

**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)

**Monday 28 June 2010
Morning**

Duration: 40 minutes



Candidate Forename		Candidate Surname	
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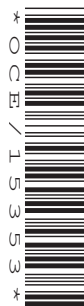
Centre Number						Candidate Number				
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INSTRUCTIONS TO CANDIDATES

- 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

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

3

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Question 1 starts on page 4

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4

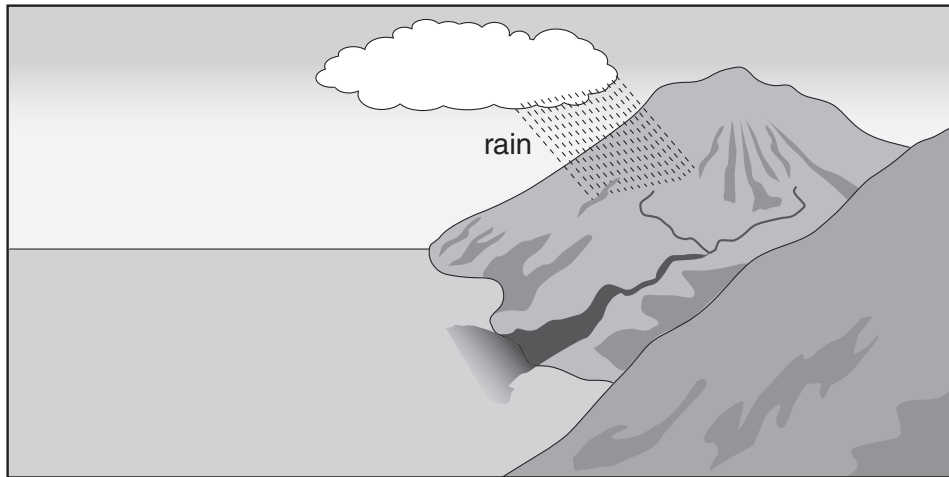
Answer **all** the questions.

- 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]

5

(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

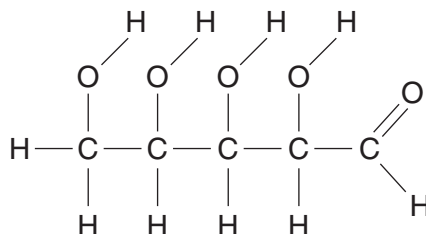
or

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]

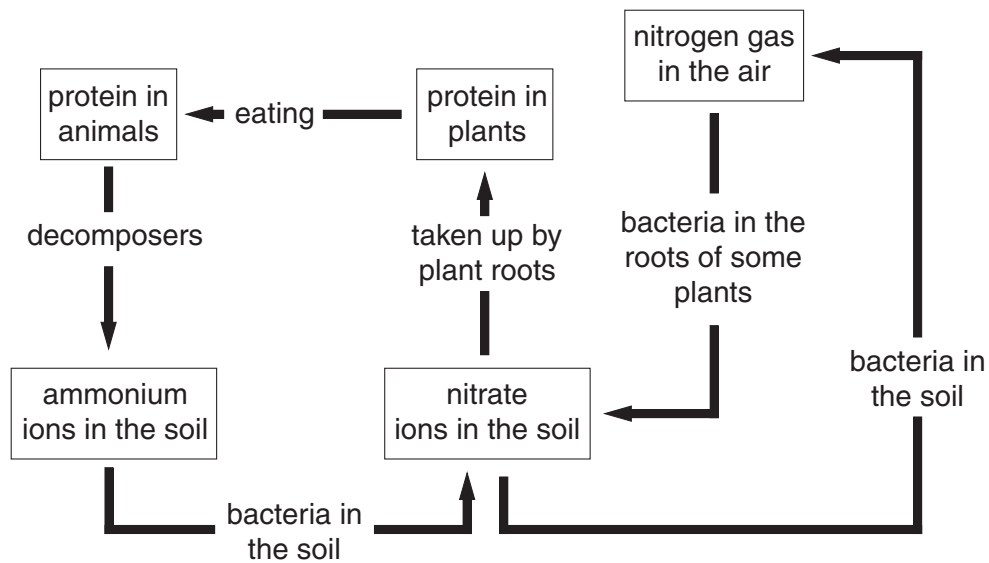
(ii) How many hydrogen atoms does it have?

answer [1]

6

(d) Another chemical that is important for life is nitrogen.

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

☐

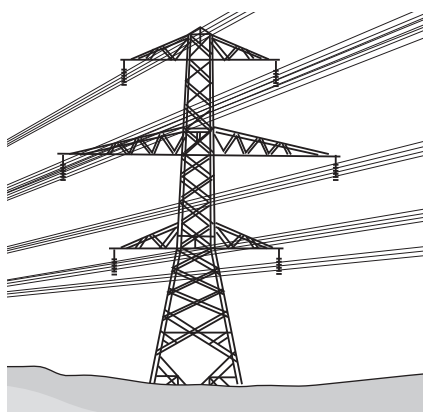
decomposers

☐

[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) A major impurity in aluminium ore is silicon dioxide.

Put a ring around another name for silicon dioxide.

carbohydrate

protein

quartz

salt

[1]

8

(c) To make aluminium, melted aluminium oxide is electrolysed.

(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

☐

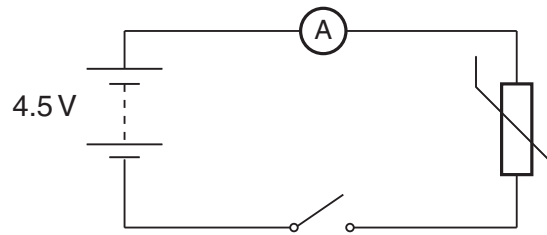
[1]

(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) When the switch is closed, the ammeter reads 0.5 A.

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

0.1 Ω 2.3 Ω 5 Ω 9 Ω [1]

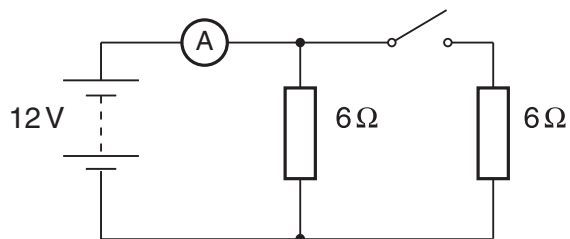
- (c) A voltmeter can be used to measure the potential difference across the thermistor.

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

[Total: 4]

10

- 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) When the switch is closed the ammeter reading increases.

Explain why.

.....

.....

.....

..... [2]

- (c) Complete the table.

Choose a number from this list.

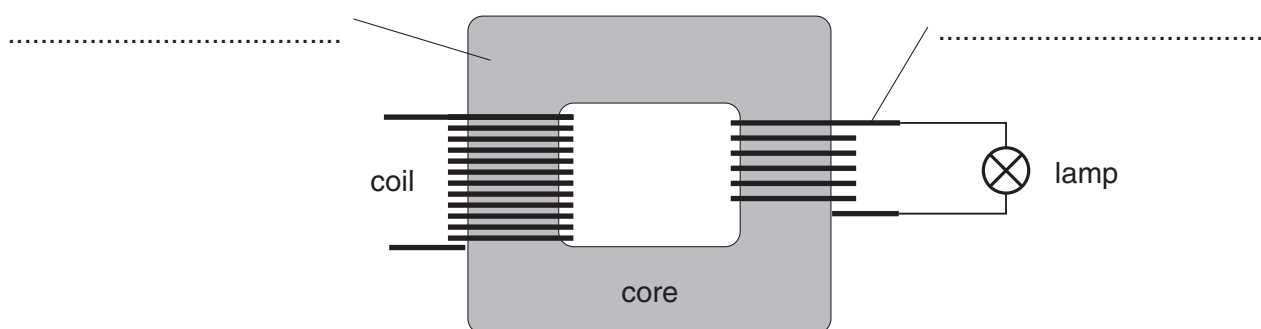
0 1 2 4

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]

12

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]

13

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	☐
nucleus	☐
cytoplasm	☐
cell membrane	☐

[1]

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

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

X-shaped

Y-shaped

double helix

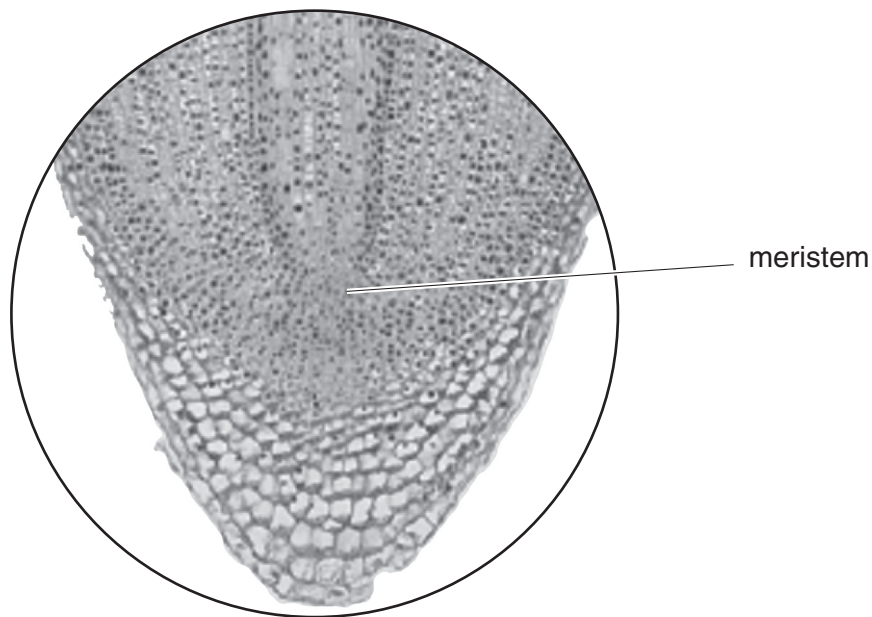
doughnut-shaped

[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. | ☐ |
| They divide. | ☐ |
| They form a hard crust. | ☐ |
| They are specialised. | ☐ |

[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. | ☐ |
| They increase its height. | ☐ |
| They make it colourful. | ☐ |
| They decrease its thickness. | ☐ |

[1]

[Total: 2]

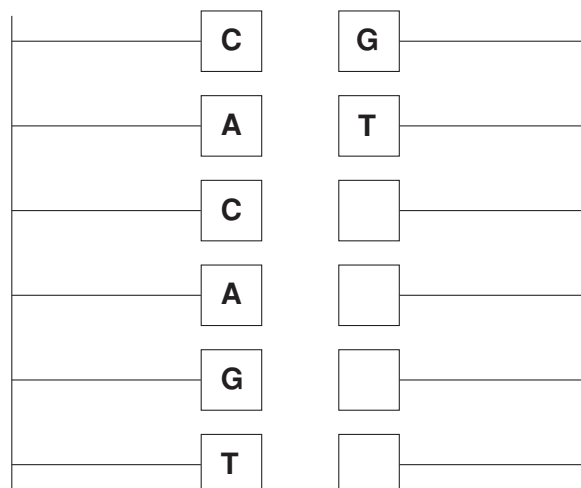
15

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]

16

(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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The Periodic Table of the Elements

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

1
H
hydrogen
1

* 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.