

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

**A216/01**

Unit 2: Modules B5 C5 P5 (Foundation Tier)

**Monday 28 June 2010  
Morning**

**Duration: 40 minutes**

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)



Candidate Forename		Candidate Surname	
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Centre Number						Candidate Number				
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**MODIFIED LANGUAGE**

**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. Additional paper may be used if necessary but you must clearly show your Candidate Number, Centre Number and question number(s).

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

## TWENTY FIRST CENTURY SCIENCE EQUATIONS

### Useful Relationships

#### Explaining Motion

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

$$\text{momentum} = \text{mass} \times \text{velocity}$$

$$\text{change of momentum} = \text{resultant force} \times \text{time for which it acts}$$

$$\text{work done by a force} = \text{force} \times \text{distance moved in the direction of the force}$$

$$\text{change in energy} = \text{work done}$$

$$\text{change in GPE} = \text{weight} \times \text{vertical height difference}$$

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

#### Electric Circuits

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

$$\frac{\text{voltage across primary coil}}{\text{voltage across secondary coil}} = \frac{\text{number of turns in primary coil}}{\text{number of turns in secondary coil}}$$

$$\text{energy transferred} = \text{power} \times \text{time}$$

$$\text{power} = \text{potential difference} \times \text{current}$$

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

#### The Wave Model of Radiation

$$\text{wave speed} = \text{frequency} \times \text{wavelength}$$

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**Question 1 starts on page 4**

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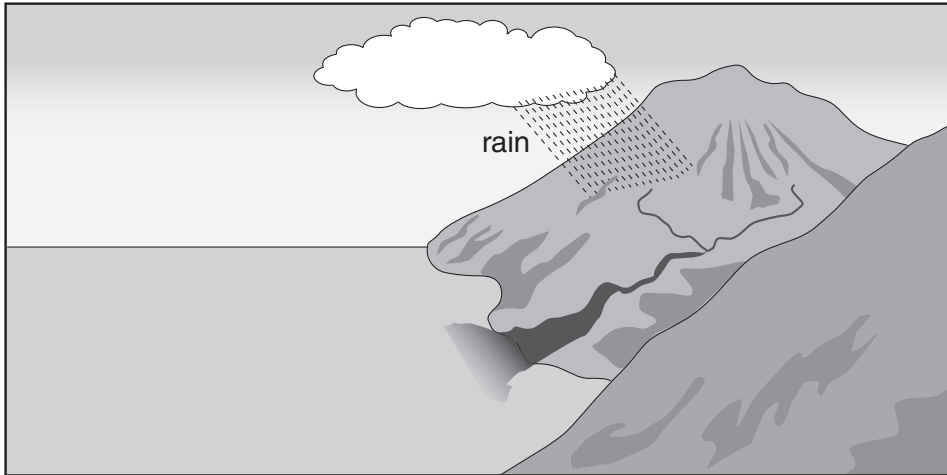
Answer **all** the questions.

1 Chemicals such as water are vital for life.

Most of our planet is covered by water.

(a) Sea water is too salty for us to use.

The salt in the sea came from rocks on the land.



Suggest how the salt inside the rocks gets into the sea.

Use the diagram to help you.

.....

.....

.....

..... [3]

(b) Water easily evaporates into the air.

What does this tell you about water?

Draw **one** straight line to join the **two** correct boxes.

**water is made of**

small molecules

**or**

large molecules

**or**

a giant structure of ions

**or**

a giant structure of atoms

**forces between water particles**

strong forces of repulsion

**or**

weak forces of repulsion

**or**

strong forces of attraction

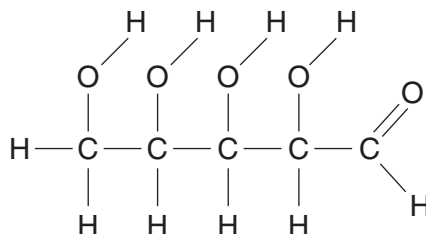
**or**

weak forces of attraction

[2]

(c) Water in plants contains chemicals such as sugars.

Here is the formula of a sugar.



(i) How many carbon atoms does it have?

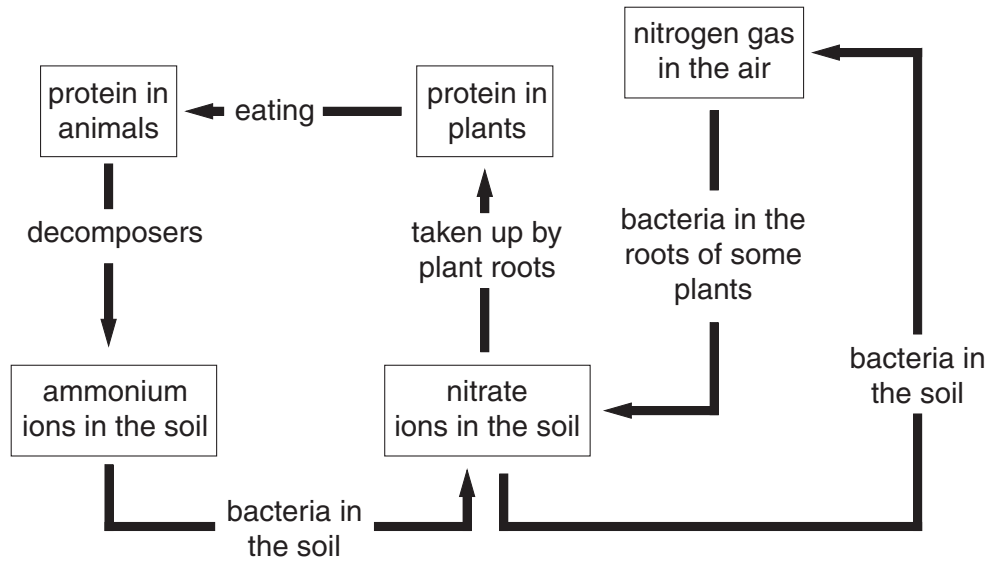
answer ..... [1]

(ii) How many hydrogen atoms does it have?

answer ..... [1]

(d) Nitrogen is another chemical that is important for life.

Look at this simple diagram of the nitrogen cycle.



Which stage in the diagram takes nitrogen directly from the air?

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

bacteria in the soil

bacteria in the roots of some plants

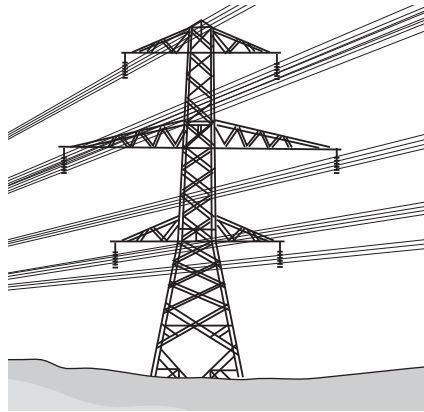
eating

decomposers

[1]

[Total: 8]

2 The electric cables carried on pylons are made from aluminium.



(a) The cables are made of thin aluminium wires that have been twisted around each other.

Put ticks (✓) in the boxes next to the **two** reasons why aluminium can be used to make these cables.

It conducts electricity.

It is non-magnetic.

It is malleable.

It is very hard.

It is silvery.

[2]

(b) The aluminium used to make the cables is extracted from aluminium oxide.

Aluminium oxide is the mineral in aluminium ore.

(i) Some ores produce 2 tonnes of aluminium oxide from 5 tonnes of ore.

Put a ring around the percentage of aluminium oxide in these ores.

10%

20%

25%

40%

50%

[1]

(ii) Silicon dioxide is a major impurity in aluminium ore.

Put a ring around another name for silicon dioxide.

carbohydrate

protein

quartz

salt

[1]

(c) Melted aluminium oxide is electrolysed to make aluminium.

(i) Put a tick (✓) in the box next to the **best** description of electrolysis.

using an electric current to melt a compound

using an electric current to purify a compound

using an electric current to make a compound

using an electric current to decompose a compound

[1]

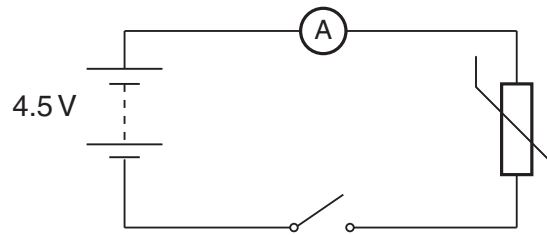
(ii) At which electrode does the aluminium metal form?

answer ..... [1]

[Total: 6]



3 The circuit below contains a thermistor.



(a) Complete the sentence for a thermistor.

Choose words from this list.

**current**    **light level**    **pressure**    **resistance**    **temperature**    **voltage**

The ..... of the thermistor increases with decreasing ..... [2]

(b) The ammeter reads 0.5 A when the switch is closed.

Put a **ring** around the **correct** value for the thermistor resistance.

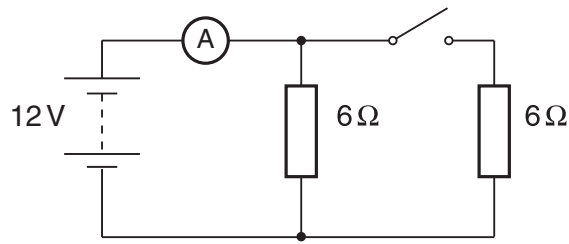
**0.1  $\Omega$**             **2.3  $\Omega$**             **5  $\Omega$**             **9  $\Omega$**             [1]

(c) A voltmeter can be used to measure the potential difference across the thermistor.

Draw the voltmeter **on the circuit diagram** and show how it should be connected. [1]

**[Total: 4]**

4 Both resistors in this circuit have the same value.



(a) Draw straight lines to join the **start** of each sentence to its correct **end**.

start	end
The battery ...	... resists the flow of charge.
Each resistor ...	... measures the current.
The ammeter ...	... pushes charge through the resistors.

[2]

(b) The ammeter reading increases when the switch is closed.

Explain why.

.....

.....

.....

..... [2]

(c) Complete the table.

Choose a number from this list.

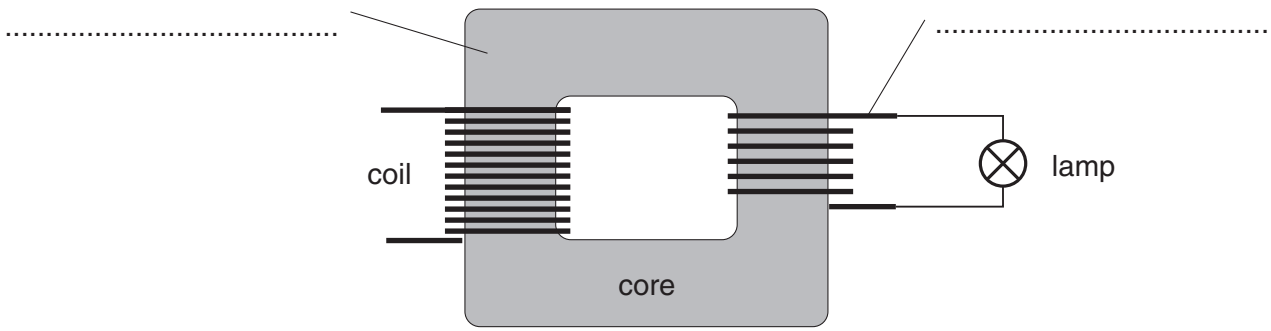
0          1          2          4

state of the switch	ammeter reading in amps
open	2
closed	

[1]

[Total: 5]

5 This transformer has two coils wound on a core.



(a) What are the **best** materials to use for the coils and the core?

Label the diagram using words from the list.

**copper          iron          rubber          wood          [2]**

(b) The left-hand coil of the transformer is connected to the mains supply.

Put a ring around the **best** description of the mains supply.

**50 V a.c.          50 V d.c.          230 V a.c.          230 V d.c.          [1]**

(c) The right-hand coil is connected to a lamp.

The current in the lamp is 2 A when the voltage across it is 12 V.

Calculate the power of the lamp. Include the unit for power with your answer.

power = ..... unit ..... [2]

**[Total: 5]**

6 Harry takes a cutting of a plant.

He wants to know what happens to the cutting as it grows into a plant.



(a) Explain how a new plant grows from a cutting.

Your explanation should include these terms:

**clone**  
**hormone**  
**xylem cells**  
**unspecialised cells**

.....  
.....  
.....  
.....  
..... [3]

(b) Harry's new plant shows a positive phototropic response.

How does this increase the plant's chance of survival?

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

**[Total: 4]**

7 The cell cycle is made up of **cell growth** and **mitosis**.

(a) Cell growth and mitosis both involve a number of processes.

Put one tick (✓) in each row to show when each of these processes happens.

process	cell growth	mitosis
more organelles are formed		
the cell divides		
copies of chromosomes are made		
copies of chromosomes separate		

[2]

(b) A parent cell has 24 chromosomes.

After a complete cell cycle, there are two new cells.

How many chromosomes are in **each** new cell?

Put a (ring) around the correct answer.

8                  12                  24                  48

[1]

(c) The genetic code is carried on DNA in the chromosomes.

(i) Where in the cell are the chromosomes found?

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

cell wall	<input type="checkbox"/>
nucleus	<input type="checkbox"/>
cytoplasm	<input type="checkbox"/>
cell membrane	<input type="checkbox"/>

[1]

(ii) What is the shape of a DNA molecule?

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

**X-shaped**

**Y-shaped**

**double helix**

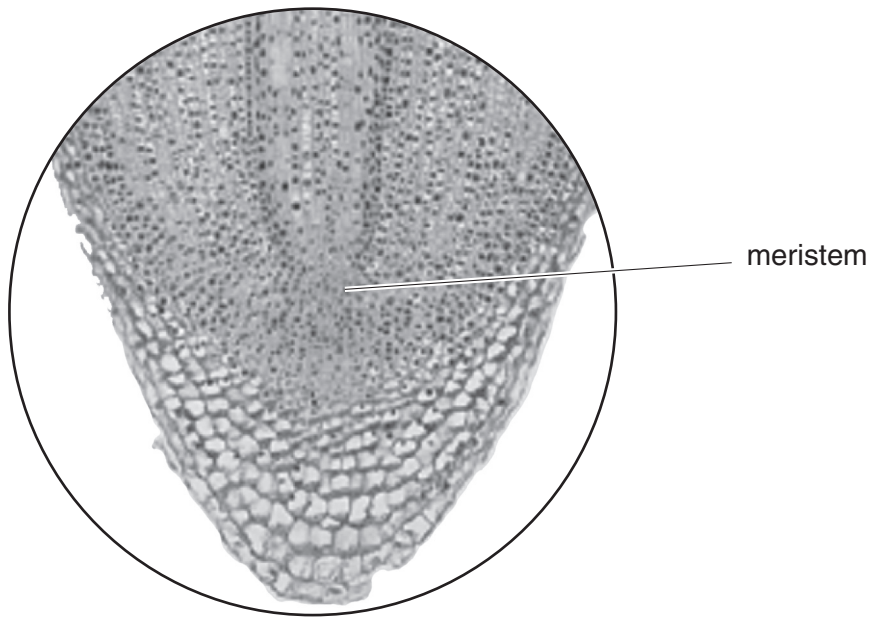
**doughnut-shaped**

[1]

[Total: 5]

Turn over

- 8 The diagram shows some cells from a plant root tip seen through a microscope.



- (a) Which statement is true of meristem cells?

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

- |                                   |                          |
|-----------------------------------|--------------------------|
| They disappear as the root grows. | <input type="checkbox"/> |
| They divide.                      | <input type="checkbox"/> |
| They form a hard crust.           | <input type="checkbox"/> |
| They are specialised.             | <input type="checkbox"/> |

[1]

- (b) Meristems are also found in the growing tips of plant shoots.

How do they affect the plant shoot?

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

- |                              |                          |
|------------------------------|--------------------------|
| They make it taste nice.     | <input type="checkbox"/> |
| They increase its height.    | <input type="checkbox"/> |
| They make it colourful.      | <input type="checkbox"/> |
| They decrease its thickness. | <input type="checkbox"/> |

[1]

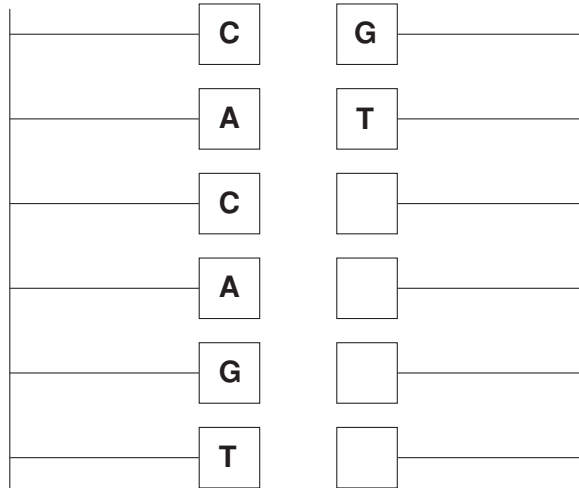
[Total: 2]

9 A length of DNA is made up of two strands.

(a) Some of the bases on the strands are shown.

Complete the diagram to show the pairing of the bases.

The first two pairs have been done for you.



[1]

(b) The sequence of bases on the strands is the genetic code for proteins.

(i) Where in the cell are proteins made?

- cell wall
- nucleus
- cytoplasm
- cell membrane

[1]

(ii) Brain cells and kidney cells in the same person have exactly the same genes.

They carry out different jobs from each other by producing different proteins.

Which person has the best explanation for this?

**Donny**  
Different combinations of genes are switched on in each type of cell.

**Jimmy**  
Both types of cell have all the genes switched on.

**Karen**  
Brain genes take priority over kidney genes.

**Marie**  
Both types of cell have the same combination of genes switched on.

answer ..... [1]

[Total: 3]

**END OF QUESTION PAPER**



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18  
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# The Periodic Table of the Elements

1	2	3	4	5	6	7	0						
7 <b>Li</b> lithium 3	9 <b>Be</b> beryllium 4	11 <b>Na</b> sodium 11	12 <b>C</b> carbon 6	13 <b>Al</b> aluminium 13	14 <b>N</b> nitrogen 7	15 <b>O</b> oxygen 8	16 <b>F</b> fluorine 9	18 <b>Ne</b> neon 10					
19 <b>K</b> potassium 19	20 <b>Ca</b> calcium 20	23 <b>Sc</b> scandium 21	24 <b>Ti</b> titanium 22	25 <b>V</b> vanadium 23	26 <b>Cr</b> chromium 24	27 <b>Mn</b> manganese 25	28 <b>Fe</b> iron 26	29 <b>Co</b> cobalt 27	30 <b>Ni</b> nickel 28	31 <b>Cu</b> copper 29	32 <b>Zn</b> zinc 30	35.5 <b>Cl</b> chlorine 17	36 <b>Ar</b> argon 18
37 <b>Rb</b> rubidium 37	38 <b>Sr</b> strontium 38	39 <b>Y</b> yttrium 39	40 <b>Zr</b> zirconium 40	41 <b>Nb</b> niobium 41	42 <b>Mo</b> molybdenum 42	43 <b>Tc</b> technetium [98]	44 <b>Ru</b> ruthenium 44	45 <b>Rh</b> rhodium 45	46 <b>Pd</b> palladium 46	47 <b>Ag</b> silver 47	48 <b>Cd</b> cadmium 48	53 <b>I</b> iodine 53	54 <b>Xe</b> xenon 54
55 <b>Cs</b> caesium 55	56 <b>Ba</b> barium 56	57 <b>La*</b> lanthanum 57	72 <b>Hf</b> hafnium 72	73 <b>Ta</b> tantalum 73	74 <b>W</b> tungsten 74	75 <b>Re</b> rhenium 75	76 <b>Os</b> osmium 76	77 <b>Ir</b> iridium 77	78 <b>Pt</b> platinum 78	79 <b>Au</b> gold 79	80 <b>Hg</b> mercury 80	85 <b>At</b> astatine 85	86 <b>Rn</b> radon 86
[223] <b>Fr</b> francium 87	[226] <b>Ra</b> radium 88	[227] <b>Ac*</b> actinium 89	[261] <b>Rf</b> rutherfordium 104	[262] <b>Db</b> dubnium 105	[266] <b>Sg</b> seaborgium 106	[264] <b>Bh</b> bohrium 107	[277] <b>Hs</b> hassium 108	[268] <b>Mt</b> meitnerium 109	[271] <b>Ds</b> darmstadtium 110	[272] <b>Rg</b> roentgenium 111	Elements with atomic numbers 112-116 have been reported but not fully authenticated		

1  
**H**  
hydrogen  
1

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.