| Candidate forename | | Candidate surname | |
|---|---|---|---|

| Centre number | | | | | Candidate number | | | | |
|---|---|---|---|---|---|---|---|---|---|

# OXFORD CAMBRIDGE AND RSA EXAMINATIONS
## GENERAL CERTIFICATE OF SECONDARY EDUCATION

# B623/01

# GATEWAY SCIENCE

# ADDITIONAL SCIENCE B

### Unit 1  Modules B3 C3 P3  (Foundation Tier)

### WEDNESDAY 25 MAY 2011: 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, centre number and candidate number in the boxes on the first page. 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 <u>ALL</u> the questions.

## 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.

- The total number of marks for this paper is <u>60</u>.

# 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.**
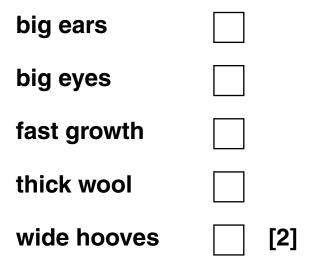
**SECTION A – MODULE B3**

1   Rob has a sheep farm.

He wants to improve his flock of sheep to make more money.

(a)  Look at the list of features.

TWO features would improve his sheep to make more money.

Put a tick (✓) in the box next to these two features.

big ears     ☐

big eyes     ☐

fast growth  ☐

thick wool   ☐

wide hooves  ☐   **[2]**

**(b)** Rob chooses sheep with the best features and breeds them together to get lambs.

This is called selective breeding.

(i) Could any of the lambs be CLONES of their PARENTS?_____

Explain your answer _____

_____ **[1]**

(ii) Could any of the lambs be CLONES of EACH OTHER?_____

Explain your answer _____

_____ **[1]**

**(c)** The flock of sheep could also be improved by transferring genes from other organisms into sheep embryos.

(i) What scientific term describes transferring genes from one organism to another?

_____ **[1]**

(ii) Suggest ONE advantage of improving sheep by transferring genes compared with selective breeding.

_____

_____ **[1]**

**[TOTAL: 6]**

**2**  **Ethan is two years old.**

**His body mass has been measured every three months.**

**The table shows his results.**

| AGE IN MONTHS | 0 | 3 | 6 | 9 | 12 | 15 | 18 | 21 | 24 |
|---|---|---|---|---|---|---|---|---|---|
| MASS IN kg | 2.4 | 5.0 | 6.3 | 7.6 | 8.8 | 9.6 | 9.9 | 10.1 | 10.2 |

**(a)  Look at the table.**

**(i)  In which three month period did Ethan's mass increase the MOST?**

**answer:  from age _____ months to age**

**_____ months   [1]**

**(ii)  In which three month period did Ethan's mass increase the LEAST?**

**answer:  from age _____ months to age**

**_____ months   [1]**

**(b)** What phase of growth is Ethan in?

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

adolescence ☐

childhood ☐

infancy ☐

maturity ☐

old age ☐ [1]

**(c)** Ethan started life when a sperm cell from his father joined with an egg cell from his mother.

Complete the following sentences.

The joining of a sperm cell and an egg cell is

called _____ .

As a baby grows, more cells are formed by cell

_____.

New TYPES of cells are formed by cell

_____ . [3]

[TOTAL: 6]

3   Amylase is an enzyme that breaks down starch.

(a)  Ann investigates how quickly one type of amylase breaks down starch at different temperatures.

The graph on the loose A3 sheet shows her results.

Look at the graph. What is the optimum temperature of this amylase?

answer _____°C   [1]

(b)  In the digestive system, amylase helps break down starch molecules into glucose molecules.

The glucose molecules are absorbed into the blood.

(i)  By what process are glucose molecules absorbed into the blood?

_____ [1]

(ii)  Starch has to be broken down into glucose before it can be absorbed into the blood.

Suggest why starch has to be broken down before it can be absorbed.

_____

_____ [1]

(iii)  In which part of the digestive system is glucose absorbed into the blood?

_____ [1]

(c) Glucose is absorbed into the blood so it can be transported around the body.

(i) Which part of the blood transports glucose?

_____ [1]

(ii) Blood moves around the body because of the action of the heart.

Describe how each side of the heart moves blood around the body.

In your answer include

- how the heart moves blood

- where each side of the heart moves blood to.

_____

_____

_____

_____ [3]

[TOTAL: 8]

## SECTION B – MODULE C3

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

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Be** | | | | | | | **H** | | | | | | **F** | | |
| | | | | | | | | | | | | | | | | **Ar** |
| | | | | | | | | | | | | | | | | |
| | **Sr** | | | | | | | | | | | | | **I** | | |
| | | | | | | | **Au** | | | | | | | | | |
| **Fr** | | | | | | | | | | | | | | | | |

**Answer the questions.**

**Choose your answers ONLY from the symbols shown on the outline Periodic Table.**

**Each symbol can be used ONCE, MORE THAN ONCE or NOT AT ALL.**

**(a)** **Which symbols show two elements in the same PERIOD?**

_____ **and** _____   **[1]**

**(b)** Which symbol shows the element with the ATOMIC NUMBER of 9?

_____ [1]

**(c)** Which symbol shows an atom with a full outer shell of electrons?

_____ [1]

**(d)** Which symbol shows an element in Group 7 that is a dark grey solid?

_____ [1]

[TOTAL: 4]

5    Jenny investigates using different metals for electrical wiring.

Look at the table.

It shows information about four different metals.

| METAL | DENSITY IN g/cm³ | RELATIVE ELECTRICAL CONDUCTIVITY | MELTING POINT IN °C | RELATIVE THERMAL CONDUCTIVITY |
|---|---|---|---|---|
| IRON | 8 | 10 | 1536 | 80 |
| ALUMINIUM | 3 | 38 | 660 | 237 |
| COPPER | 9 | 60 | 1084 | 401 |
| MAGNESIUM | 2 | 23 | 650 | 156 |

(a) (i)  Iron is the cheapest of the four metals.

Iron is NOT used for electrical wiring in houses.
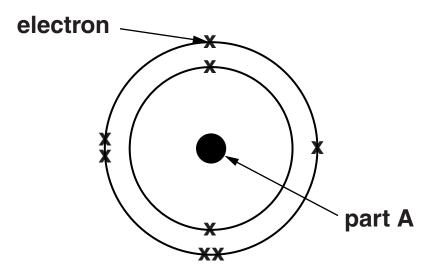
Explain why. Use information from the table.

_____

_____ [1]

(ii) **Aluminium is used for making overhead power cables instead of copper.**

**Aluminium is cheaper than copper.**

**Suggest one OTHER reason why aluminium is used. Use information from the table.**

_____

_____ **[1]**

(b) **Complete the sentences about metals.**

**Use words from the list.**

**ALKALIS**

**IONIC**

**METALLIC**

**RANDOM**

**REGULAR**

**SUPERCONDUCTORS**

**The particles in a solid metal are in a**

_____ **arrangement.**

**The particles in a metal are held together by**

_____ **bonds.**

**At low temperatures some metals can be used as**

_____ . **[3]**

**[TOTAL: 5]**

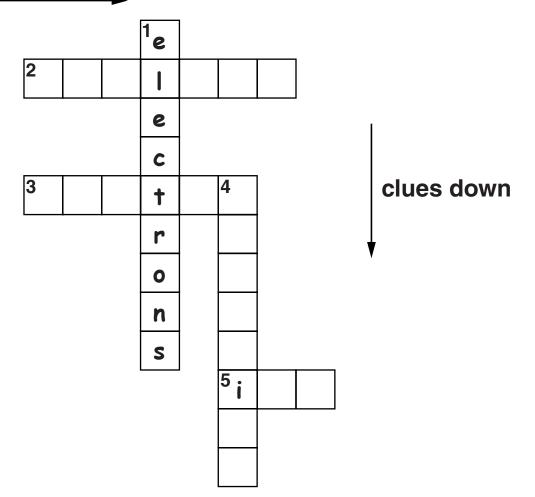**6**   **This question is about atomic structure.**

**The diagram shows the structure of an oxygen atom.**

electron

part A

**Complete the crossword puzzle using the clues given.
One has been done for you.**

|    **CLUES ACROSS**    |    **CLUES DOWN**    |
|---|---|

**2**   **Part A is called the**
_ _ _ _ _ _ _ .

**1**   **The space around part
A is occupied by**
<u>e l e c t r o n s</u> .

**3**   **A particle with a
relative mass of 1 is
called a** _ _ _ _ _ _ .

**4**   **The electrical charge
on an electron is**
_ _ _ _ _ _ _ _ _ .

**5**   **A charged atom is
called an** _ _ _ .

clues down

|   |   | $^1$e |   |   |   |
|---|---|---|---|---|---|
| $^2$ |   | l |   |   |   |
|   |   | e |   |   |   |
|   |   | c |   |   |   |
| $^3$ |   | t |   | $^4$ |   |
|   |   | r |   |   |   |
|   |   | o |   |   |   |
|   |   | n |   |   |   |
|   |   | s |   |   |   |
|   |   |   |   | $^5$i |   |   |
|   |   |   |   |   |   |
|   |   |   |   |   |   |

[4]

[TOTAL: 4]

7   Trevor works for a firework company.

(a) Trevor has seen flame tests done in a laboratory.

He wants to make a firework that gives red and lilac colours.

He needs to use two different metal compounds.

Which TWO should he use?

Choose from the list.

COPPER CHLORIDE

IRON(II) CHLORIDE

LITHIUM CHLORIDE

SODIUM CHLORIDE

POTASSIUM CHLORIDE

answer _____ and _____   [2]

(b) Lithium, sodium and potassium are Group 1 elements.

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

   What are the Group 1 elements called?

   _____ [1]

   (ii) The Group 1 elements are stored under oil.

   Explain why.

   _____

   _____ [2]

   [TOTAL: 5]

**8** Copper carbonate decomposes when heated.

The symbol equation for this reaction is

$$CuCO_3 \rightarrow CuO + CO_2$$

(a) Write down the formula for a reactant in this reaction.

_____ [1]

(b) Copper carbonate has the formula $CuCO_3$.

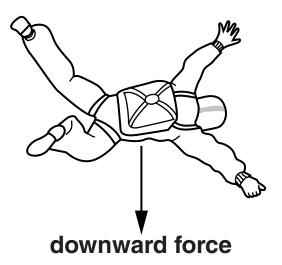How many ATOMS are there in this formula?

_____ [1]

[TOTAL: 2]

## SECTION C – MODULE P3

**9** **(a)** **Patrick is a parachutist.**

**He jumps out of an aeroplane.**



**downward force**

**(i)** **Write down the NAME of the DOWNWARD force acting on Patrick.**

_____ **[1]**

**(ii)** **What happens to Patrick's SPEED just after he jumps from the plane?**

_____ **[1]**

**(b)** Patrick opens his parachute.

After a short time he falls at a steady speed.



**(i)** The upward force on Patrick acts against the downward force.

Write down the NAME of the UPWARD force acting on Patrick.

_____ **[1]**

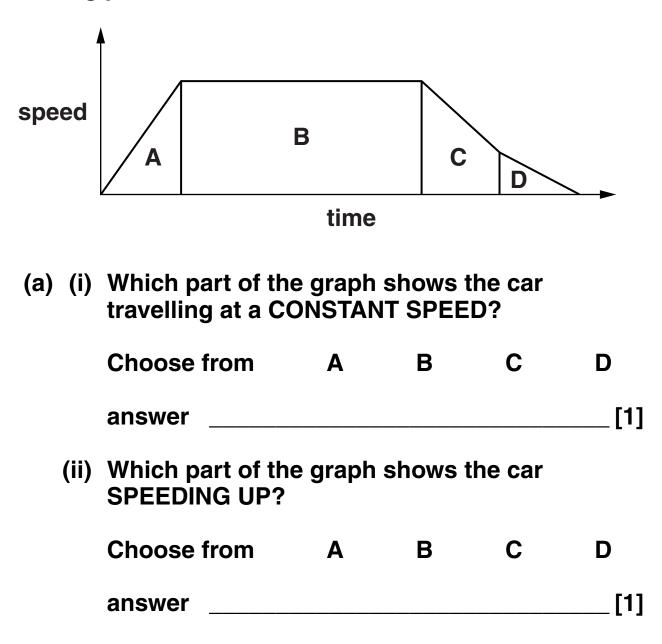**(ii)** Jane wants to calculate Patrick's SPEED as he falls.

What two MEASUREMENTS will Jane need to take to calculate speed?

1 _____

2 _____ **[2]**

**[TOTAL: 5]**

**10  Fernando is a racing driver.**

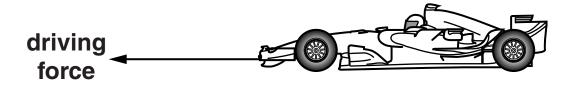**Look at the graph. It shows the speed of his car during part of a race.**



**(a)  (i)  Which part of the graph shows the car travelling at a CONSTANT SPEED?**

   **Choose from        A        B        C        D**

   **answer  _____ [1]**

   **(ii)  Which part of the graph shows the car SPEEDING UP?**

   **Choose from        A        B        C        D**

   **answer  _____ [1]**

**(b)** In a different part of the race Fernando makes the car **ACCELERATE** quickly.

**(i)** Complete the sentence.

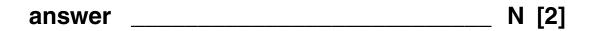Acceleration is the _____

in speed per unit _____ . **[1]**

**(ii)** The acceleration of the car is 5 m/s². 

The total mass of the car and driver is 1200 kg.

driving
force ⟵

Calculate the DRIVING FORCE.

The equations on page 3 may help you.

_____

_____

answer _____ N **[2]**

**(iii)** Fernando drives the car along a STRAIGHT part of the racing circuit.

The length of the straight part of the racing circuit is 200 m.

The driving force is now 8000 N.

The driving force stays the same along the straight part of the racing circuit.

Calculate the WORK DONE by the car's engine.

The equations on page 3 may help you.

_____

_____

_____

answer _____ J  **[2]**

**[TOTAL: 7]**

**BLANK PAGE**

**Please turn over for Question 11.**

11  Hybrid cars are becoming more popular with motorists.

Some hybrid cars run on fuels made from fossil fuels. They store and reuse energy from braking.

Look at the table.

| TYPE OF CAR | TYPE OF FOSSIL FUEL | ENGINE SIZE | FUEL CONSUMPTION IN KILOMETRES TRAVELLED PER LITRE OF FUEL |
|---|---|---|---|
| hybrid | petrol | medium | 25 |
| non-hybrid | petrol | medium | 12 |
| non-hybrid | diesel | medium | 16 |
| non-hybrid | petrol | small | 14 |

These cars have the same shape and mass.

Suggest how cars can be made MORE EFFICIENT.
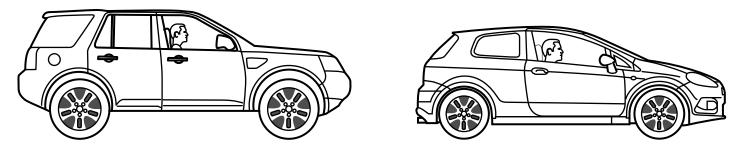
**Use the information in the table to write about**

- **the type of car**

- **the type of fossil fuel used by the car**

- **the engine size.**

_____

_____

_____

_____

_____ **[3]**

**[TOTAL: 3]**

**12** **Look at the two cars.**

**They have the same size engine.**



**car A**
**four wheel drive SUV**
**mass = 2000 kg**
**top speed = 140 km / h**

**car B**
**super-mini**
**mass = 1400 kg**
**top speed = 170 km / h**

**(a)** **(i)** **Both cars accelerate.**

**Car B has higher acceleration.**

**Suggest ONE reason why car B has HIGHER acceleration.**

_____

_____ **[1]**

**(ii)** **The cars are driven up a hill to the same height.**

**Car A has more gravitational POTENTIAL energy (PE) than car B.**

**Why does car A have MORE potential energy?**

_____

_____ **[1]**

(iii) **What is the unit for ENERGY?**

**Choose from the list.**

**JOULE**

**METRE**

**NEWTON**

**WATT**

answer _____ [1]

(b) **Car A then travels down the hill.**

**The car travels at TWICE the speed that it did on the way up.**

**Complete the sentence to show how much the kinetic energy (KE) of the car changes.**

**As the SPEED of the car doubles, the KE of the car**

_____ . [1]

(c) Both cars have similar safety features.

They both have crumple zones, air bags and seat belts.

These safety features can reduce injuries in a CRASH.

Look at the statements.

Which one is correct?

| A | in a crash the safety features PRODUCE energy |
| B | in a crash the safety features DESTROY energy |
| C | in a crash the safety features ABSORB energy |
| D | in a crash the safety features INCREASE the energy |

answer _____ [1]

[TOTAL: 5]

**END OF QUESTION PAPER**

# The Periodic Table of the Elements

**Key**

| relative atomic mass |
| **atomic symbol** |
| name |
| atomic (proton) number |

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