

## GENERAL CERTIFICATE OF SECONDARY EDUCATION

## GATEWAY SCIENCE

B623/01

## ADDITIONAL SCIENCE B

Unit 1 Modules B3 C3 P3 (Foundation Tier)



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)

**Wednesday 20 January 2010**  
**Morning**

**Duration: 1 hour**

Candidate Forename		Candidate Surname	
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Centre Number						Candidate Number			
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**INSTRUCTIONS TO CANDIDATES**

- Write your name clearly in capital letters, your Centre Number and Candidate Number in the boxes above.
- 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.
- Do **not** write in the bar codes.
- 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 two.
- The Periodic Table is printed on the back page.
- The total number of marks for this paper is **60**.
- This document consists of **24** pages. Any blank pages are indicated.

**2**  
**EQUATIONS**

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

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

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

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

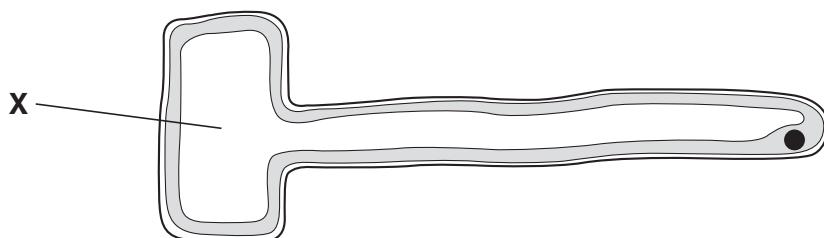
$$\text{power} = \frac{\text{work done}}{\text{time}}$$

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

Answer **all** the questions.

**Section A – Module B3**

1 Look at the diagram of a root hair cell from a plant.



(a) Part **X** contains cell sap.

(i) Write down the **name** of part **X**.

..... [1]

(ii) Write down the **job** of part **X**.

..... [1]

(b) The nucleus of the plant cell contains genes.

Write down the name of the chemical that genes are made of.

..... [1]

(c) Plants contain lots of different shaped cells.

The cells do different jobs.

What process makes cells different?

Put a **(ring)** around the correct answer.

**cell differentiation**

**cell division**

**mitosis**

[1]

(d) The roots of a plant grow downwards.

This is because roots respond to gravity.

The shoots of a plant grow upwards.

Explain why shoots grow upwards.

..... [1]

**[Total: 5]**

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2 Look at the picture. It shows a mechanical heart.



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

(a) Finish the sentences about the human heart.

Use words from this list.

**arteries**

**body**

**fast**

**high**

**low**

**lungs**

**veins**

The heart acts as a pump. The right side pumps blood to the .....

The heart is attached to blood vessels.

The vessels taking blood away from the heart are called .....

The blood leaving the heart is under ..... pressure.

[3]

(b) Write down **one** problem of using mechanical hearts.

.....

..... [1]

(c) Scientists are hoping to use pigs to provide hearts for transplant.

First they need to transfer human genes into pigs.

Write down the name of this process.

..... [1]

**[Total: 5]**

**Turn over**

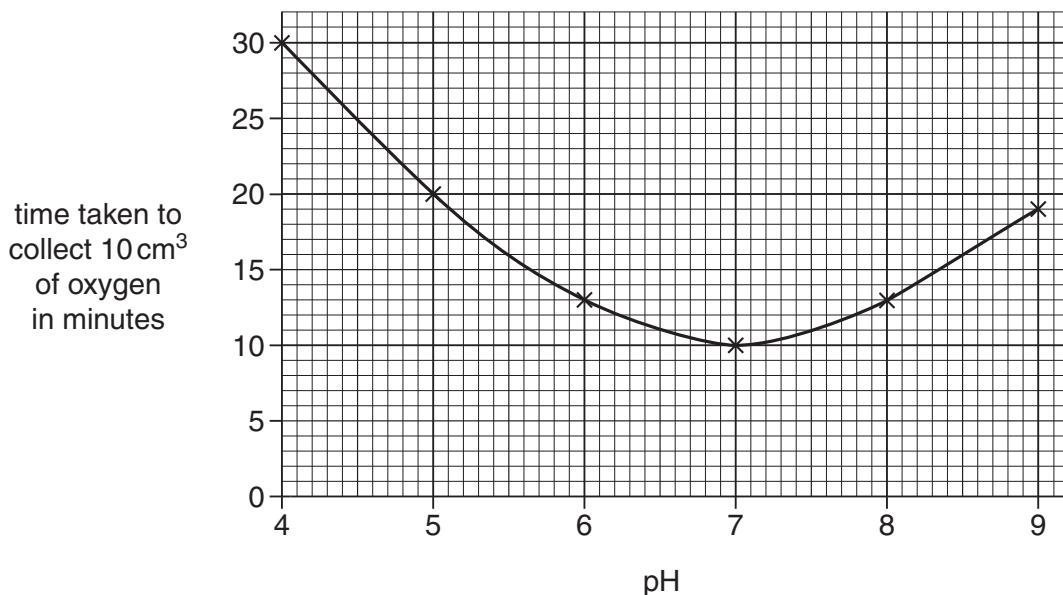
3 Tyrone is investigating the effect of pH on catalase enzyme.

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

He times how long it takes to collect 10 cm<sup>3</sup> of oxygen.

The graph shows his results.

**effect of pH on catalase activity**



(a) Use the graph to answer these questions.

(i) How long does it take Tyrone to collect 10 cm<sup>3</sup> of oxygen at pH 5?

..... minutes

[1]

(ii) Write down the **optimum** pH of the enzyme catalase.

pH .....

[1]

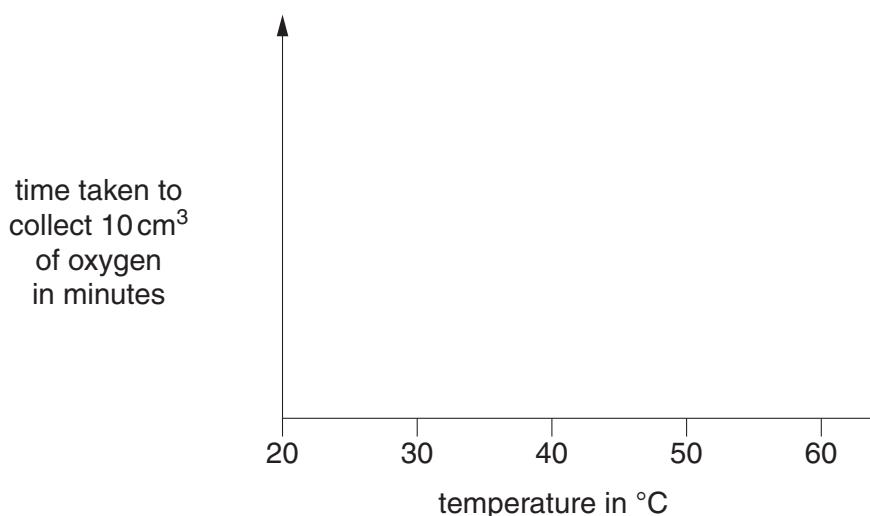
(b) Tyrone repeats his investigation.

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.

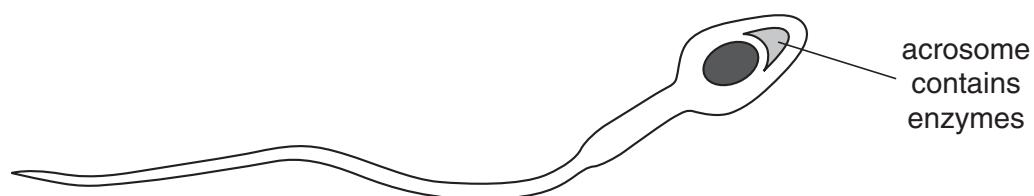
Draw a sketch graph to show the pattern Tyrone should expect in his results.



[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]

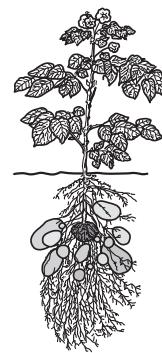
**[Total: 5]**

4 Potato plants grow from potatoes.

(a) Nick puts a potato into the ground.

It grows into a potato plant.

Write about how this happens.



.....  
.....  
.....

[2]

(b) The new plant is a clone.

Write down the name of the type of reproduction that makes clones.

.....

[1]

(c) Look at the statements about clones.

Put a tick (✓) in the box next to the correct statement.

clones are genetically different

clones always have two parents

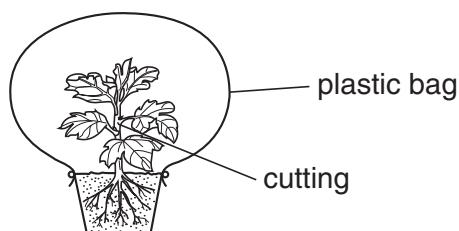
identical twins are not clones

Dolly the sheep was the first mammal cloned from an adult

[1]

(d) Taking cuttings from plants can also make clones.

The cuttings are put into compost then placed inside a clear plastic bag.



Suggest why they are placed inside the plastic bag.

.....  
.....

[1]

**[Total: 5]**

## Section B – Module C3

5 This question is about the Group 1 elements.

(a) Sodium is a Group 1 element.

Write down the name of one **other** Group 1 element.

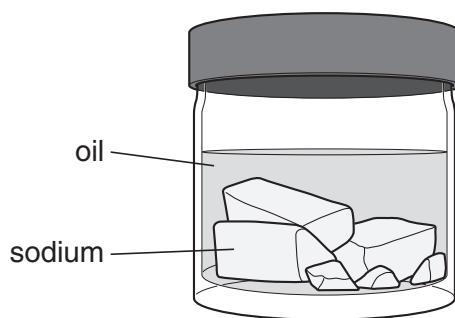
..... [1]

(b) The Group 7 elements are called the halogens.

Finish the sentence.

The Group 1 elements are called the ..... [1]

(c) Look at the diagram of a bottle of sodium.



Sodium is stored under oil.

Explain why.

.....  
.....  
..... [2]

(d) Sodium reacts with water.

A gas which burns with a 'pop' is made.

An alkaline solution is also made.

Complete the **word** equation for this reaction.

sodium + water → ..... + ..... [2]

[Total: 6]

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/cm <sup>3</sup>	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	20000
zinc	420	7.1	18	870

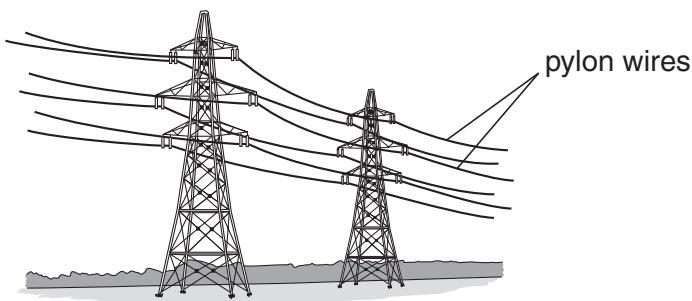
(a) Which metal has the **highest** melting point?

answer ..... [1]

(b) Which metal has a density of 7.1 g/cm<sup>3</sup>?

answer ..... [1]

(c) 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]

(d) Write down one **other** property of metals **not** shown in the table.

..... [1]

[Total: 5]

7 Look at the diagram. It shows an outline of the Periodic Table.

Answer the questions.

Choose your answers **only** from the symbols shown on the outline table.

Use the Periodic Table on the back page to help you.

(a) Which symbol shows

(i) a transition element? ..... [1]

(ii) an element that gives a lilac colour in a flame test? ..... [1]

(iii) an element used to sterilise water? ..... [1]

(iv) an element whose atoms have 8 electrons in their outer shell? ..... [1]

**(b)** Which symbols show

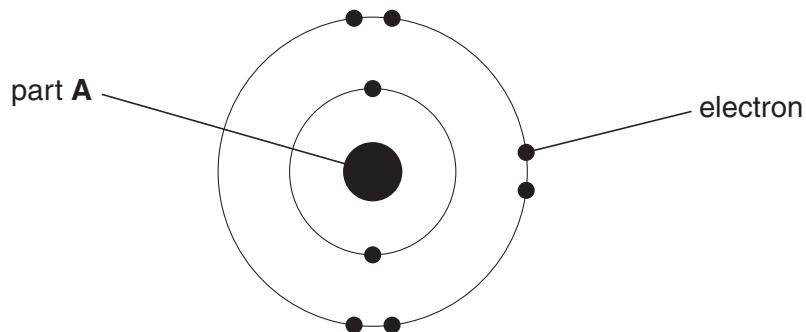
(i) two elements in the same **group**? ..... and ..... [1]

(ii) two elements in the same **period**? ..... and ..... [1]

[Total: 6]

8 This question is about atoms.

Look at the diagram of an oxygen atom.



(a) What is the name of part A?

..... [1]

(b) What is the charge on an electron?

Choose from:

**negative**

**neutral**

**positive**

answer ..... [1]

(c) The **atomic number** of oxygen is 8.

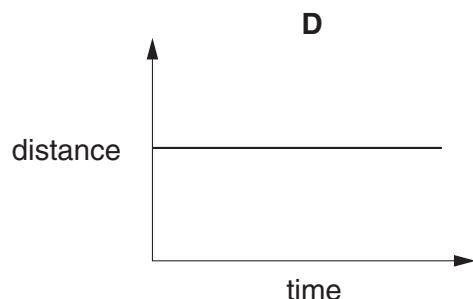
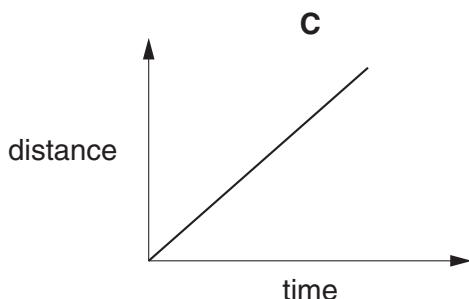
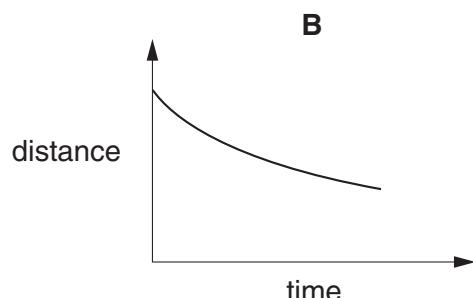
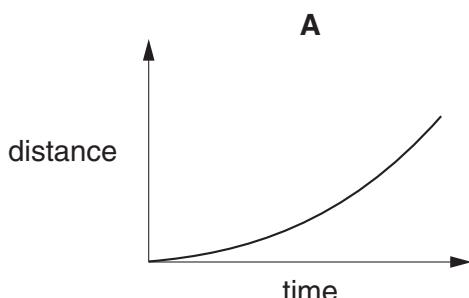
What is meant by atomic number?

..... [1]

**[Total: 3]**

9 This question is about the speed of different cars.

(a) Look at the four graphs of distance against time for the cars.



(i) Which graph shows a car **moving** at a steady speed?

Choose from **A** **B** **C** **D**

answer .....

[1]

(ii) Which graph shows a **stationary** car?

Choose from **A** **B** **C** **D**

answer .....

[1]

(b) Katya calculates the speed of cars passing the school.

She uses a stopwatch and a trundle wheel.

She measures the time with the stopwatch.

What does she measure with the trundle wheel?

..... [1]

[Total: 3]

10 Leon drives a car.



The car engine produces a driving force.

(a) Leon increases the driving force.



What happens to the **speed** of the car?

..... [1]

(b) Leon's car has a top speed of 160 km/hr.

He fits a roof box on to the car.



What happens to the **top speed** of the car?

..... [1]

(c) A passenger gets into the car with Leon.

Leon does not change the driving force.



What happens to the **acceleration** of the car?

..... [1]

**[Total: 3]**

15

11 Claire drives her car carefully. She needs to stop the car quickly.

(a) 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]

(b) 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: 2]

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

(a) Look at the table.

car	engine size in cm <sup>3</sup>	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.

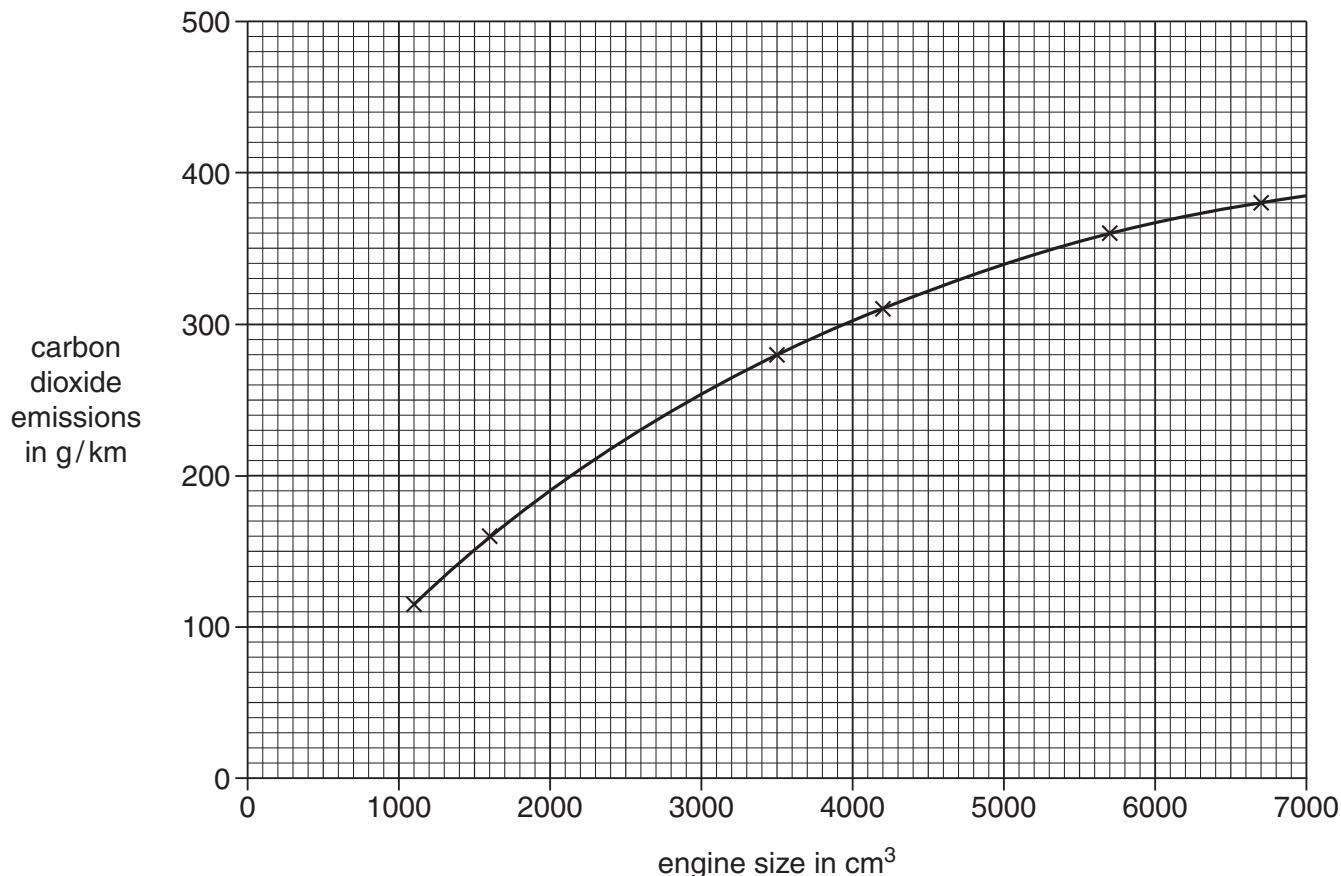
What is the pattern?

.....  
.....

[1]

(b) The data is plotted on a graph.

Look at the graph.



(i) Many cars have an engine size of  $2000 \text{ cm}^3$ .

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

answer .....  $\text{g}/\text{km}$

[1]

(ii) Many cars have smaller engines.

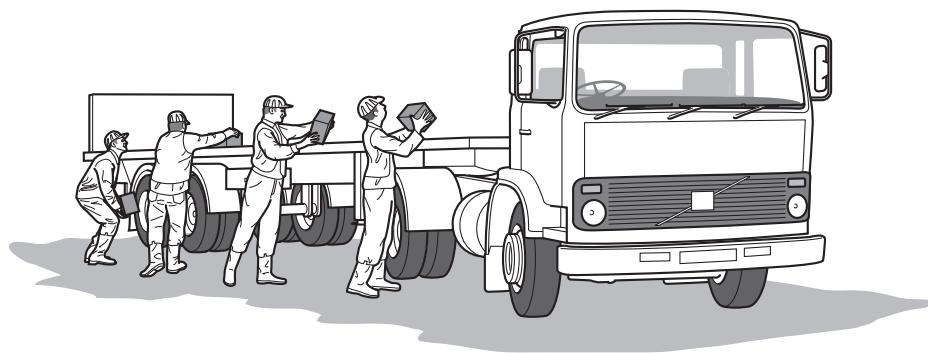
Extend the graph to find the carbon dioxide emission from a  $600 \text{ cm}^3$  engine.

answer .....  $\text{g}/\text{km}$

[1]

**[Total: 3]**

13 Four builders load identical bricks on to a lorry.



Look at the information about the four builders.

name of builder	number of bricks loaded	time taken to load 10 bricks in seconds
Mike	80	25.0
Nick	40	30.0
Owen	120	33.0
Phil	100	20.0

(a) Owen does the most work.

Explain why.

.....  
.....

[1]

(b) Phil is the most powerful.

Explain why.

.....  
.....

[1]

[Total: 2]

14 Cars use different energy sources.

(a) Ralph's car uses a fossil fuel.



Write down the name of **one** fossil fuel that is used in cars.

..... [1]

(b) Sanjay has an electric car.

Write about how Sanjay's car uses energy.

Use ideas about

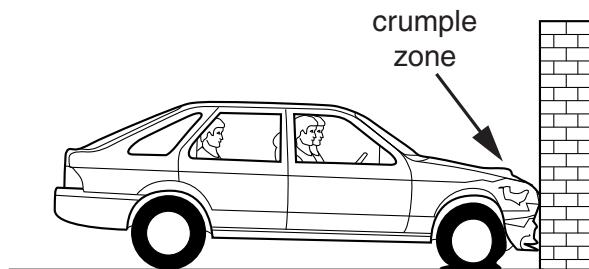
- how the energy is collected
- how the energy is stored.

.....  
.....  
.....  
.....

[2]

[Total: 3]

15 Cars have crumple zones.



They absorb energy in a crash.

(a) Write down the name of one **other** safety feature that absorbs energy in a crash.

..... [1]

(b) Tessa drives her car.

She puts the brakes on.

Complete the sentence.

Most of the kinetic energy of the car is converted into ..... energy by the brakes. [1]

(c) Tessa's car has electric windows.

They are a safety feature.

Suggest how electric windows can make cars safer.

..... [1]

(d) The seat belts of a car must be replaced after an accident.

Explain why.

..... [1]

[Total: 4]

**END OF QUESTION PAPER**

**21**

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22

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# The Periodic Table of the Elements

1	2	3	4	5	6	7	0
7 <b>Li</b> lithium 3	9 <b>Be</b> beryllium 4	11 <b>B</b> boron 5	12 <b>C</b> carbon 6	14 <b>N</b> nitrogen 7	16 <b>O</b> oxygen 8	19 <b>F</b> fluorine 9	20 <b>Ne</b> neon 10
23 <b>Na</b> sodium 11	24 <b>Mg</b> magnesium 12	27 <b>Al</b> aluminium 13	28 <b>Si</b> silicon 14	31 <b>P</b> phosphorus 15	32 <b>S</b> sulfur 16	35.5 <b>Cl</b> chlorine 17	40 <b>Ar</b> argon 18
39 <b>K</b> potassium 19	40 <b>Ca</b> calcium 20	45 <b>Sc</b> scandium 21	48 <b>Ti</b> titanium 22	51 <b>V</b> vanadium 23	52 <b>Cr</b> chromium 24	55 <b>Mn</b> manganese 25	56 <b>Fe</b> iron 26
85 <b>Rb</b> rubidium 37	88 <b>Sr</b> strontium 38	91 <b>Y</b> yttrium 39	93 <b>Zr</b> zirconium 40	96 <b>Mo</b> molybdenum 42	[98] <b>Tc</b> technetium 43	101 <b>Ru</b> ruthenium 44	103 <b>Rh</b> rhodium 45
133 <b>Cs</b> caesium 55	137 <b>Ba</b> barium 56	139 <b>La*</b> lanthanum 57	178 <b>Hf</b> hafnium 72	181 <b>Ta</b> tantalum 73	184 <b>W</b> tungsten 74	186 <b>Re</b> rhenium 75	190 <b>Os</b> osmium 76
[226] <b>Fr</b> francium 87	[227] <b>Ra</b> radium 88	[261] <b>Ac*</b> actinium 89	[262] <b>Rf</b> rutherfordium 104	[266] <b>Sg</b> seaborgium 106	[264] <b>Bh</b> bohrium 107	[277] <b>Hs</b> hassium 108	[271] <b>Mt</b> meitnerium 109
					[271] <b>Ds</b> darmstadtium 110	[272] <b>Rg</b> roentgenium 111	

Elements with atomic numbers 112-116 have been reported but not fully authenticated

\* 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.