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Centre Number						Candidate Number				
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**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 20 JANUARY 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

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, however additional paper may be used if necessary.**

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 printed on the back page.**
- **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 B3

- 1 (a) Mechanical hearts have been used to help patients while they wait for a heart transplant.

Finish the sentences about the heart.

Use words from this list.

ARTERIES

BACKFLOW

BLOCKAGE

CAPILLARIES

LEAKAGE

VEINS

The mechanical heart contains valves to prevent

_____ .

The heart is attached to blood vessels.

The vessels taking blood away from the heart are

called _____ .

[2]

(b) Write down ONE problem of using mechanical hearts.

_____ [1]

(c) Some people need heart transplants because cholesterol has caused damage to their heart.

Describe how cholesterol build up could damage the heart.

_____ [1]

[Total: 4]

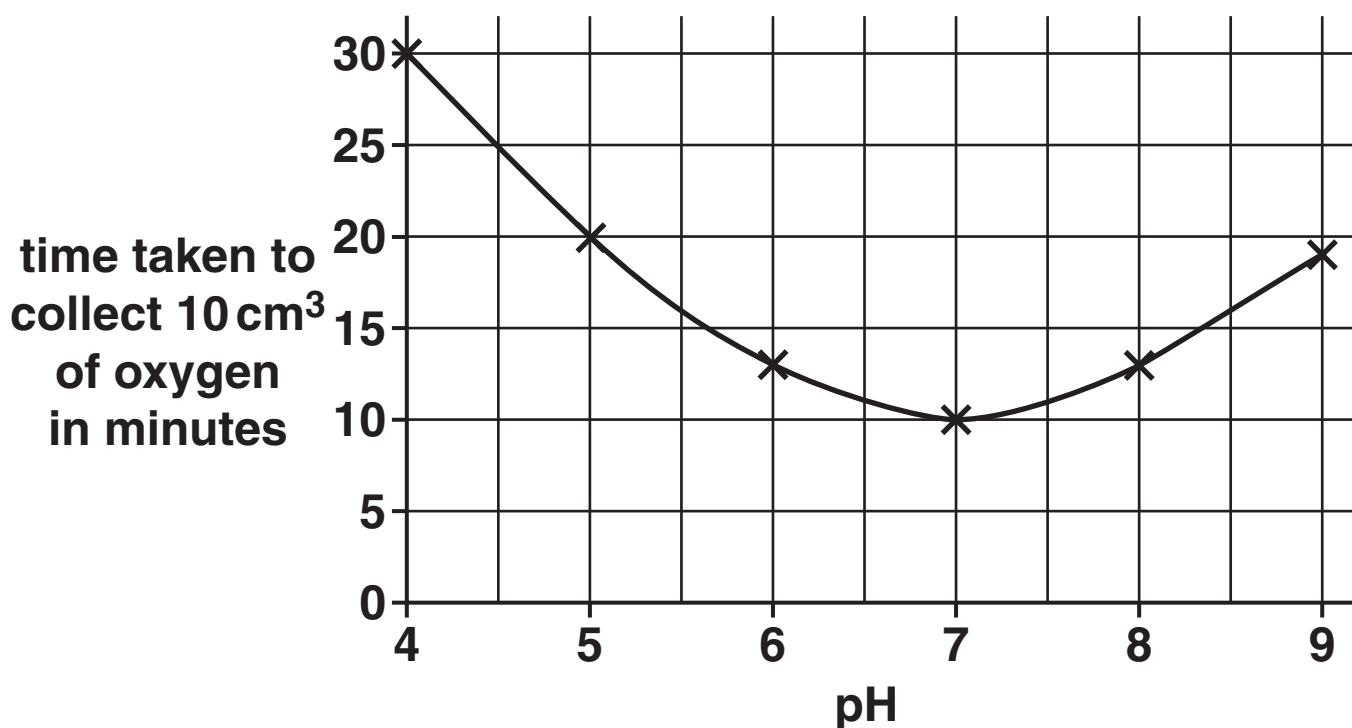
2 Tyrone is investigating the effect of pH on catalase enzyme.

He uses the enzyme to break down hydrogen peroxide into water and oxygen.

He times how long it takes to collect 10 cm^3 of oxygen.

The graph shows his results.

EFFECT OF pH ON CATALASE ACTIVITY



(a) Use the graph to answer these questions.

(i) Write down the OPTIMUM pH of the enzyme catalase.

pH _____ [1]

(ii) Use your knowledge of enzymes to explain the shape of the graph.

_____ [2]

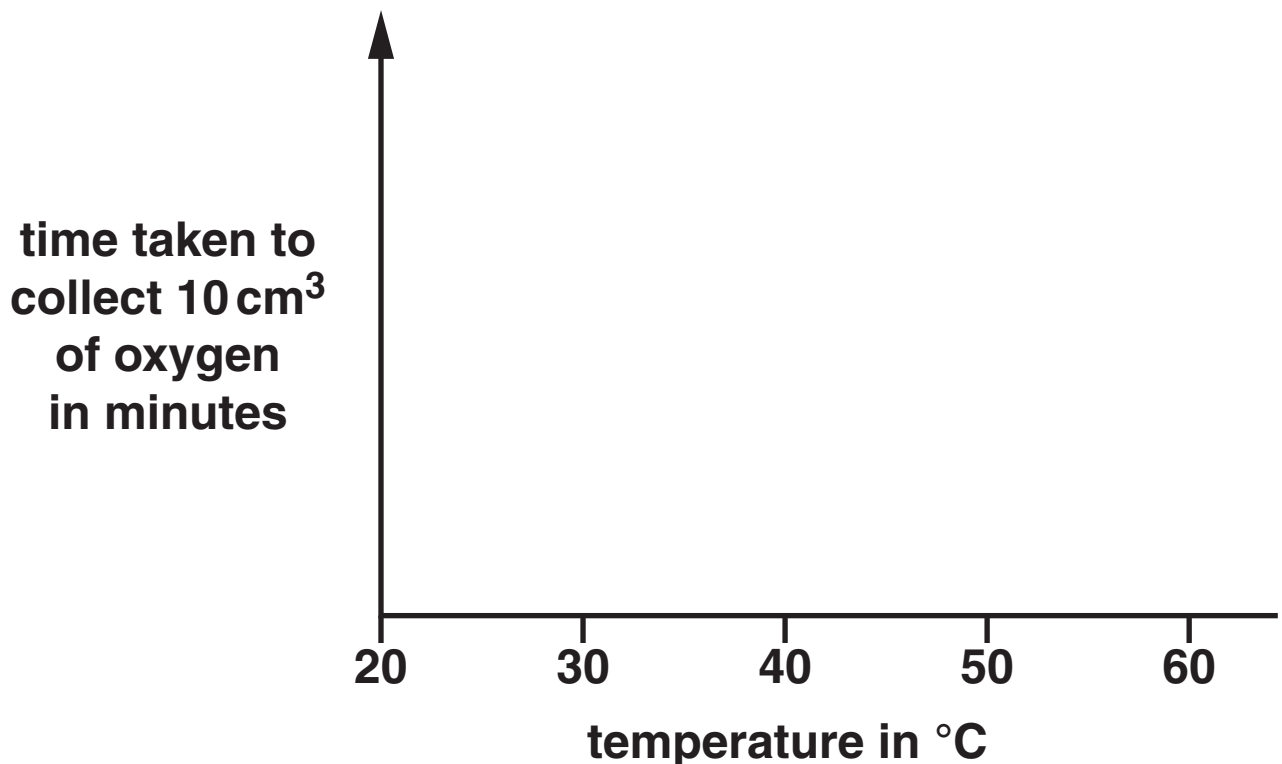
(b) Tyrone repeats his investigation.

This time he keeps the pH the same but changes the temperature.

He uses the temperatures 20 °C, 30 °C, 40 °C, 50 °C and 60 °C.

Catalase has an optimum temperature of 40 °C.

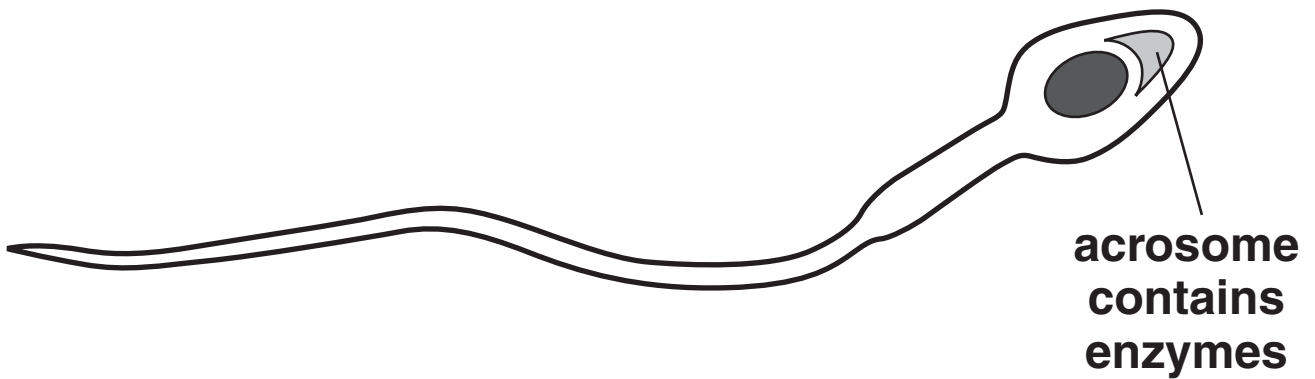
Draw a sketch graph to show the pattern Tyrone should expect in his results.



[2]

(c) Enzymes are found in cells.

The diagram shows where some enzymes are found in the SPERM CELL.



Write down the job of the enzymes in the acrosome.

[1]

[Total: 6]

3 Potato plants grow from potatoes.

(a) Nick puts a potato into the ground.

It grows into a potato plant.

This is an example of cloning.

Describe ONE advantage and ONE disadvantage of producing potato plants by cloning.

advantage _____

disadvantage _____

_____ [2]

(b) Plants can also be cloned by tissue culture.

One of the processes involved in tissue culture is selecting the plant with the correct characteristics.

Write about TWO OTHER processes involved in tissue culture.

1 _____

2 _____

_____ [2]

(c) New varieties of potato can be produced using selective breeding.

Look at the statements about selective breeding.

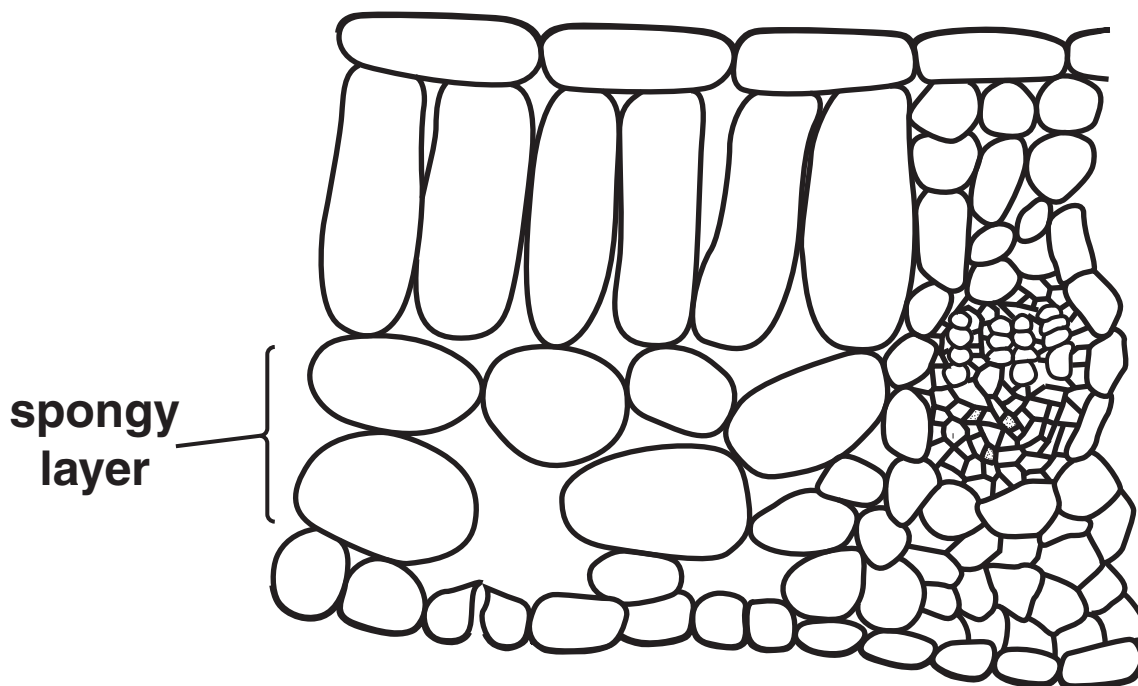
Put ticks (✓) in the boxes to show if each statement is true or false.

	<u>TRUE</u>	<u>FALSE</u>
it reduces variation	<input type="checkbox"/>	<input type="checkbox"/>
it increases the rate of mutation	<input type="checkbox"/>	<input type="checkbox"/>

[1]

[Total: 5]

- 4 Look at the diagram. It shows the cells in the leaf of a plant.



- (a) Oxygen moves out of the leaf during gas exchange.

What is the name of this process?

_____ [1]

- (b) The spongy layer is adapted for efficient gas exchange.

Explain how.

_____ [1]

(c) Cells have to differentiate to make all the different cells in a plant.

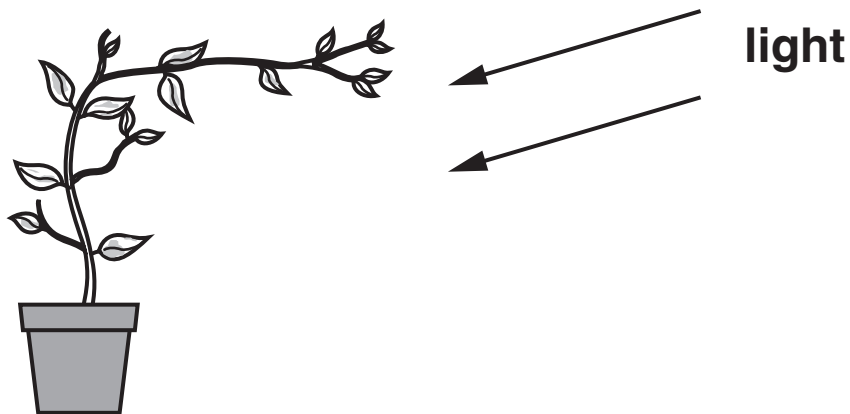
Cell differentiation in plants is different from animals.

Explain ONE way it is different.

_____ [1]

(d) Look at the diagram.

It shows a plant growing towards the light.



The plant grows towards the light because of auxin.

(i) Where in the plant stem is auxin made?

_____ [1]

(ii) Plants grow towards light.

What is the name given to this response?

_____ [1]

[Total: 5]

SECTION B – MODULE C3

5 Sodium reacts with water.

A gas which burns with a ‘pop’ is made.

An alkaline solution is also made.

(a) Complete the WORD equation for this reaction.

sodium + water → _____
+ _____ [2]

(b) All Group 1 elements react with water in a similar way.

Explain why. Use ideas about electronic structure.

_____ [1]

(c) Sodium reacts with water.

A sodium ion, Na⁺, is made.



What type of reaction is this?

Choose from:

DECOMPOSITION

ELECTROLYSIS

OXIDATION

REDUCTION

answer _____

Explain your answer.

_____ [2]

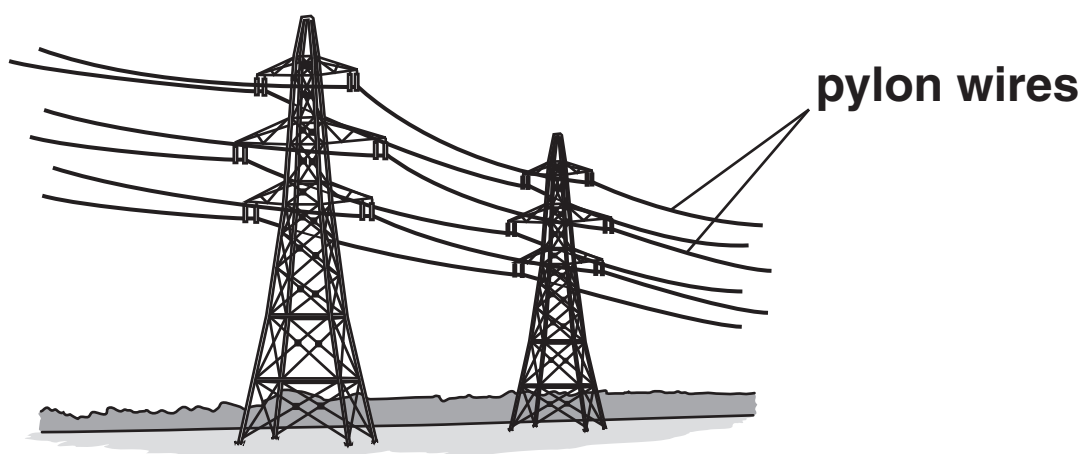
[Total: 5]

6 This question is about metals.

Look at the table. It shows the properties of some metals.

METAL	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
iron	1535	7.9	11	400
silver	962	10.5	67	20 000
zinc	420	7.1	18	870

(a) Aluminium is used to make pylon wires.



Silver and copper are better electrical conductors than aluminium.

Silver and copper are NOT used to make pylon wires.

Explain why silver and copper are NOT used to make pylon wires.

Use the table to help you.

[2]

(b) Which metal would be the best to use for a door stop for keeping doors open?

Choose from the table.

metal _____

Write down TWO reasons why.

[2]

(c) Metals are good conductors of electricity.

Explain how metals conduct electricity.

Use ideas about the structure of metals.

[2]

[Total: 6]

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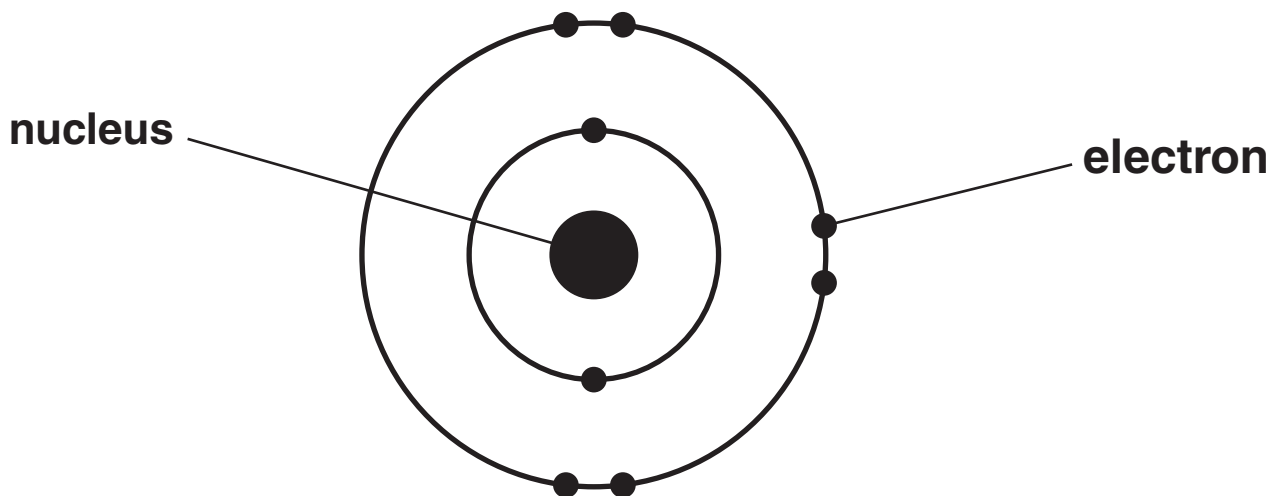
(d) the element in Group 2 and Period 5?

[1]

[Total: 4]

8 This question is about atoms.

Look at the diagram of an oxygen atom.



(a) The ATOMIC NUMBER of oxygen is 8.

What is meant by atomic number?

_____ [1]

(b) Oxygen reacts with sodium. Sodium oxide is made.

The electronic structure of oxygen is 2.6.

The electronic structure of sodium is 2.8.1.

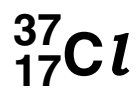
Describe the bonding in sodium oxide, Na₂O.

Your answer should include

- a dot and cross diagram**
- the charges on the ions made.**

[2]

(c) An atom of chlorine can be represented by the symbol



Complete the table about this atom of chlorine.

number of protons	17
number of neutrons	
number of electrons	17
electronic structure	

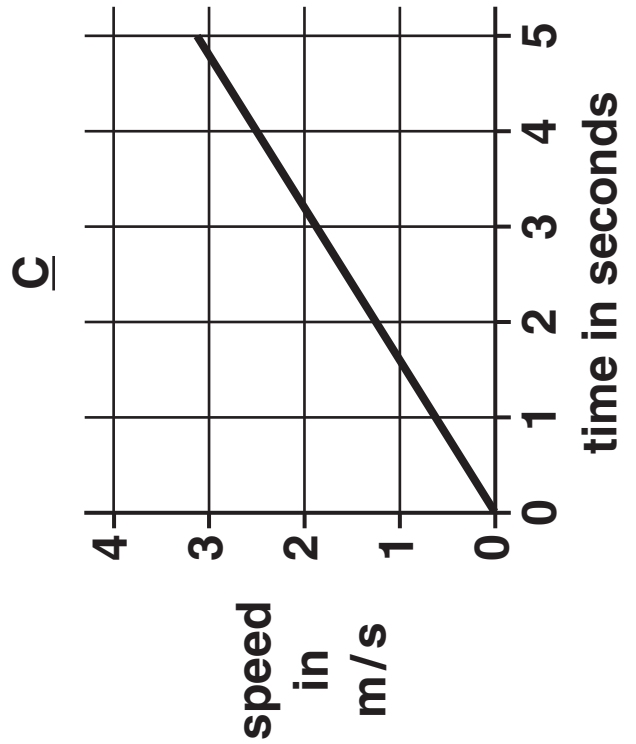
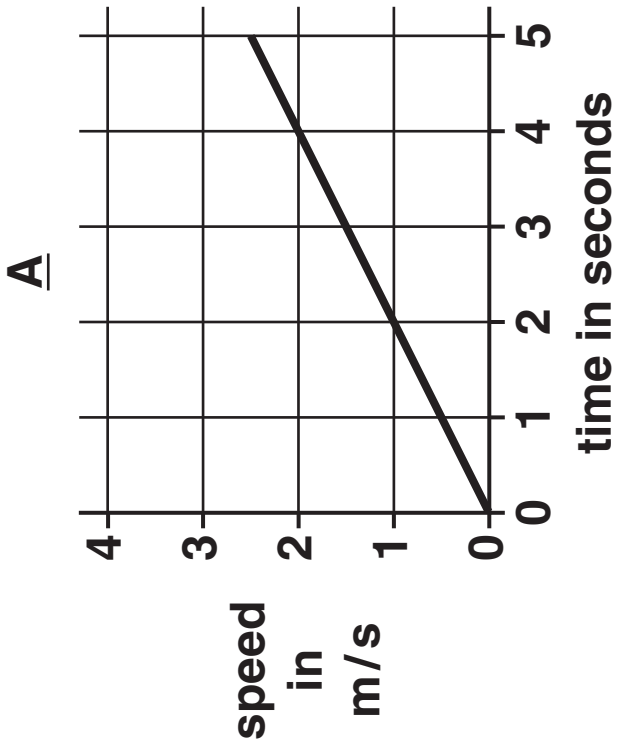
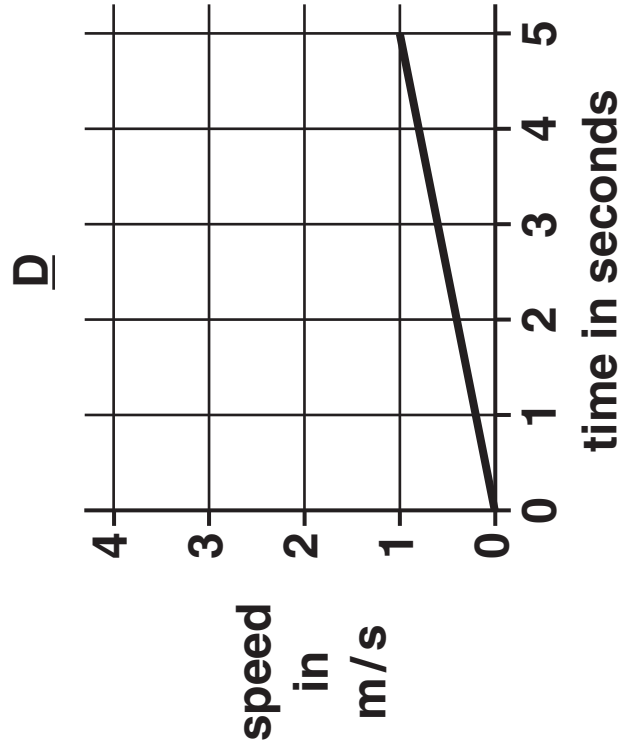
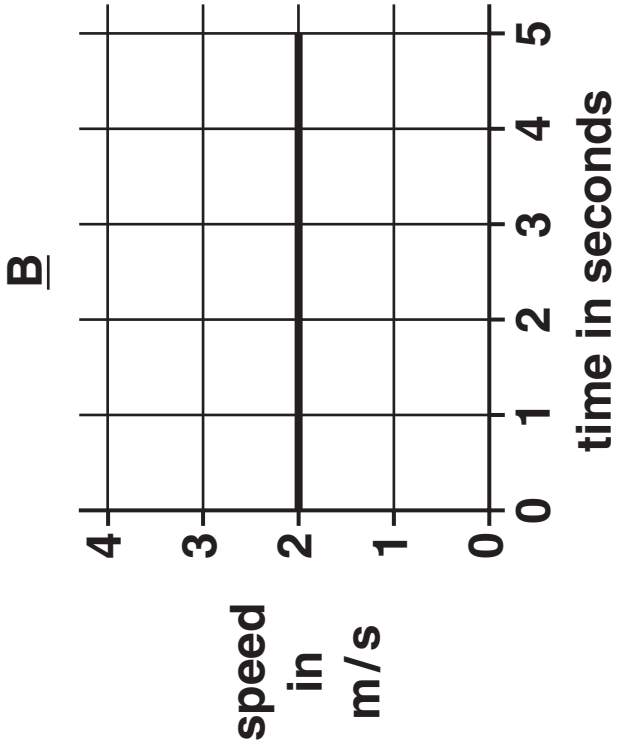
[2]

[Total: 5]

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SECTION C – MODULE P3

9 Look at the four speed–time graphs.



(a) (i) Which graph shows a distance of 5 m travelled in the first 4 seconds?

Choose from A B C D

answer _____ [1]

(ii) Which graph shows an acceleration of 0.2 m/s^2 ?

Choose from A B C D

answer _____ [1]

(b) Claire drives her car carefully. She needs to stop the car quickly.

(i) Some factors can increase or decrease her THINKING DISTANCE.

Some factors do NOT change her thinking distance.

Complete the table.

The first one is done for you.

FACTOR	THINKING DISTANCE		
	INCREASES	DECREASES	UNCHANGED
drinking alcohol	✓		
worn tyres			
answering mobile phone			
higher speed			

[1]

- (ii) Some factors can increase or decrease her BRAKING DISTANCE.

Some factors do NOT change her braking distance.

Complete the table.

The first one is done for you.

FACTOR	BRAKING DISTANCE		
	INCREASES	DECREASES	UNCHANGED
drinking alcohol			✓
worn tyres			
answering mobile phone			
higher speed			

[1]

[Total: 4]

10 Carley drives a car.

The total mass of the car and all the people in it is 1600 kg.



The engine produces a driving force of 4200 N.

During acceleration there is a frictional force (F) of 1000 N.

Calculate the acceleration of the car.

The equations on page 2 may help you.

answer _____ m/s² [3]

[Total: 3]

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11 This question is about the engine sizes of cars and how much pollution they make.

(a) Look at the table.

CAR	ENGINE SIZE IN cm³	CARBON DIOXIDE EMISSIONS IN g/km
A	6700	380
B	5700	360
C	4200	310
D	3500	280
E	1600	160
F	1100	115

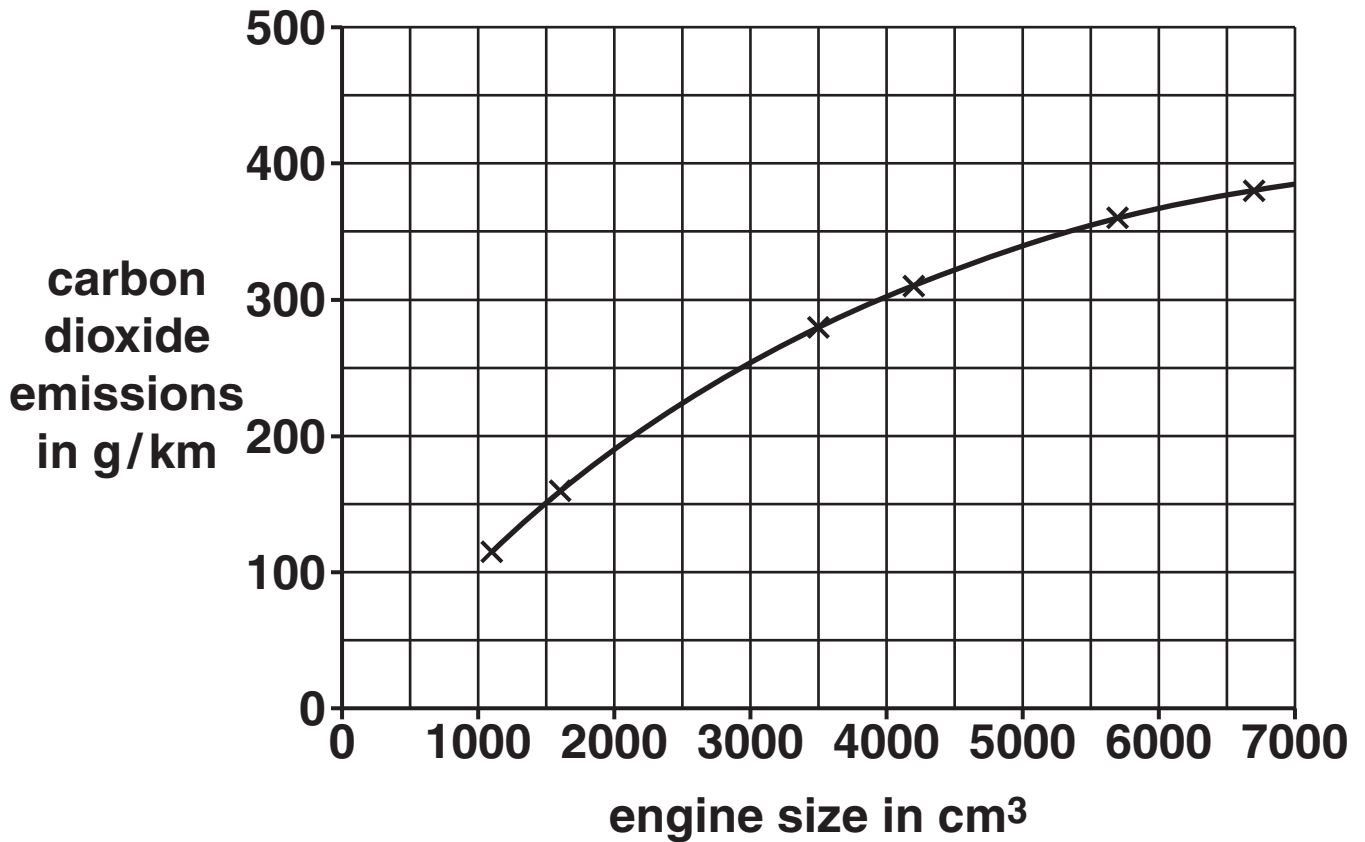
There is a pattern between the size of engine and the carbon dioxide emissions.

What is the pattern?

[1]

(b) The data is plotted on a graph.

Look at the graph.



(i) Many cars have an engine size of 2000 cm³.

What is the carbon dioxide emission for an engine this size?

answer _____ g/km [1]

(ii) Many cars have smaller engines.

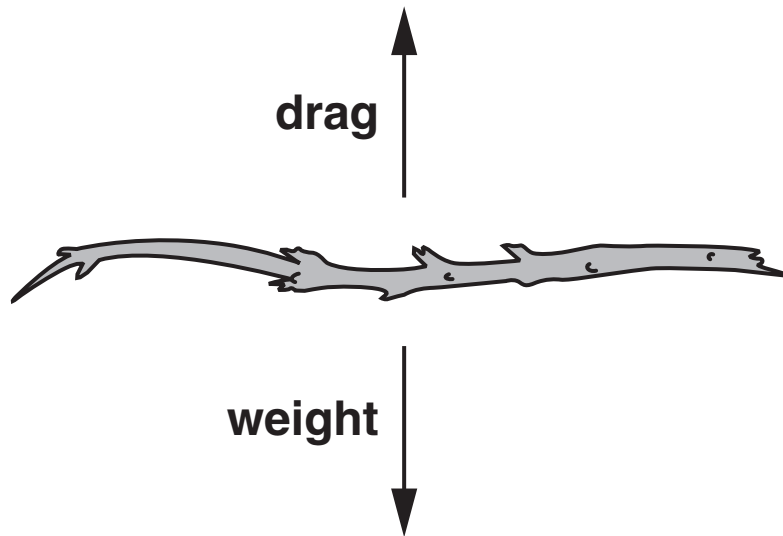
Extend the graph to find the carbon dioxide emission from a 600 cm³ engine.

answer _____ g/km [1]

[Total: 3]

12 (a) Dina drops a twig from a high bridge.

When it hits the ground it is travelling at its terminal speed.



(i) The twig increases in speed when it is dropped.

Explain why.

[1]

(ii) The twig travels at a terminal speed before it hits the ground.

Explain why.

[1]

(b) The weight of the twig is 5 N.

Write down the size of the drag when the twig reaches TERMINAL SPEED.

answer _____ N [1]

[Total: 3]

13 (a) Different cars have different fuel consumptions.

Look at what four drivers say about their cars.

FIONA

'My car does 12 km per litre.'

GREG

**'My car has the best fuel consumption.
It does 8 km per litre.'**

HELEN

'My car does 13 km per litre.'

IVOR

'My car does 6 km per litre.'

Greg is wrong.

Whose car has the best fuel consumption?

Explain why.

[1]

- (b) Switching on air conditioning increases the amount of fuel a car uses.**

Write down one OTHER factor that INCREASES the amount of fuel a car uses.

Factor _____

Explain why this increases the amount of fuel used.

_____ [1]

- (c) Jennie's car is fitted with an air bag.**

The car is involved in a crash.

- (i) What does the air bag absorb in a crash?**

_____ [1]

(ii) An air bag reduces the forces on the driver in a crash.

Explain how.

In your answer write about

- **stopping time**
- **acceleration.**

[3]

(d) Tessa's car has electric windows.

They are a safety feature.

Suggest how electric windows can make cars safer.

[1]

[Total: 7]

END OF QUESTION PAPER



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