OCR
RECOGNISING ACHIEVEMENT

F

GENERAL CERTIFICATE OF SECONDARY EDUCATION
TWENTY FIRST CENTURY SCIENCE
ADDITIONAL SCIENCE A

A216/01

Unit 2 Modules B5 C5 P5
(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)

Friday 23 January 2009
Morning

Duration: 40 minutes

Candidate Forename		Candidate Surname	

Centre Number						Candidate Number				

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.
- The total number of marks for this paper is **42**.
- A list of physics equations is printed on page 2.
- The Periodic Table is printed on the back page.
- This document consists of **16** pages. Any blank pages are indicated.

FOR EXAMINER'S USE	
1	4
2	4
3	6
4	5
5	5
6	4
7	5
8	4
9	5
TOTAL	42

TWENTY FIRST CENTURY SCIENCE EQUATIONS

Useful Relationships

Explaining Motion

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

momentum = mass × velocity

change of momentum = resultant force × time for which it acts

work done by a force = force × distance moved by the force

change in energy = work done

change in GPE = weight × vertical height difference

kinetic energy = $\frac{1}{2}$ × mass × [velocity]^2

Electric Circuits

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

$$\frac{V_p}{V_s} = \frac{N_p}{N_s}$$

energy transferred = power × time

power = potential difference × current

$$\text{efficiency} = \frac{\text{energy usefully transferred}}{\text{total energy supplied}} \times 100\%$$

The Wave Model of Radiation

wave speed = frequency × wavelength

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Question 1 starts on page 4.

PLEASE DO NOT WRITE ON THIS PAGE

Answer **all** the questions.

1 The outer layers of the Earth are made of four 'spheres', the atmosphere, the biosphere, the hydrosphere and the lithosphere.

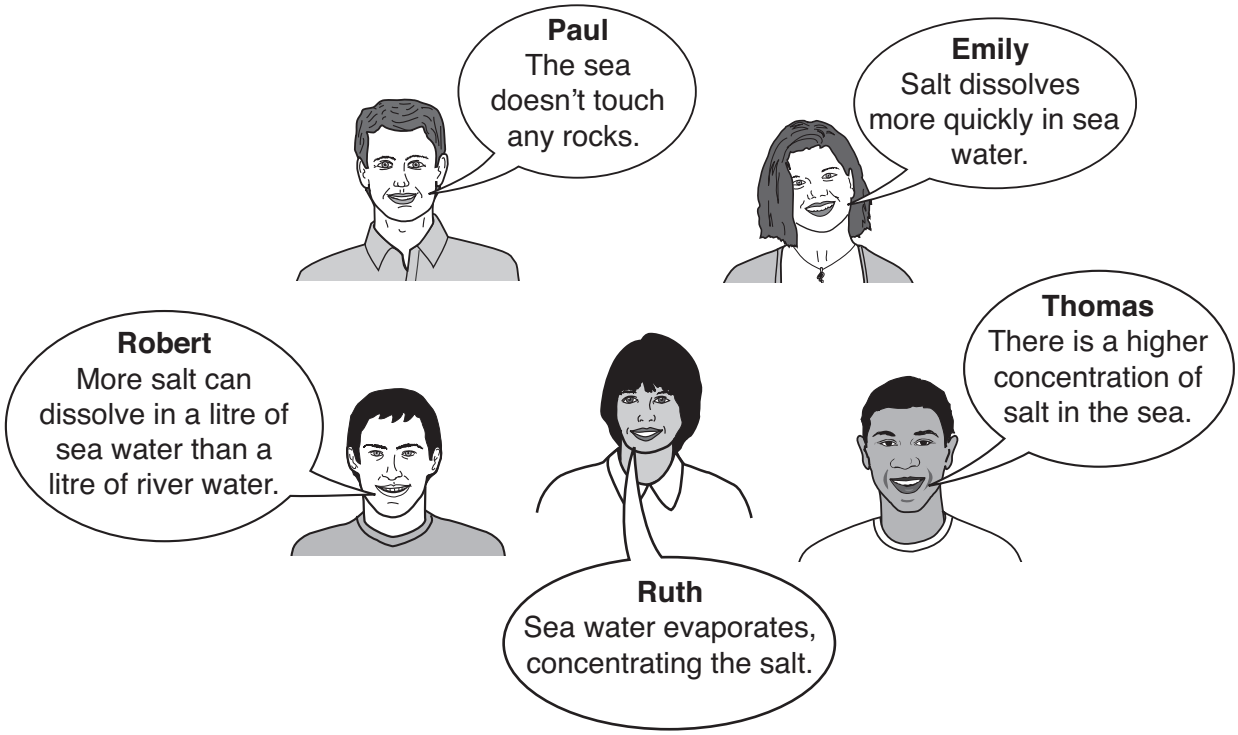
(a) Put a tick (✓) on each row of the table to show where you mainly find each of the following substances.

substance	mostly in atmosphere	mostly in biosphere	mostly in hydrosphere	mostly in lithosphere
liquid water				
sand				
carbon dioxide gas				

[2]

(b) Mary knows that rivers dissolve salt from rocks and carry it down to the sea.

She asks her friends why sea water tastes more salty than river water.



Only two of these friends make statements that explain why the sea is saltier than the rivers. Which two?

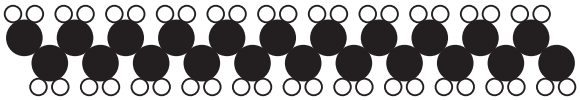
answers ..... and ..... **[2]**

[Total: 4]

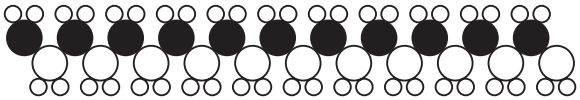
2 Mary draws some chemical structures **A**, **B**, **C**, **D** and **E**.

A

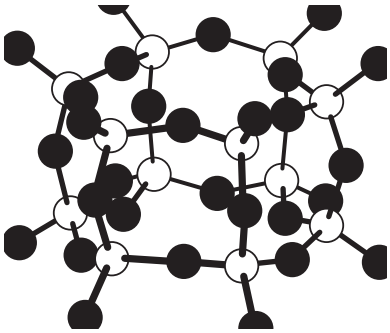
B



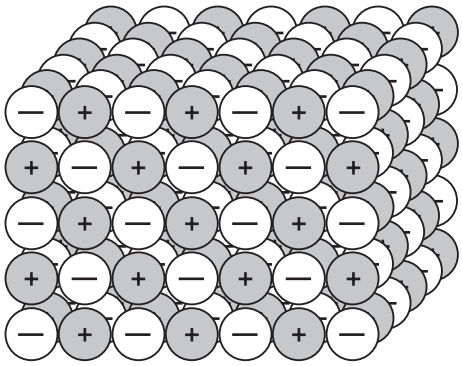
C



D



E



(a) Which structure, **A**, **B**, **C**, **D** or **E**, is most likely to contain a chain of carbon atoms?

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

(b) Which structure, **A**, **B**, **C**, **D** or **E**, will have the lowest boiling point?

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

(c) Which structure, **A**, **B**, **C**, **D** or **E**, is part of a covalent giant structure?

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

(d) Which structure, **A**, **B**, **C**, **D** or **E**, is part of an ionic giant structure?

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

[Total: 4]

3 Electric wires are usually made of copper because copper is a good electrical conductor.

(a) How do copper wires conduct electricity?

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

Atoms move through the copper wires. ☐

Electrons move through the copper wires. ☐

Ions move through the copper wires. ☐

[1]

(b) Here are some stages in the production of a length of copper wire.

They are in the **wrong** order.

A extract the mineral

B make the wire

C extract copper from its compound

D use the wire

E purify the metal

(i) Fill in the boxes to show the correct order.

The last one has been done for you.

				D

[2]

(ii) Old copper wires often get coated with solder.
Solder is made of different metals.
Soldered copper wires can be recycled.

Here are some possible stages in the recycling of soldered copper wire.

A make the wire

B extract copper from its compound

C use the wire

D purify the metal

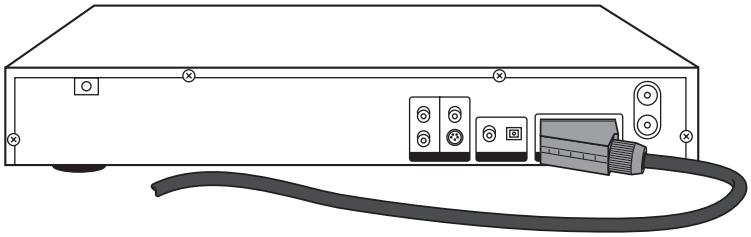
Which of these sequences shows recycling?

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

CBA **CDA** **CBD** **CDB**

[1]

(c) The cable connecting a TV to a DVD player sometimes has gold-plated contacts.



Here are five facts about gold.

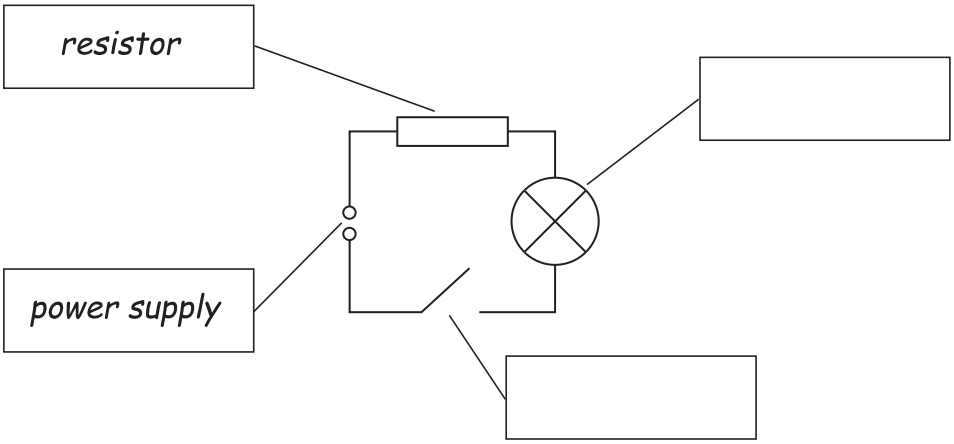
Put ticks (✓) in the boxes next to the **two** best reasons for using gold-plated contacts.

Gold is a good electrical conductor.	☐
Gold is expensive.	☐
Gold does not corrode.	☐
Gold is the same colour as copper.	☐
Gold is rarer than copper.	☐

[2]

[Total: 6]

4 Geoff builds this circuit.



(a) The circuit contains four components.

Two of them have been labelled.

Write the labels for the other two in the boxes. Choose from this list.

ammeter **cell** **lamp** **LDR** **switch** **voltmeter**

[2]

(b) Finish the sentences below.

Choose words from this list.

charge **current** **order** **parallel** **power** **series** **voltage**

The circuit has the components connected in ..... .

This means that the ..... for each component will be the same.

[2]

(c) The circuit contains a resistor.

What effect does the resistor have in the circuit?

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

It removes free electrons from the circuit. ☐

It reduces the flow of charge through the circuit. ☐

It increases the energy of the charge which passes through. ☐

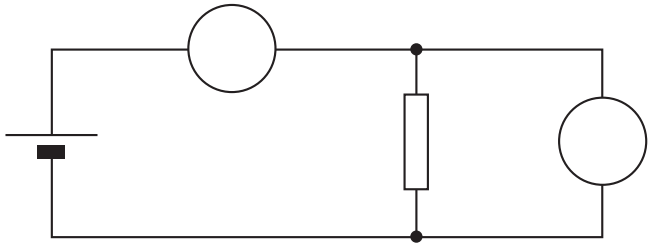
It provides a potential difference to push the charge through. ☐

[1]

[Total: 5]

5 Isla uses this circuit to test a resistor.

She measures the current and the voltage.



(a) The meters in the diagram are not labelled.

Write the correct letter into each circle.

Choose from the list.

A **C** **P** **V** **W**

[2]

(b) The cell provides a potential difference for the circuit.

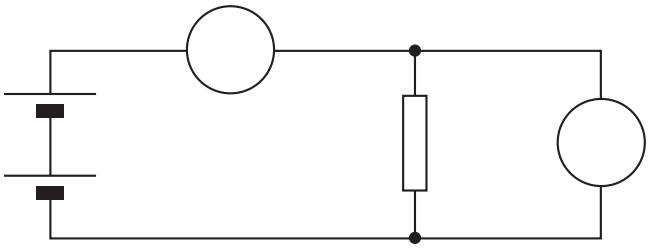
Which of these is another word for potential difference?

Put a (ring) around the answer.

charge **current** **power** **voltage**

[1]

(c) Isla puts another cell in her circuit, as shown below.



What is the effect of the extra cell?

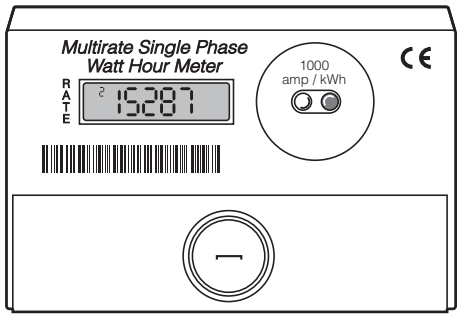
Put a tick (✓) in the correct box for each row.

	decreases	**increases**	**stays the same**
effect on the potential difference			
effect on the current			

[2]

[Total: 5]

6 Lucinda reads her electricity meter.



(a) Why is the energy transfer measured in kilowatt-hours instead of joules?

Put a tick (✓) in the box next to the **best** reason.

The joule is a very small amount of energy. ☐

It tells you how much electricity is being used moment by moment. ☐

Each type of energy transfer has its own special unit of measurement. ☐

The meter design can't be adapted to measure energy transfers in joules. ☐

[1]

(b) Lucinda uses her 2.1 kW heater for 3 hours. Each kilowatt-hour costs 8p.

(i) What is the correct way of calculating how many pence it costs to use the heater?

Put a (ring) around the answer.

2.1 × 3 × 8 $\qquad \frac{2.1}{3} \times 8 \qquad \frac{3}{2.1} \times 8$

[1]

(ii) The 2.1 kW heater produces 6 kWh of heat energy in 3 hours.

Who has the correct way of calculating the percentage efficiency of the heater?

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

(c) Complete the sentence. Choose a word from the list.

charge **power** **resistance** **voltage**

Lucinda's electricity meter measures the energy transferred as ..... passes through the heater.

[1]

[Total: 4]

7 **(a)** Here are some statements about genes and DNA.

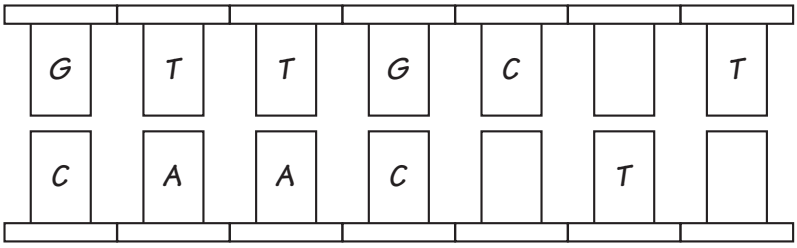
Put a tick (✓) in the box next to the **two** correct statements.

Genes are made of chromosomes.	☐
Genes are made of DNA.	☐
Genes are found in the cell membrane.	☐
DNA is a set of instructions for making proteins.	☐
There are three pairs of bases in DNA.	☐

[2]

(b) DNA is made up of two strands, linked by bases **A**, **G**, **T** and **C**.
These bases always pair up in the same way.
The diagram shows part of a DNA molecule.

Complete the diagram by writing **A**, **G**, **T** or **C** to identify the unlabelled bases.



[2]

(c) Different cells in an organism can have different functions.

Which of these statements explains why?

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

Different cells contain different genes.	☐
Cells lose some genes when they become specialised.	☐
Genes that are not needed are switched off.	☐
All the genes in a specialised cell are switched on.	☐

[1]

[Total: 5]

8 This question is about the cell cycle.

(a) The statements **A** to **E** are about either mitosis or meiosis.

A produces cells identical to the parent cells

B produces cells with only half the number of chromosomes

C produces gametes

D produces cells with a full set of paired chromosomes

E is a process within the cell cycle

Put the letters **A**, **B**, **C**, **D**, and **E** in the correct column of the table to show whether they refer to **mitosis** or **meiosis**.

mitosis	meiosis

[2]

(b) These sentences are about the cell cycle.

They are in the wrong order.

A The cell divides to form two new cells.

B The numbers of organelles in the cell increase.

C Copies of the chromosomes separate and move to opposite ends of the cell.

D The two strands of DNA separate so that the chromosomes can be copied.

Put the letters **A**, **B**, **C** and **D** in the correct order in the boxes.

The first one has been done for you.

B			

[2]

[Total: 4]

9 Mike is a gardener. He grows geranium plants on his windowsill.

(a) He notices that the plants all grow towards the window.

(i) What is this process called?

Put a (ring) around the correct answer.

photography **photosynthesis** **phototropism**

[1]

(ii) How does this process benefit the geranium plants?

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

allows plants to get more light ☐

allows plants to get more water ☐

allows plants to get more carbon dioxide ☐

[1]

(b) Mike is growing a geranium plant from a cutting.
He cuts a piece of stem from a mature plant.
He puts the cutting into water until it grows roots.
He then plants the cutting in compost.

(i) Which of these statements explain why this method works?

Put a tick (✓) in the boxes next to the **two** correct answers.

All plant cells are unspecialised.	☐
Some plant cells are unspecialised.	☐
Some phloem cells turn into root cells.	☐
Unspecialised cells turn into root cells.	☐
Roots can develop from any part of the plant.	☐

[2]

(ii) Which statement best describes the new plant Mike has grown?

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

It is only part of a plant.	☐
It is a complete plant that is a clone of the parent plant.	☐
It is a complete plant that is different from the parent plant.	☐
The new plant can grow leaves but not flowers.	☐

[1]

[Total: 5]

END OF QUESTION PAPER

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