electrons.

_____

_____ **[1]**

(d) Bromine reacts to make bromide ions.

$$Br_2 + 2e^- \rightarrow 2Br^-$$

This process is called <u>REDUCTION</u>.

Explain why.

_____

_____ **[1]**

[Total: 5]

6 This question is about transition elements.

(a) The compounds of transition elements are often coloured.

Draw a straight line to match each COMPOUND to its COLOUR.

COMPOUND	COLOUR
iron(III) sulfate	orange / brown
copper sulfate	pale green
iron(II) sulfate	blue

[2]

(b) Mercury is a transition element.

At very low temperatures, mercury is a SUPERCONDUCTOR.

Superconductors are materials that conduct electricity with little or no resistance.

Write about the BENEFITS and DRAWBACKS of using superconductors.

_____

_____

_____

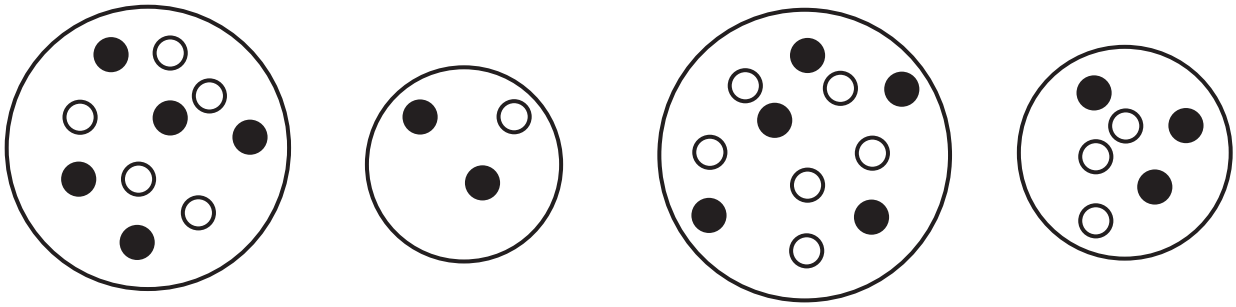
_____

_____ **[3]**

[Total: 5]

7 This question is about atomic structure and bonding.

(a) Look at the diagrams. Each diagram shows the nucleus of a different atom.



A **B** **C** **D**

● = proton
○ = neutron

(i) Which nucleus has a mass number of 3?

Choose from A, B, C and D.

answer _____ [1]

(ii) Which are isotopes of the same element?

_____ and _____ . [1]

(b) Oxygen atoms have the electronic structure 2. 6.

Hydrogen atoms have the electronic structure 1.

Draw a dot and cross diagram to show the covalent bonding in a water molecule, H_2O.

[2]

[Total: 4]

SECTION C – MODULE P3

8 Ibrahim is the fastest runner in his class.

He runs a 100 metre race.

(a) Other pupils in his class are going to calculate his speed during the race.

They measure the DISTANCE he runs and the TIME he takes for the race.

The results are:

distance = 100 metres (m)

time = 12 seconds (s)

Calculate Ibrahim's AVERAGE speed for the race.

The equations on page 3 may help you.

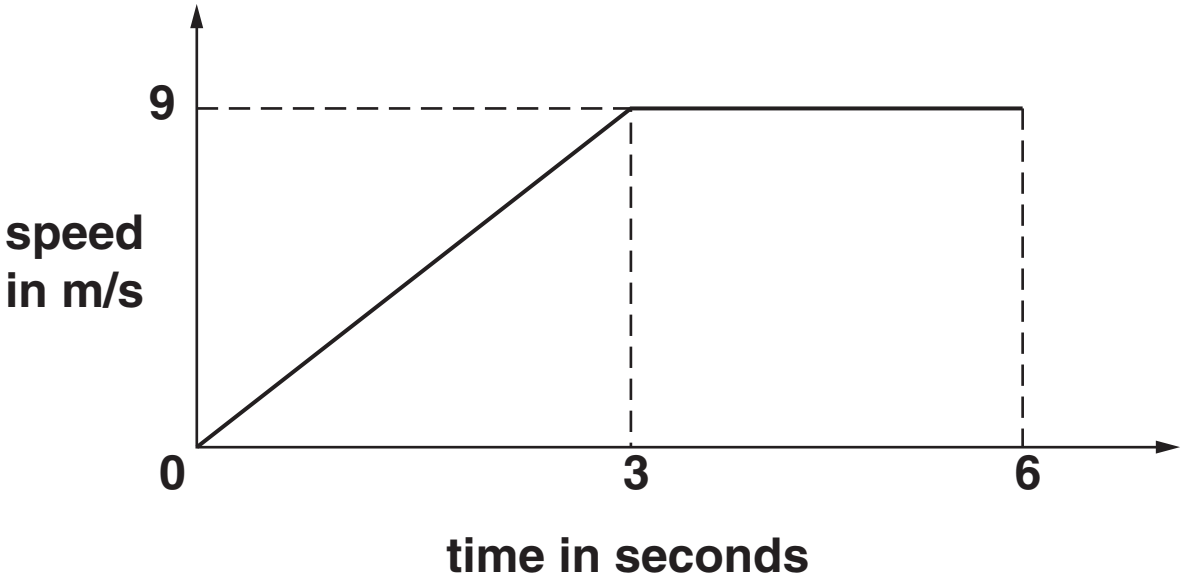
_____

_____

_____

answer _____ m/s [2]

(b) Look at the graph of part of Ibrahim's race.



(i) After 3 seconds Ibrahim's speed is 9 metres per second (m/s).

Calculate his acceleration during the first 3 seconds.

The equations on page 3 may help you.

_____

_____

_____

answer _____ m/s^2 [2]

(ii) What can be calculated from the <u>AREA</u> under the line of the speed-time graph?

_____ **[1]**

[Total: 5]

9 Julie is driving her car.

Julie approaches some traffic lights.

The lights change to red (stop). She stops the car quickly.

(a) When Julie applies the brakes work is done.

While the brakes are applied

- **the car travels 15 m**
- **the braking force is 4000 N.**

Calculate the work done by the brakes.

The equations on page 3 may help you.

_____

_____

_____

_____

answer _____ joules [2]

(b) The traffic lights turn green. Julie pulls away from the lights.

She now drives the car at a higher speed.

Higher speed increases her braking distance. It also increases her thinking distance.

Write about <u>OTHER</u> factors that could <u>INCREASE</u>

- **the braking distance**
- **the thinking distance.**

_____

_____

_____ **[2]**

(c) Look at the table about braking distances.

SPEED IN m/s	BRAKING DISTANCE IN m
14	15
28	60
42	135

The braking distance increases as the speed increases.

Look at the table.

Explain in <u>DETAIL</u> what happens to braking distance when the speed increases.

Use ideas about kinetic energy.

The equations on page 3 may help you.

_____

_____

_____

_____ **[2]**

[Total: 6]

10 Modern cars have safety features that absorb energy in a crash.

This reduces the forces on the driver.

One example of this is a crumple zone.

(a) Crumple zones reduce the force on the driver in a crash.

Write down TWO reasons why.

1 _____

_____

2 _____

_____ **[2]**

(b) Crumple zones are a PASSIVE safety feature in a car.

ABS brakes are an example of an active safety feature.

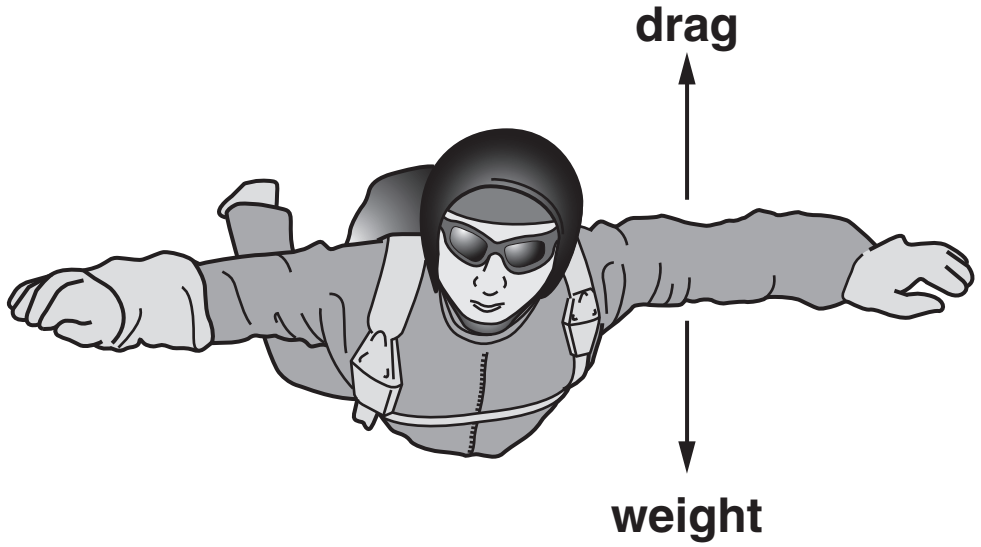
How do ACTIVE safety features make driving safer?

_____ **[1]**

[Total: 3]

11 Liz is a free-fall parachutist. Look at the drawing.

It shows the forces acting on Liz at the start of her free-fall.



Her weight is greater than the drag so she falls.

(a) What happens to the acceleration of free-fall (g) acting on Liz as she falls?

Choose from

DECREASES

INCREASES

STAYS THE SAME

answer _____ [1]

(b) (i) As Liz falls, her drag force increases.

Explain why.

_____

_____ **[1]**

(ii) She spreads her body out flat. This increases the drag force.

Explain why.

_____

_____ **[1]**

(iii) As she falls, Liz reaches a <u>TERMINAL SPEED</u>.

There is a relationship between the forces acting on her.

What is the relationship between these forces at terminal speed?

_____ **[1]**

(c) Liz falls at terminal speed.

(i) What happens to Liz's kinetic energy (KE) as she falls at terminal speed?

_____ **[1]**

(ii) At terminal speed her potential energy (PE) decreases as she falls.

What happens to this energy?

_____ **[1]**

[Total: 6]

END OF QUESTION PAPER

BLANK PAGE