OCR
RECOGNISING ACHIEVEMENT

GENERAL CERTIFICATE OF SECONDARY EDUCATION

GATEWAY SCIENCE
SCIENCE B

Unit 2 Modules B2 C2 P2

HIGHER TIER

FRIDAY 19 JANUARY 2007

H **B622/02**

Afternoon
Time: 1 hour

Calculators may be used.
Additional materials: Pencil
Ruler (cm/mm)

Candidate Name

Centre Number

Candidate Number

INSTRUCTIONS TO CANDIDATES

- Write your name, Centre number and candidate number in the boxes above.
- Answer **all** the questions.
- Use blue or black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully and make sure you know what you have to do before starting your answer.
- Do **not** write in the bar code.
- Do **not** write outside the box bordering each page.
- WRITE YOUR ANSWER TO EACH QUESTION IN THE SPACE PROVIDED. ANSWERS WRITTEN ELSEWHERE WILL NOT BE MARKED.

INFORMATION FOR CANDIDATES

- The number of marks for each question 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.

FOR EXAMINER'S USE		
Section	**Max.**	**Mark**
A	**20**	
B	**20**	
C	**20**	
TOTAL	**60**	

This document consists of **20** printed pages and **4** blank pages.

[Turn over

EQUATIONS

$$\text{efficiency} = \frac{\text{useful energy output}}{\text{total energy input}}$$

energy = mass × specific heat capacity × temperature change

energy = mass × specific latent heat

fuel energy input = waste energy output + electrical energy output

power = voltage × current

energy supplied = power × time

kilowatt hours = power (kW) × time (h)

wave speed = frequency × wavelength

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Section A starts on page 4.

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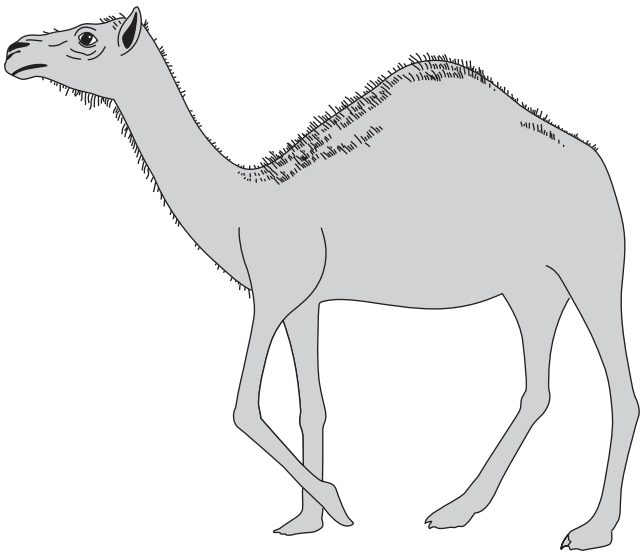
Answer **all** the questions.

Section A

1 The picture shows a camel.



(a) Camels are adapted to live in the desert.

They can close their nostrils.

This stops the sand getting in.

Write about **other** ways they are adapted to live in the desert.

.....

.....

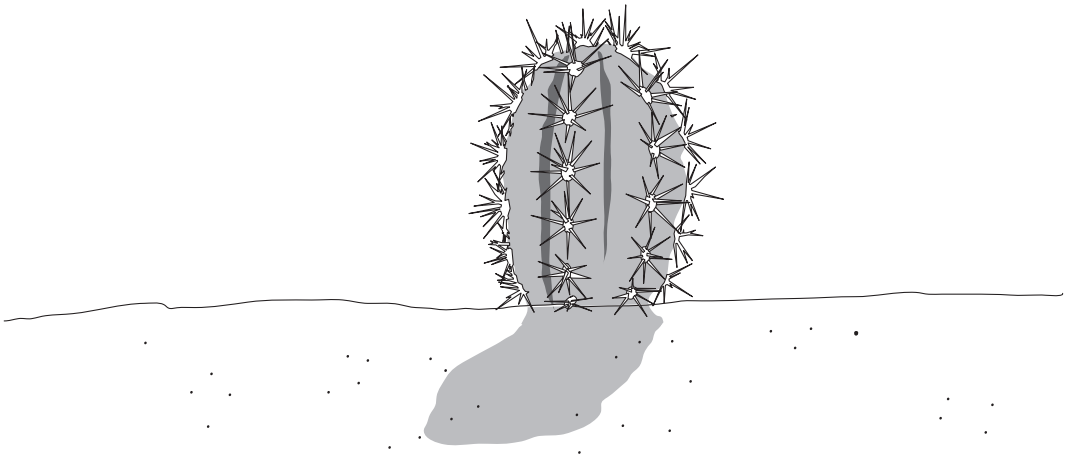
.....

.....

..... [3]

(b) The cactus is also adapted to live in the desert.

Look at the picture. It shows the shape of a cactus.



Explain why the cactus has this shape.

.....

..... [1]

[Total: 4]

2 This question is about classification.

Look at the pictures of a lion and a cheetah.

© iStockphoto.com/Styve Reineck

© OCR

(a) (i) Write down the class of vertebrates that lions and cheetahs belong to.

..... [1]

(ii) Animals in this class produce milk.

Write down one **other** characteristic found only in this class.

.....

..... [1]

(b) Lions and cheetahs are different **species**.

What is meant by the term species?

.....

.....

..... [2]

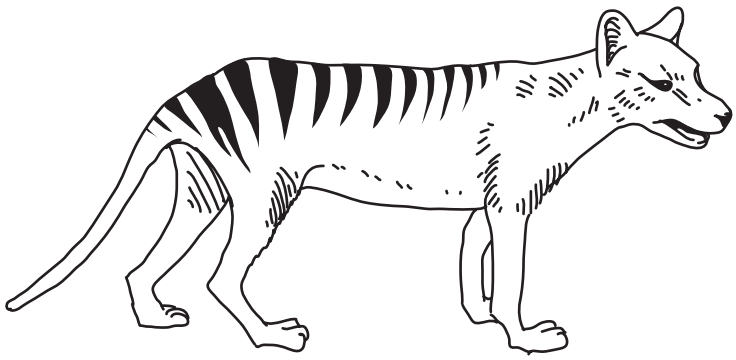
[Total: 4]

3 The Tasmanian tiger once lived on the island of Tasmania.

It was a large predator.

It became extinct in 1936.

This was a number of years after Europeans settled in Tasmania to farm sheep.



(a) Suggest **two** reasons why the Tasmanian tiger became extinct.

.....

.....

..... [2]

(b) There are many other species close to extinction.

Describe **two** ways in which species close to extinction can be saved.

1 .....

.....

2 .....

..... [2]

[Total: 4]

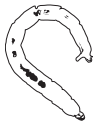
4 Gary works for the Water Authority.

His job is to sample water to find out how clean it is.

Look at the table.

It shows some of the animals he looks for in the water.

It also shows the type of water they can live in.

clean		**some pollution**		**very polluted**	
caddis fly larva	dragonfly nymph	flatworm	leech	rat-tailed maggot	bloodworm
					

(a) Write down the name of **one** animal that cannot tolerate pollution.

..... [1]

(b) Gary takes water samples from four streams.

He counts the different animals in each sample.

The table shows his results.

animal	**total number of animals in each sample**			
	stream A	**stream B**	**stream C**	**stream D**
caddis fly larva	0	6	1	6
dragonfly nymph	0	7	0	5
flatworm	0	4	10	2
leech	1	4	15	2
rat-tailed maggot	4	0	1	0
bloodworm	5	1	0	0

(i) Which stream contains the highest biodiversity?

..... [1]

(ii) Suggest why there are no dragonfly nymphs in **stream A**.

..... [1]

(c) Gary measures the oxygen levels in the four streams.

One stream has a much lower oxygen level than the others.

Suggest which stream has the **lowest** level of oxygen.

.....

Explain your answer.

.....

.....

..... [2]

[Total: 5]

5 Plants use a process called photosynthesis to make glucose, $C_6H_{12}O_6$.

(a) Finish the balanced symbol equation for photosynthesis.

..... + ... → $C_6H_{12}O_6$ + ... [1]

(b) The picture shows plants growing in a bottle.

The bottle is sealed so no air can get in or out.

The bottle is kept in a well-lit room.

Explain why the plants do **not** die without fresh air.

.....

.....

.....

.....

..... [2]

[Total: 3]

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Section B starts on page 12.

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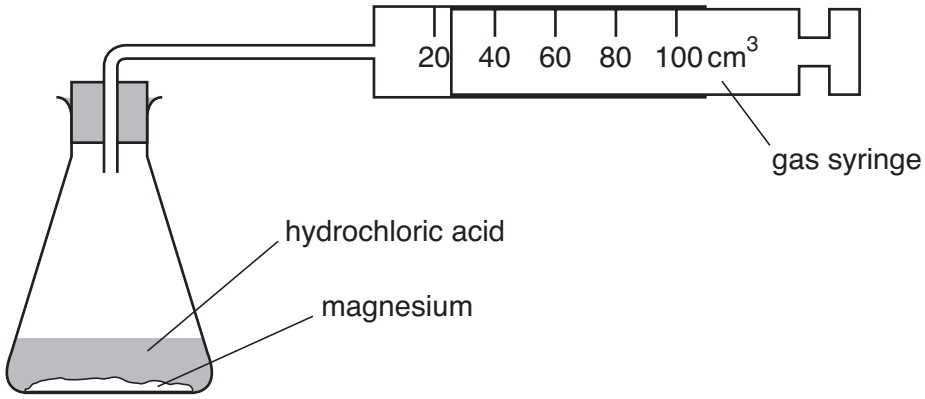
Section B

6 Louise and Ann investigate the reaction between magnesium and hydrochloric acid.

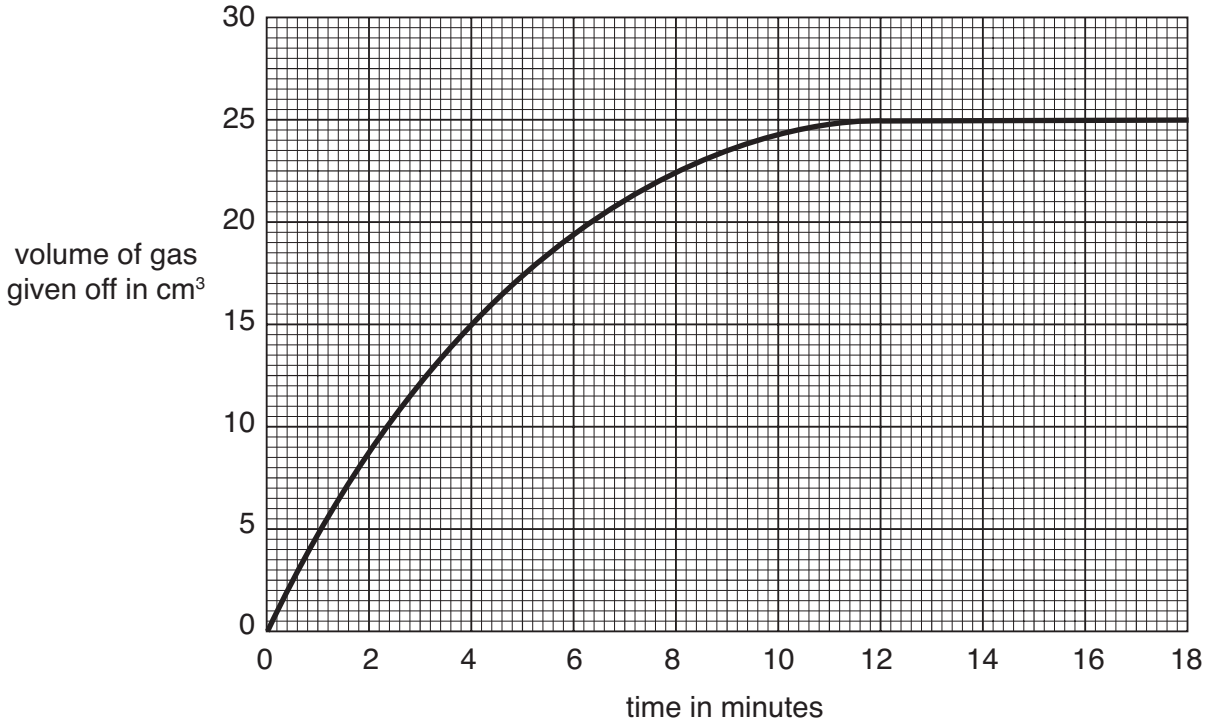
Look at the diagram. It shows the apparatus they use.



They use 0.2 g magnesium and 25 cm^3 hydrochloric acid.

The temperature of the acid is 25 °C.

Look at the graph. It shows their results.



(a) How long does it take for the reaction to stop?

..... minutes [1]

(b) Louise and Ann do the experiment again. They keep everything the same except the temperature.

This time they use a **higher** temperature.

On the grid, draw the graph they should get. [2]

(c) Increasing the **concentration** of hydrochloric acid makes the reaction go **faster**.

Explain why. Use ideas about collisions between particles.

.....

.....

..... [2]

[Total: 5]

7 This question is about paints.

Paints are made of three types of substance.

These types are **pigments**, a **solvent** and a **binding medium**.

(a) Emulsion paints can be painted onto walls. The brushes can be washed clean easily.

What is the name of the solvent used in emulsion paints?

..... [1]

(b) Emulsion paints usually dry in a few hours.

Explain why paints dry.

.....

..... [1]

(c) **(i)** Paints are **colloids**.

Explain what is meant by a colloid.

.....

..... [2]

(ii) Colloids do not separate into their different components.

Explain why.

.....

.....

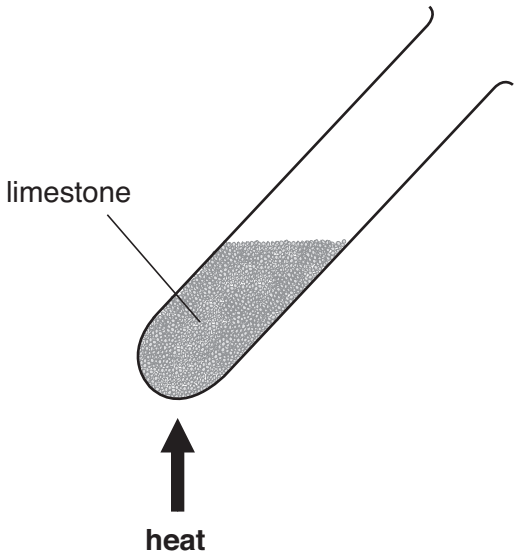
..... [2]

[Total: 6]

8 Tom and Phil are heating some limestone.

The chemical name for limestone is calcium carbonate.

Look at the diagram. It shows the apparatus they use.



Calcium carbonate breaks down when it is heated.

$$\text{calcium carbonate} \longrightarrow \text{calcium oxide} + \text{carbon dioxide}$$

(a) (i) What is the name of this process?

..... [1]

(ii) Write a balanced symbol equation for this reaction.

..... [2]

(b) Limestone is used as a building material.

Marble is another rock used as a building material.

Marble is harder than limestone.

Explain why. Use ideas about the **type** of rocks involved.

.....

.....

..... [2]

[Total: 5]

9 This question is about metals and alloys.

(a) Solder is an alloy used to join electrical components.

Which **two** metals make up solder?

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

(b) Iron and aluminium are metals. They are both used to make car bodies.

One advantage of using aluminium is that it corrodes less than iron.

Explain why this is an advantage.

..... [1]

(c) Describe and explain one **other** advantage of using aluminium rather than iron to make car bodies.

.....

.....

..... [2]

[Total: 4]

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Section C starts on page 18.

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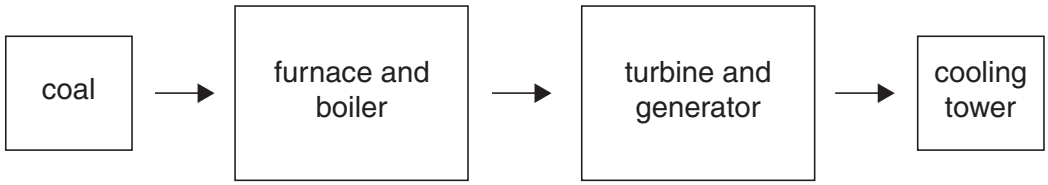
Section C

10 Power stations generate electricity.

Look at the diagram.

It shows the parts of a coal-fired power station.



(a) What happens in each part of the power station?

Draw one line from each **part** to what **happens**.

part	what happens
furnace	warm water cooled
boiler	electricity produced
turbine	steam makes it spin
generator	water heated
cooling tower	coal burns

[4]

(b) The generator in the power station produces a voltage (pd) of 20 000 V.

It generates a current of 60 A.

Calculate the power output of the generator.

.....

.....

answer ..... W [2]

(c) The National Grid transmits electricity along cables at very high voltage (400 000 V).

This very high voltage reduces the cost of supplying electricity.

Explain how.

In your answer, use ideas about

- current
- energy wastage.

.....

.....

.....

..... [3]

[Total: 9]

11 This question is about generating electricity.

Look at the picture. It shows some photocells.

Photocells use light energy from the Sun.

They transfer this energy into electrical energy.

(a) (i) Suggest one **advantage** of using photocells.

.....

..... [1]

(ii) Suggest one **disadvantage** of using photocells.

.....

..... [1]

(b) Describe how light produces electricity in a photocell.

In your answer, write about

- atoms
- electrons.

.....

.....

..... [2]

[Total: 4]

12 Asteroids are made of rock.

They are mainly found in the asteroid belt.

(a) Where in the Solar System is the asteroid belt?

Put a tick (✓) in the correct box.

place in solar system	tick
between the Sun and Mercury	
between Earth and Mars	
between Mars and Jupiter	
between Neptune and Pluto	

[1]

(b) When were the asteroids formed?

Put a tick (✓) in the correct box.

asteroids were left over from	tick
the formation of the Solar System	
the formation of our Moon	
the formation of Venus	
comets colliding	

[1]

[Total: 2]

13 This question is about nuclear radiation.

(a) Background radiation is in the environment. It is around us all the time.

Write down **one** main source of background radiation.

..... [1]

(b) The three types of nuclear radiation are alpha, beta and gamma.

They can be identified by their different penetrating powers.

Alpha radiation **cannot** penetrate paper.

Explain how you could identify beta and gamma by their **penetrating powers**.

beta radiation .....

.....

gamma radiation .....

..... [2]

(c) Nuclear radiation causes ionisation.

Ionisation makes charged particles.

Explain how radiation ionises an atom to make a **positive** ion.

.....

.....

..... [2]

[Total: 5]

END OF QUESTION PAPER

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The Periodic Table of the Elements

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						

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