

Wednesday 30 May 2012 – Afternoon

**GCSE GATEWAY SCIENCE
ADDITIONAL SCIENCE B**

B623/01 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)

Duration: 1 hour



Candidate forename		Candidate surname	
Centre number		Candidate number	

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. HB pencil may be used for graphs and diagrams only.
- Answer **all** the questions.
- 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).
- 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.

2

EQUATIONS

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

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

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

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

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

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

3

Answer **all** the questions.**Section A – Module B3**

- 1 (a)** Ranjit has poor circulation.

His doctor says that Ranjit has a very high cholesterol level in his blood.

Which part of Ranjit's circulatory system is affected by a build-up of cholesterol?

..... [1]

- (b)** In the UK, the average cholesterol level is 5.7 mmol per litre of blood.

Statins are drugs that lower cholesterol levels in the blood.

Ranjit has a cholesterol level of 8.5 mmol per litre of blood.

He takes a statin that lowers his blood cholesterol level by 40%.

- (i)** Calculate how much lower his blood cholesterol will be than the UK average.

.....

answer mmol per litre of blood [3]

- (ii)** The doctor says Ranjit's genes may be involved in his high cholesterol levels.

What are genes made of?

..... [1]

- (c)** Statins are taken as tablets that are swallowed.

Statins are absorbed in the small intestine by diffusion.

Describe what is meant by diffusion.

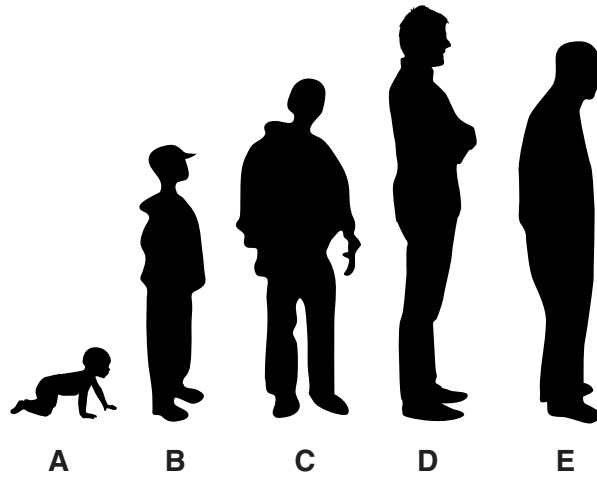
.....
 [1]

[Total: 6]

2 Look at the picture.

It shows outlines, labelled **A** to **E**, of five male humans.

They show different phases of human growth.



(a) Match each letter to the correct human growth phase.

One has been done for you.

human growth phase	letter
adolescence	C
childhood	
infancy	
maturity	
old age	

[2]

(b) Look at the table.

It shows the gestation period (length of pregnancy) of different mammals.

mammal	gestation period in days
dog	61
hamster	16
human	266
rhino	480
sea lion	360

(i) During the gestation period **cell differentiation** occurs.

What is cell differentiation?

.....
 [1]

(ii) Suggest why the gestation periods for different mammals are **not** the same.

.....
 [1]

(c) During gestation the developing foetus is supplied with oxygen from the mother's blood.

An organ develops between the foetus and mother to speed up the supply of oxygen.

(i) Write down the name of this organ.

..... [1]

(ii) What part of the blood carries oxygen?

..... [1]

(d) After 112 days of pregnancy, the small intestine of a human foetus is fully developed.

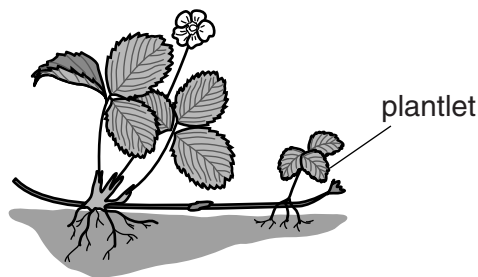
The small intestine is only used after birth.

Explain why the small intestine is **not** used until after birth.

.....
 [1]

[Total: 7]

- 3 Look at the drawing of a strawberry plant.



- (a) Strawberry plants can reproduce using flowers.

They can also reproduce using plantlets.

Name the type of reproduction used to produce the plantlet.

..... [1]

- (b) The plantlets produce roots.

The roots will always grow in a downward direction in response to a stimulus.

What is the stimulus?

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

carbon dioxide

☐

food

☐

gravity

☐

oxygen

☐

salt

☐

[1]

7

- (c) When new strawberry plants develop, cell division occurs.

Cell division also occurs throughout the life of the strawberry plant.

Explain why cell division is important for the strawberry plant.

.....

.....

.....

.....

..... [3]

- (d) Scientists can produce strawberry plants that survive freezing temperatures.

Strawberries can now be grown in parts of the world where they could not be grown before.

Finish these sentences about the process the scientists use.

Choose words from this list.

breed insert modification multiplication mutate resistance

Putting genes from one organism into another is called genetic

Scientists select the desired antifreeze characteristic from an arctic fish and isolate that gene.

The scientists then the antifreeze gene into the cells of the strawberry plant.

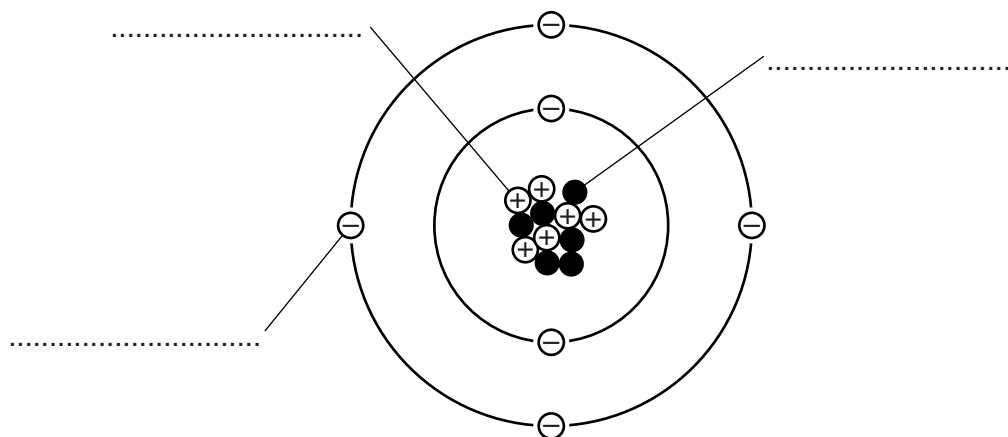
[2]

[Total: 7]

Section B – Module C3

4 This question is about atoms.

(a) The diagram shows the particles in a carbon atom and their charges.



(i) Complete the labels on the diagram. [2]

(ii) Write down the **mass number** of this carbon atom.

..... [1]

(b) Carbon can react with oxygen to form carbon dioxide, CO_2 .

Carbon is a solid. Oxygen is a gas.

What is the **state** of carbon dioxide at room temperature?

..... [1]

(c) Write down the **name** of an element in the same **group** of the Periodic Table as carbon.

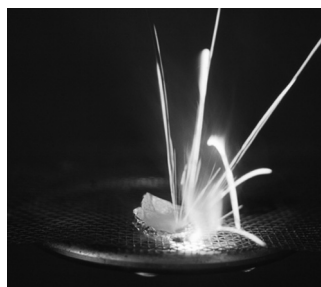
Use the Periodic Table on the back page to help you.

..... [1]

[Total: 5]

- 5 This question is about Group 1 metals.

Read the following newspaper article.



Sodium blaze at factory

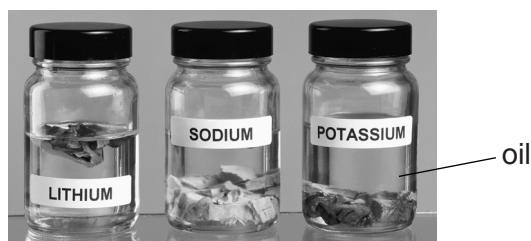
A large drum containing sodium metal burst into flames when it reacted with rainwater at a factory. The factory owner believes that the sodium, which is normally stored under oil, had been left uncovered outside by accident.

A fireman who put out the fire said, "These Group 1 metals are very dangerous."

- (a) What **name** is given to the Group 1 metals?

..... [1]

- (b) Group 1 metals are stored under oil.



Explain why.

.....
 [2]

- (c) Group 1 metals can be identified using a flame test.

Draw a straight line from each **metal** to the correct **flame colour**.

You should only draw **three** lines.

metal	flame colour
sodium	red
lithium	lilac
potassium	yellow

[2]

[Total: 5]

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PLEASE DO NOT WRITE ON THIS PAGE

6 Look at the table.

It shows some properties of Group 7 elements.

element	molecular formula	state at room temperature	colour	order of reactivity
fluorine	F ₂	gas	pale yellow	most reactive ↓ least reactive
chlorine	Cl ₂		pale green	
bromine	Br ₂	liquid		
iodine	I ₂	solid	grey	
astatine	At ₂	solid	black	

(a) Complete the table.

[2]

(b) Write down a **use** for chlorine.

Choose from this list.

electrolyte

flavouring

making plastics

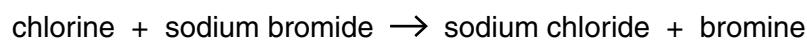
preservative

sterilising wounds

answer [1]

(c) In the table, the Group 7 elements are listed in order of their reactivity.

Look at the equation. It shows a displacement reaction of a Group 7 element.



Write a **word equation** for the reaction between bromine and sodium iodide.

..... [1]

[Total: 4]

7 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 ³	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) Which metal has the **highest** density?

answer [1]

(b) A factory owner needs 4 tonnes of aluminium to build an extension.

Work out the cost of buying **4 tonnes** of aluminium.

.....

answer [1]

(c) Metals have **high melting points**.

Put a tick (✓) next to the statement which explains why metals have high melting points.

Metals have electrons that can move.

☐

Metals have particles in a regular arrangement.

☐

Metals have strong metallic bonds.

☐

Metals are superconductors.

☐

[1]

13

- (d) Aluminium is extracted from its mineral, bauxite, using electricity.

What is the name of this process?

Choose from this list.

electrolysis

oxidation

precipitation

thermal decomposition

answer [1]

- (e) (i) Copper is extracted from its ore. The ore is called chalcopyrite.

Chalcopyrite has the formula CuFeS_2 .

How many **atoms** are in the formula CuFeS_2 ?

answer [1]

- (ii) One type of iron ore has the formula FeCO_3 .

Write down the **names** of the elements in FeCO_3 .

The Periodic Table on the back page may help you.

..... [1]

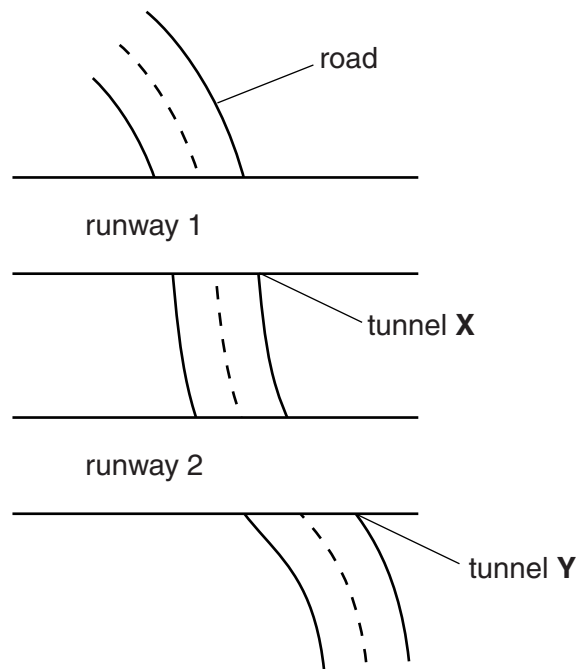
[Total: 6]

Section C – Module P3

- 8 This question is about speed and acceleration.

Look at the drawing. It shows the two runways at Manchester Airport. A road passes through tunnels underneath the runways.

The tunnels are of equal length.



- (a) Look at the information Katy collects about five cars passing through the tunnels.

car	time taken to drive through tunnel X in seconds	time taken to drive through tunnel Y in seconds
A	20	22
B	25	24
C	27	27
D	27	21
E	23	26

- (i) Which car travelled at the **same** speed through both tunnels?

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

answer

[1]

15

(ii) Which car travelled **fastest** through tunnel Y?

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

answer [1]

(b) Katy wants to calculate the speed of cars travelling through the tunnels.

(i) The table shows the time taken.

What else does she need to measure?

.....
 [1]

(ii) What equipment does she need to do this?

.....
 [1]

(c) Katy buys a new car.

It has a mass of 900 kg.

The car can accelerate from 0 to 20 m/s in 4 seconds.

Calculate the accelerating **force**.

The equations on page 2 may help you.

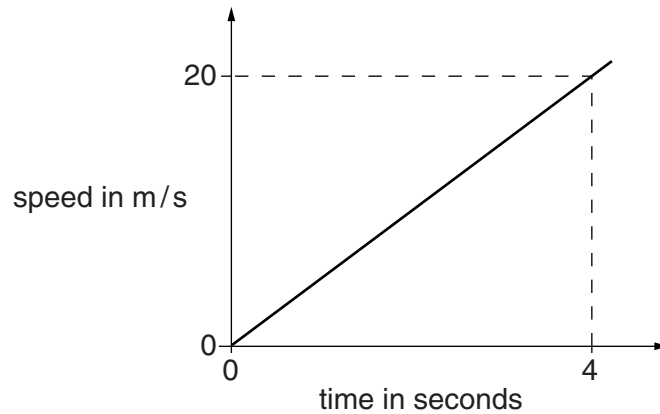
.....

answer N [3]

16

(d) The graph shows how the speed of Katy's car changes with time.

Look at the graph.



How can she use the graph to find the **distance** travelled in the first four seconds?

.....
.....
..... [1]

[Total: 8]

- 9 Jenny drops a ball from a cliff.



- (a) Write about what happens when the ball falls.

Your answer should include

- the name of the force causing the ball to fall
- the direction of this force
- what happens to the speed of the ball as it falls.

.....

.....

.....

.....

..... [3]

- (b) What sort of energy does the ball gain as it falls?

.....

..... [1]

[Total: 4]

- 10 (a) **Thinking distance** is the distance travelled by a car between the need for braking occurring and the brakes starting to act.

What is meant by **braking distance**?

.....

.....

..... [1]

- (b) How is **stopping distance** related to braking distance and thinking distance?

.....

..... [1]

- (c) Put ticks (✓) in the boxes to show which distance is affected by each condition in the table.

The first one has been done for you.

condition	thinking distance	braking distance
increased speed	✓	✓
icy road		
bald tyres		
tired driver		
driver has drunk alcohol		

[2]

- (d) Modern cars have many safety features.

Many of these features **absorb energy** when a car stops.

These are very important in an accident.

Write down **two** car safety features that absorb energy in an accident.

.....

.....

..... [2]

[Total: 6]

- 11 (a) Leo has some workers in his garden.

Mike is loading a wheelbarrow with sand.

Nick is digging in the garden.

Phil is climbing some steps.

John is sitting on a ride-on mower.

Which person is doing the **least** work?

Choose from **Mike** **Nick** **Phil** **John**

answer [1]

- (b) Leo measures how much work each person does.

What else must he measure to find out which person develops the most power?

..... [1]

[Total: 2]

END OF QUESTION PAPER

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The Periodic Table of the Elements

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1	2	Key										3	4	5	6	7	0	
		relative atomic mass atomic symbol name atomic (proton) number																
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							

Key

relative atomic mass
atomic symbol
name
atomic (proton) number

* 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.