OCR
RECOGNISING ACHIEVEMENT

H

GENERAL CERTIFICATE OF SECONDARY EDUCATION

GATEWAY SCIENCE **B623/02**

ADDITIONAL SCIENCE B

Unit 1 Modules B3 C3 P3 (Higher Tier)

Candidate forename		Candidate surname	

Centre number					Candidate number				

MODIFIED LANGUAGE

INSTRUCTIONS TO CANDIDATES
* Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
* Use black ink. Pencil may be used for graphs and diagrams only.
* 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).
* Answer **all** the questions.
* Do **not** write in the bar codes.

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 **20** pages. Any blank pages are indicated.

Turn over

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   The diagram shows human lungs.

Air passes down the windpipe to lots of small air sacs.

The air sacs allow gases to pass into and out of the blood.
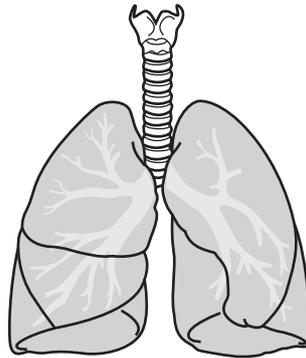
(a) What is the name of the small air sacs in the lungs?

.... **[1]**

(b) The air sacs are adapted to allow efficient movement of gases into and out of the blood.

Write down **one** way in which they are adapted.

.... **[1]**

(c) It is difficult for Julie to get air into her lungs.

This is because her windpipe is damaged.

Doctors repair her windpipe using stem cells.

Suggest why they use stem cells.

....

.... **[1]**

[Total: 3]

2 The table shows some information about the three main types of blood vessel in the body.

type of blood vessel	diameter in mm	average thickness of wall in mm	percentage of the body's blood contained in the vessel
arteries	4 – 25	1	
capillaries	0.01	0.001	5
veins	5 – 30	0.5	60

(a) Capillaries carry blood from arteries to veins.

   (i) What is **another** function of capillaries in the body?

   ....

   .... **[1]**

   (ii) Explain how **one** adaptation of capillaries allows them to work efficiently.

   You must include information from the table in your answer.

   adaptation ....

   explanation ....

   .... **[2]**

(b) **(i)** The heart contains 12 % of the body's blood.

   Calculate the percentage of the body's blood contained in the arteries.

   ....

   ....

   answer .... %   **[1]**

   (ii) The heart pumps blood out into two arteries.

   One of these is the pulmonary artery.

   Write down the name of the **other** artery.

   .... **[1]**

   [Total: 5]

3 Read this newspaper article carefully.

Scientists clone a frozen mouse

Scientists have produced clones of a mouse that has been dead and frozen for 16 years.

This comes 11 years after the first living adult mammal was cloned.

Scientists used to think it was impossible to clone dead, frozen animals because of cell damage. Genetic material is destroyed when ice crystals form inside cells.

The scientists used genetic material from brain cells because the high fat content protected the cells from ice damage.

This work may be used on humans in the future. This would raise many ethical issues.

(a) Finish the following sentences about the cloned mice.

The cloned mice contain the same genetic material as the frozen mouse.

The genetic code is determined by the sequence of ………………..……………… in DNA.

Identical genetic material will code for the production of identical ………………..……………… molecules. **[2]**

(b) The mice were produced by a cloning process similar to the one used to produce Dolly the sheep.

Write about how this cloning process is performed.

....

....

....

....

.... **[3]**

Turn over for the remainder of question 3

(c) The article claims that there are possible ethical issues if this technique were to be used on humans.

One of these statements does **not** contain an ethical issue.

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

In the future, humans could be frozen after death and cloned. ☐

The technique took years to develop. ☐

Many of the embryos produced by this technique die because they are abnormal. ☐

Children produced by cloning may be expected to develop certain skills. ☐

[1]

[Total: 6]

4 The diagram shows a soya plant growing in soil.

(a) When a plant grows, new cells are made by cell division.

Where in the plant does cell division occur?

....

.... **[1]**

(b) The shoot of the soya plant is growing towards light.

(i) What name is given to this growth response?

.... **[1]**

(ii) Plant hormones control the growth of the soya plant.

Write down the name of **one** of these plant hormones.

.... **[1]**

(c) Scientists have used genetic engineering to produce soya plants that are resistant to herbicide (weed killer).

(i) Suggest why some farmers want to grow these genetically engineered plants.

....

.... **[1]**

(ii) Some people think it is wrong to use such genetically engineered plants and some people think that they are useful.

Suggest how people's views on this subject may be affected by where they live in the world.

....

....

.... **[2]**

[Total: 6]

Section B – Module C3

5 This question is about the elements in the Periodic Table.

Look at the list of elements.

aluminium	**bromine**
chlorine	**fluorine**
gold	**helium**
hydrogen	**iron**
oxygen	**phosphorus**
sulfur	**zinc**

Answer the questions.

Choose your answers from the list.

Each element can be used **once**, **more than once** or **not at all**.

The Periodic Table on the back page may help you.

(a) Which element is a green gas at room temperature?

.... [1]

(b) Which element is an orange liquid at room temperature?

.... [1]

(c) Dilute sulfuric acid is electrolysed.

Which element is made at the positive electrode (anode)?

.... [1]

(d) Which element is used as a catalyst in the Haber process?

.... [1]

[Total: 4]

6 Iron and copper are typical metals.

**(a)** Look at the picture of some electrical wires.
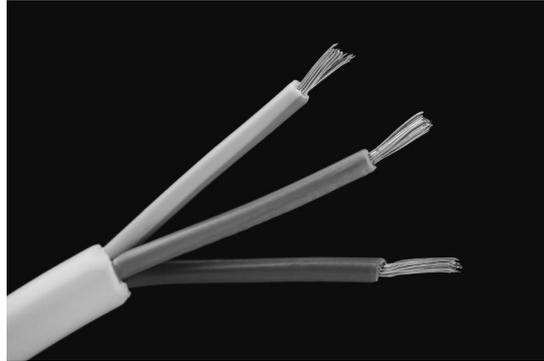
Copper is used to make electrical wire even though it is expensive.

This is because copper is a good conductor of electricity.

Write down one **other** reason why copper is used to make electrical wires.

.... **[1]**

(b) Look at the diagram. It shows the structure of a metal.
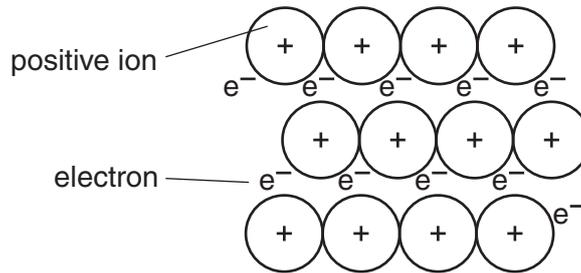
(i) Copper conducts electricity.

Explain why. Use ideas about the structure of metals.

....

.... **[1]**

(ii) Iron has a very high melting point.

Explain why. Use ideas about the structure of metals.

....

....

....

.... **[2]**

[Total: 4]

Turn over

7 All elements are made up of atoms.

Look at the diagram of an atom of an element.

nucleus

○ = proton

● = neutron

X = electron
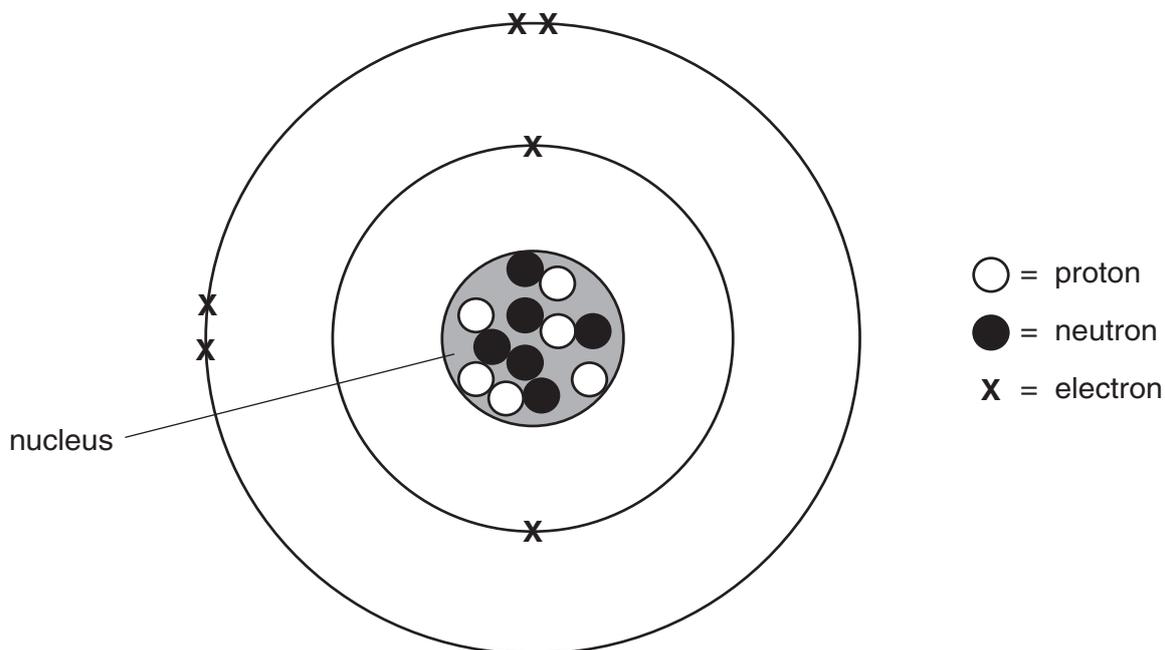
(a) To which **group** of the Periodic Table does the element belong?

.... **[1]**

(b) This element is in period **2** of the Periodic Table.

How can you tell from the diagram of the atom?

.... **[1]**

(c) The atom has a mass number of 12.

How can you tell from the diagram of the atom?

.... **[1]**

(d) Complete the table about the particles found in atoms.

particle	relative electric charge	relative mass
electron	....	0.0005
neutron	0	....
proton	+1	1

[2]

(e) Explain why an atom of this element is neutral.

………..

………..[1]

[Total: 6]

Turn over

**8** Fluorine, chlorine and bromine are halogens.

Lithium, sodium and potassium are alkali metals.

Lithium reacts with bromine to make lithium bromide.

$$2Li + Br_2 \rightarrow 2LiBr$$
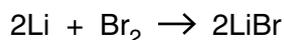
In this reaction lithium ions are made.

(a) Lithium atoms make lithium ions, Li^+.

Finish the sentence about how this happens.

Lithium atoms lose .... to make positive lithium ions.   **[1]**

(b) Potassium reacts with fluorine to make potassium fluoride.

Write the **balanced symbol** equation for this reaction.

.... **[2]**

(c) The reaction between potassium and fluorine is more violent than that of lithium and bromine.

One reason is that fluorine is more reactive than bromine.

Explain why fluorine is more reactive.

Use ideas about gain of electrons.

....

.... **[1]**

(d) Chlorine has the electronic structure 2.8.7.

Draw a 'dot and cross' diagram to show the bonding in a chlorine molecule, Cl_2.

You only need to draw the electrons in the outer shells.

[2]

[Total: 6]

Section C – Module P3

9 This question is about the energy and speed of a roller coaster.

(a) An electric motor pulls the roller coaster car up the slope.

pulling force = 1000 N
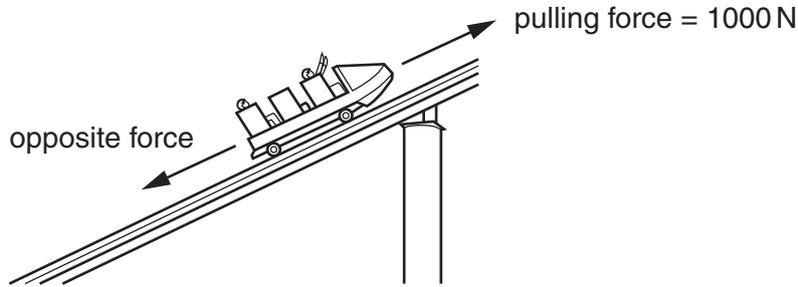
opposite force

(i) The car moves 20 m.

The pulling force is 1000 N.

Calculate the work done on the car.

The equations on page 2 may help you.

....

....

answer.. J **[2]**

(ii) The car climbs the slope at a **steady speed**.

What is the size of the opposite force when the speed is steady?

answer.. N **[1]**

Turn over for the remainder of question 9

(b) Look at the diagram of the roller coaster.
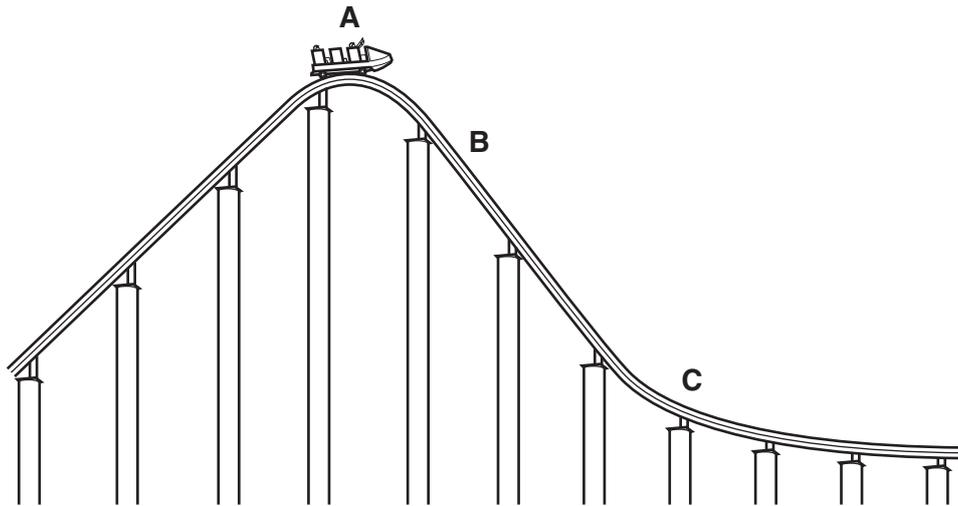
The car stops at point **A**.

What type of energy does the car have when it stops here?

.... **[1]**

(c) The car rolls down the slope.

At point **B** its speed is 6 m/s.

At point **C** its speed has doubled to 12 m/s.

What happens to its **kinetic** energy between point **B** and point **C**?

....

.... **[2]**

[Total: 6]

10 Look at the diagram.

It shows the stopping distance of a car travelling at 16 m/s.

| thinking distance = 12 m | braking distance = 24 m |
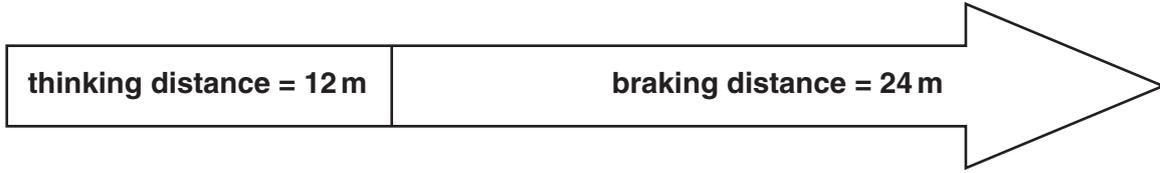
(a) Thinking distance **and** braking distance both increase when cars go faster.

(i) Write down two **other** things that can increase the **thinking** distance.

1 ....

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

(ii) Write down one **other** thing that can increase **braking** distance.

.... **[1]**

(b) Another car travels at 32 m/s.

This car brakes suddenly.

Look at the speed – time graph of the car.
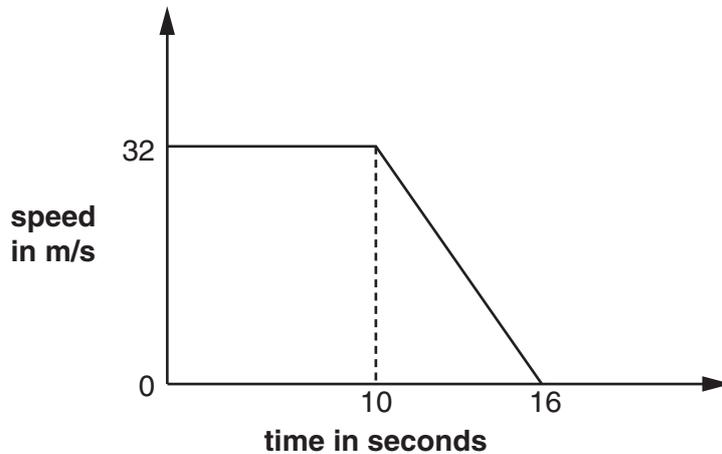
The car brakes in 6 s.

Use the graph to calculate the distance the car moves while **braking**.

....

....

answer .... m **[2]**

[Total: 5]

11 This question is about the fuel consumption of different vehicles.

Look at the information on fuel consumption.

type of vehicle	fuel consumption in kilometres per litre	number of people carried by vehicle
bus	3	60
car	11	4
motorbike	23	2
tractor	4	1

(a) The motorbike has the lowest fuel consumption.

How far can the motorbike travel on 5 litres of fuel?

....

answer .... km **[1]**

(b) The bus is better for the environment than the motorbike.

Use the information in the table to explain why.

....

.... **[1]**

(c) The average fuel consumption of the car is 11 kilometres per litre but this consumption can vary from 7 to 13 kilometres per litre.

Suggest **two** reasons for this variation.

1 ....

....

2 ....

.... **[2]**

[Total: 4]

12 Cars have crumple zones.
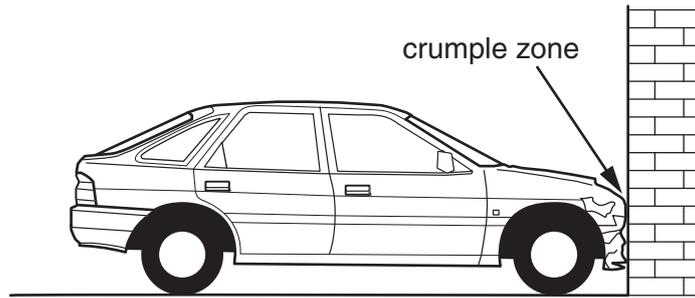
crumple zone

Crumple zones absorb energy and help to reduce injuries in a crash.

Explain why.

In your answer use ideas about

- force

- time

- acceleration.

....

....

....

....

.... **[3]**

[Total: 3]

Turn over

13 A car has a maximum driving force of 2000 N.

It has a top speed of 140 km/h.

Look at the diagram.

140 km/h

2000 N driving force

2000 N drag force
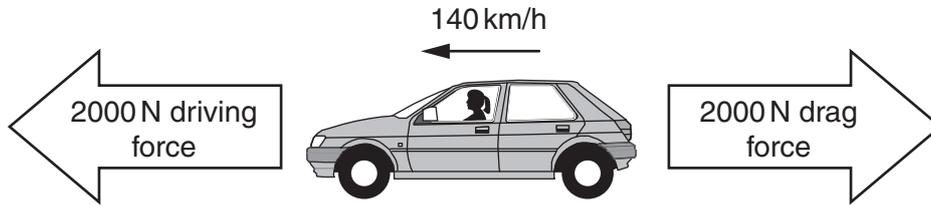
A roof box is placed on top of the car. Look at the diagram.

2000 N driving force
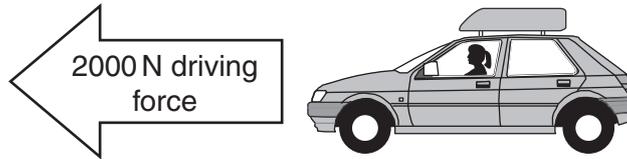
Explain why the roof box affects the drag force.

....

....

Explain why the top speed is lower with the roof box.

....

....

.... **[2]**

[Total: 2]

END OF QUESTION PAPER

PLEASE DO NOT WRITE ON THIS PAGE

The Periodic Table of the Elements

Key

relative atomic mass
atomic symbol
name
atomic (proton) number

1	2													3	4	5	6	7	0
						1 **H** hydrogen 1													4 **He** helium 2
7 **Li** lithium 3	9 **Be** beryllium 4													11 **B** boron 5	12 **C** carbon 6	14 **N** nitrogen 7	16 **O** oxygen 8	19 **F** fluorine 9	20 **Ne** neon 10
23 **Na** sodium 11	24 **Mg** magnesium 12													27 **Al** aluminium 13	28 **Si** silicon 14	31 **P** phosphorus 15	32 **S** sulfur 16	35.5 **Cl** chlorine 17	40 **Ar** argon 18
39 **K** potassium 19	40 **Ca** calcium 20	45 **Sc** scandium 21	48 **Ti** titanium 22	51 **V** vanadium 23	52 **Cr** chromium 24	55 **Mn** manganese 25	56 **Fe** iron 26	59 **Co** cobalt 27	59 **Ni** nickel 28	63.5 **Cu** copper 29	65 **Zn** zinc 30	70 **Ga** gallium 31	73 **Ge** germanium 32	75 **As** arsenic 33	79 **Se** selenium 34	80 **Br** bromine 35	84 **Kr** krypton 36
85 **Rb** rubidium 37	88 **Sr** strontium 38	89 **Y** yttrium 39	91 **Zr** zirconium 40	93 **Nb** niobium 41	96 **Mo** molybdenum 42	[98] **Tc** technetium 43	101 **Ru** ruthenium 44	103 **Rh** rhodium 45	106 **Pd** palladium 46	108 **Ag** silver 47	112 **Cd** cadmium 48	115 **In** indium 49	119 **Sn** tin 50	122 **Sb** antimony 51	128 **Te** tellurium 52	127 **I** iodine 53	131 **Xe** xenon 54
133 **Cs** caesium 55	137 **Ba** barium 56	139 **La*** lanthanum 57	178 **Hf** hafnium 72	181 **Ta** tantalum 73	184 **W** tungsten 74	186 **Re** rhenium 75	190 **Os** osmium 76	192 **Ir** iridium 77	195 **Pt** platinum 78	197 **Au** gold 79	201 **Hg** mercury 80	204 **Tl** thallium 81	207 **Pb** lead 82	209 **Bi** bismuth 83	[209] **Po** polonium 84	[210] **At** astatine 85	[222] **Rn** radon 86
[223] **Fr** francium 87	[226] **Ra** radium 88	[227] **Ac*** actinium 89	[261] **Rf** rutherfordium 104	[262] **Db** dubnium 105	[266] **Sg** seaborgium 106	[264] **Bh** bohrium 107	[277] **Hs** hassium 108	[268] **Mt** meitnerium 109	[271] **Ds** darmstadtium 110	[272] **Rg** 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.

© OCR 2011