Candidate Forename		Candidate Surname	

Centre Number					Candidate Number				

OXFORD CAMBRIDGE AND RSA EXAMINATIONS
GENERAL CERTIFICATE OF SECONDARY EDUCATION

A216/01

TWENTY FIRST CENTURY SCIENCE

ADDITIONAL SCIENCE A

UNIT 2: Modules B5 C5 P5 (Foundation Tier)

MONDAY 28 JUNE 2010: Morning
DURATION: 40 minutes

SUITABLE FOR VISUALLY IMPAIRED CANDIDATES

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)

READ INSTRUCTIONS OVERLEAF

INSTRUCTIONS TO CANDIDATES

- **Write your name clearly in capital letters, your Centre Number and Candidate Number in the boxes on the first page.**

- **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 <u>ALL</u> the questions.**

- **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 <u>42</u>.**

- **A list of physics equations is printed on pages 4 and 5.**

- **The periodic Table is printed on the back page.**

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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

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

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

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

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

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

THE WAVE MODEL OF RADIATION

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

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Answer <u>ALL</u> 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.
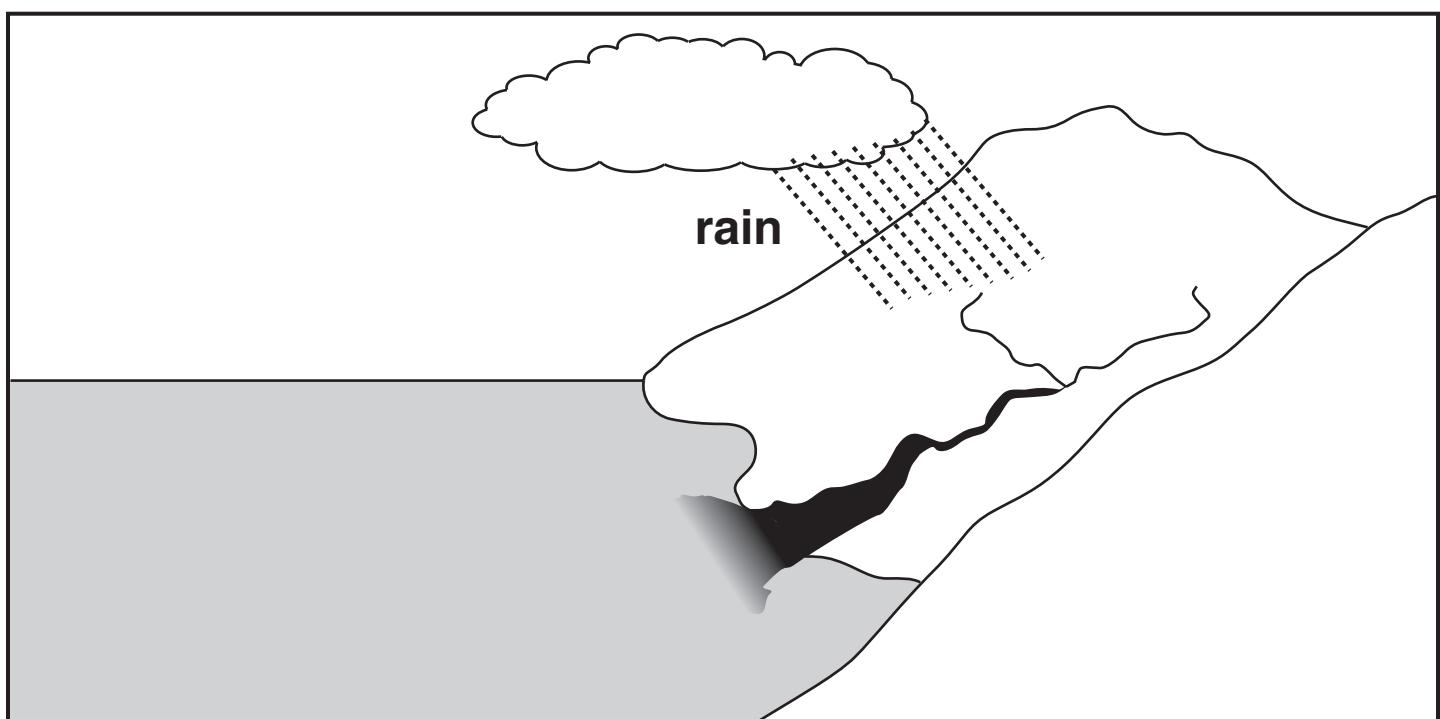
Suggest how the salt inside the rocks gets into the sea.

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.

<u>**WATER IS MADE OF**</u>   <u>**FORCES BETWEEN WATER PARTICLES**</u>

small molecules

<u>**OR**</u>

large molecules

<u>**OR**</u>

a giant structure of ions

<u>**OR**</u>

a giant structure of atoms

strong forces of repulsion

<u>**OR**</u>

weak forces of repulsion

<u>**OR**</u>

| strong forces of attraction |
|---|

<u>**OR**</u>

weak forces of attraction

[2]

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

Here is the formula of a sugar.
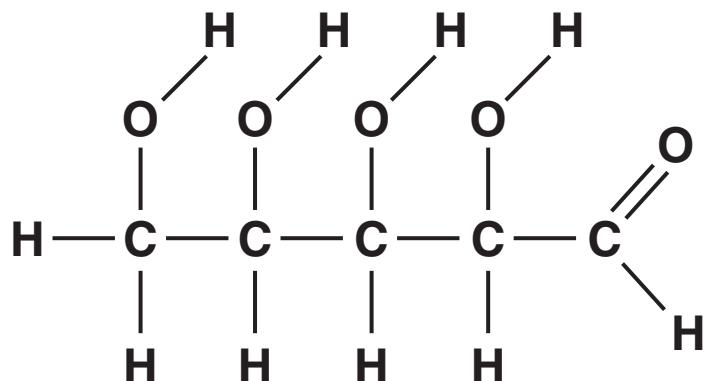
(i) How many carbon atoms does it have?

answer _____ [1]

(ii) How many hydrogen atoms does it have?

answer _____ [1]

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

Look at this simple diagram of the nitrogen cycle.
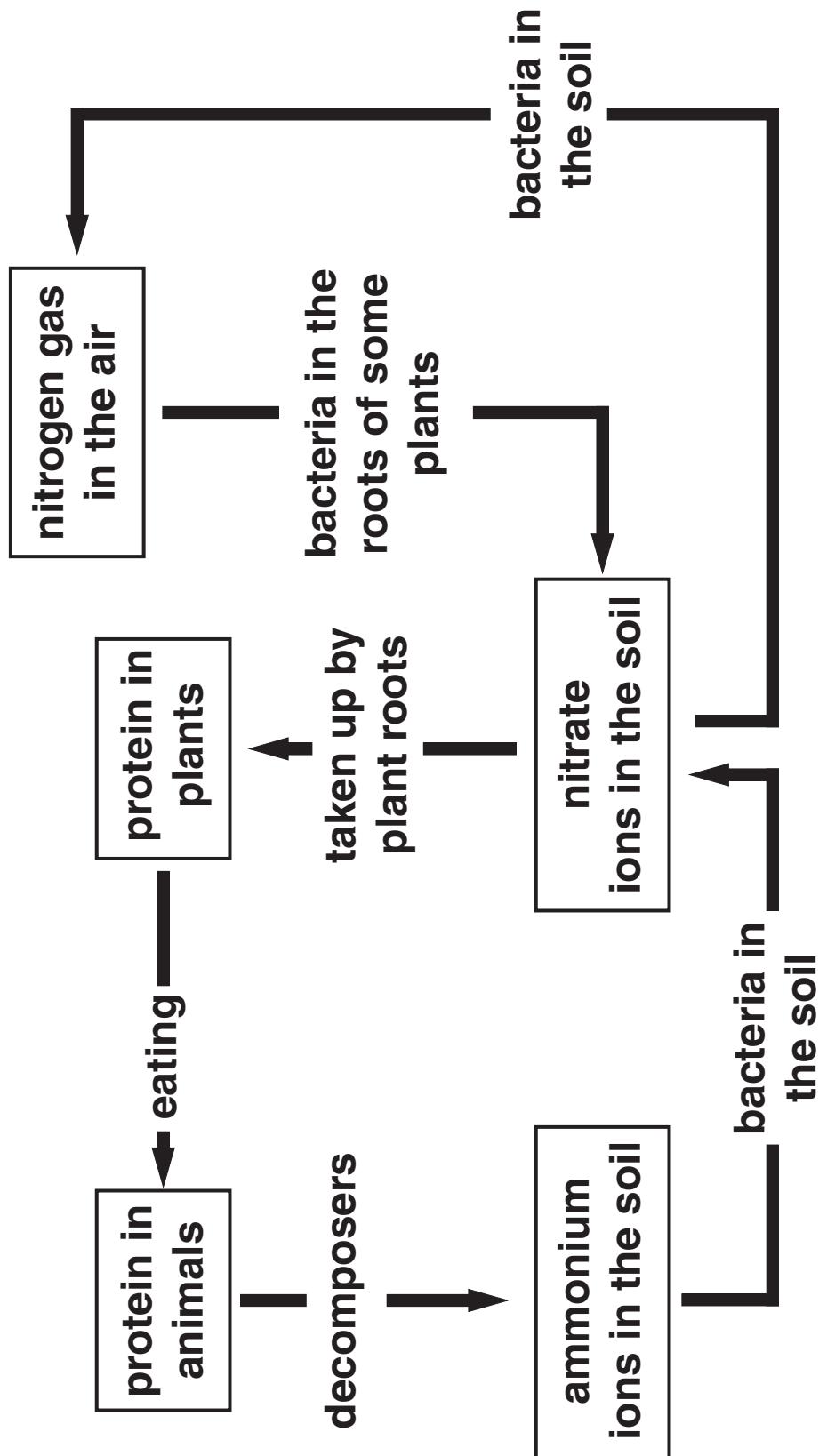
Which stage in the diagram takes nitrogen directly from the air?

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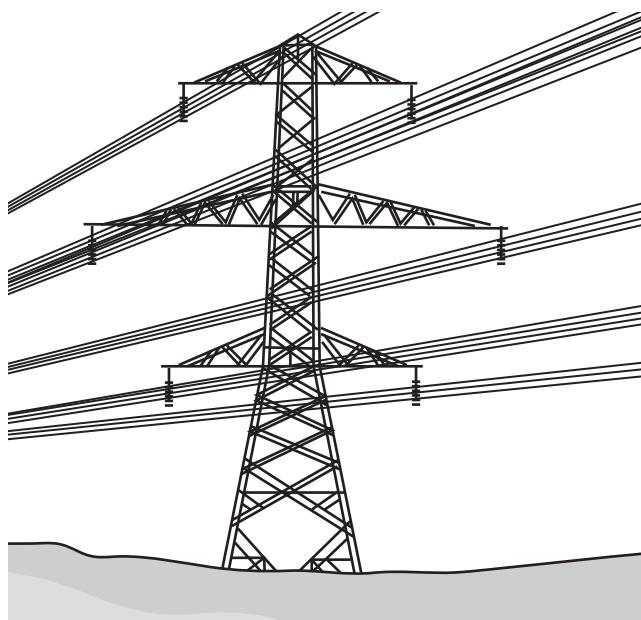
(a) The cables are made of thin aluminium wires that have been twisted around each other.

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]

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

   (i) Put a tick (✔) in the box next to the <u>BEST</u> 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]

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3   **The circuit below contains a thermistor.**
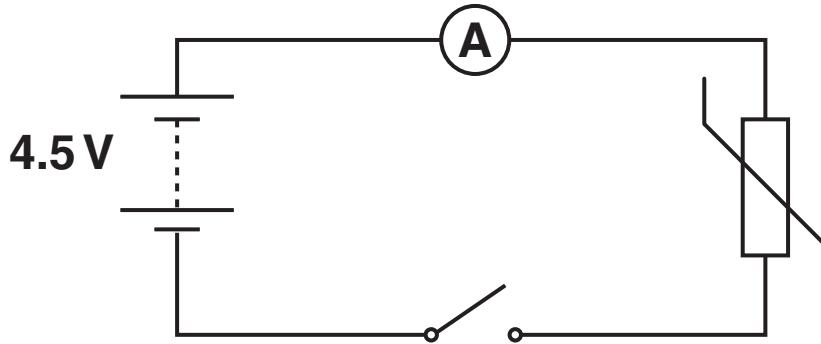
(a) **Complete the sentence for a thermistor.**

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 <u>ON THE CIRCUIT DIAGRAM</u> and show how it should be connected. [1]

[Total: 4]

4 Both resistors in this circuit have the same value.
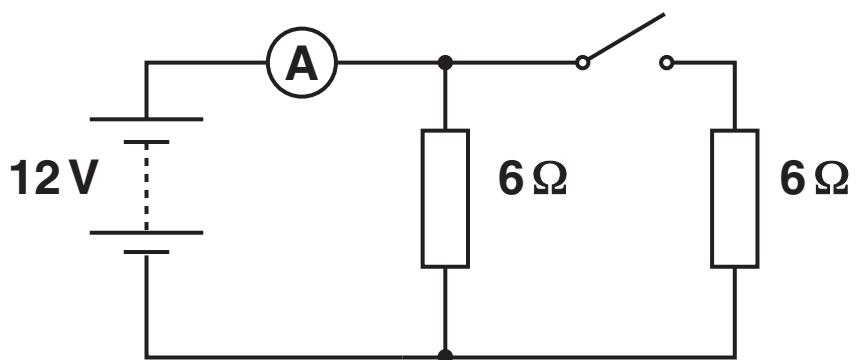
(a) Draw straight lines to join the **START** of each sentence to its correct **END**.

START   **END**

| The battery ... | | ... resists the flow of charge. |

| Each resistor ... | | ... measures the current. |

| The ammeter ... | | ... pushes charge through the resistors. |

[2]

(b) When the switch is closed the ammeter reading increases.

Explain why.

_____

_____

_____

_____ **[2]**

(c) Complete the table.

Choose a number from this list.

<div align="center">

0   **1**   **2**   **4**

</div>

STATE OF THE SWITCH	AMMETER READING IN AMPS
open	2
closed	

[1]

[Total: 5]

5   This transformer (opposite) 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.   230V a.c.   230V 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]

lamp

core

coil

21
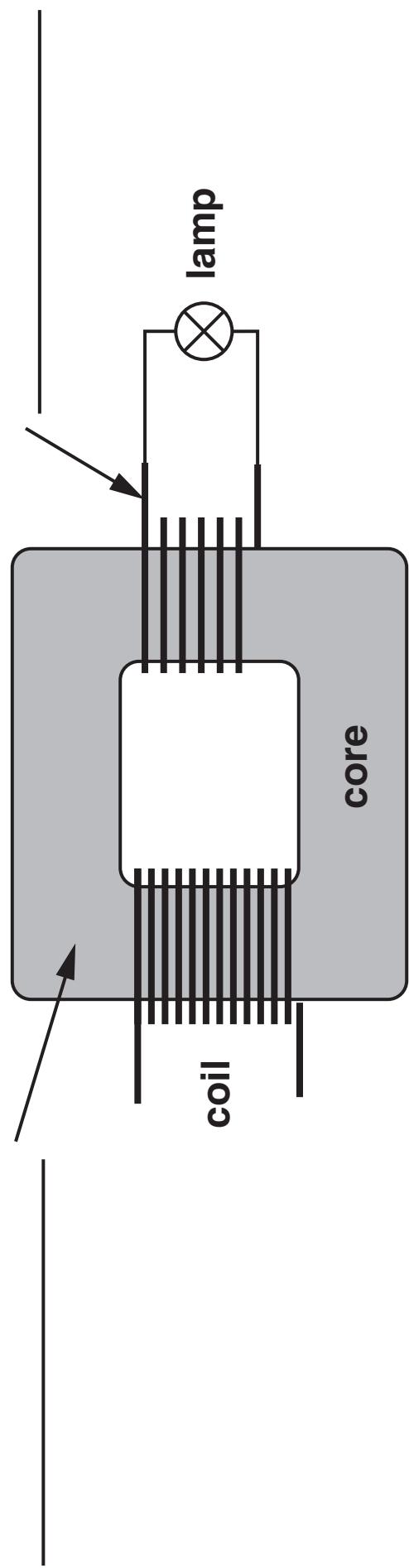
6 Harry takes a cutting of a plant.

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:

<div align="center">

CLONE
HORMONE
XYLEM CELLS
UNSPECIALISED CELLS

</div>

_____

_____

_____

_____

_____ **[3]**

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

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

_____

_____ **[1]**

[Total: 4]

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7 The cell cycle is made up of <u>CELL GROWTH</u> and <u>MITOSIS</u>.

(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 <u>EACH</u> 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]

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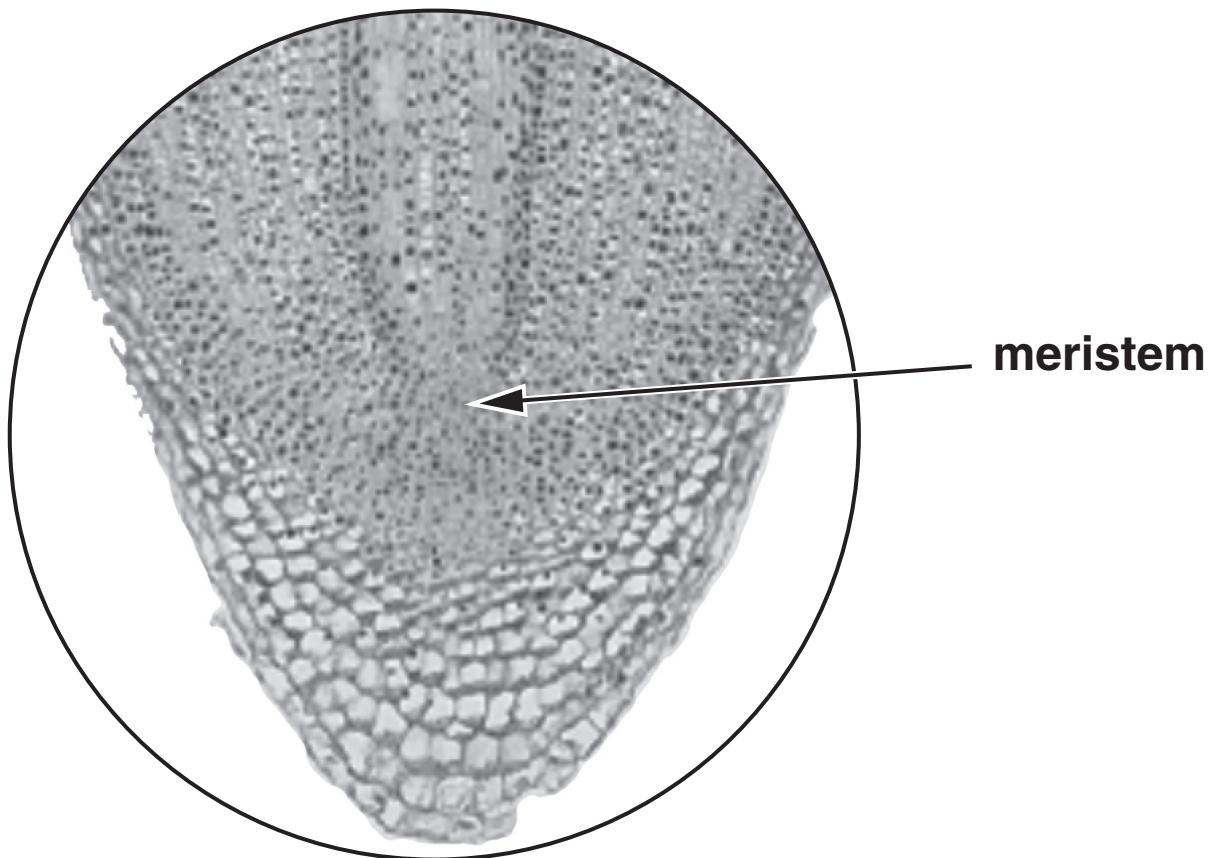
meristem

(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]

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.

C	G
A	T
C	
A	
G	
T	
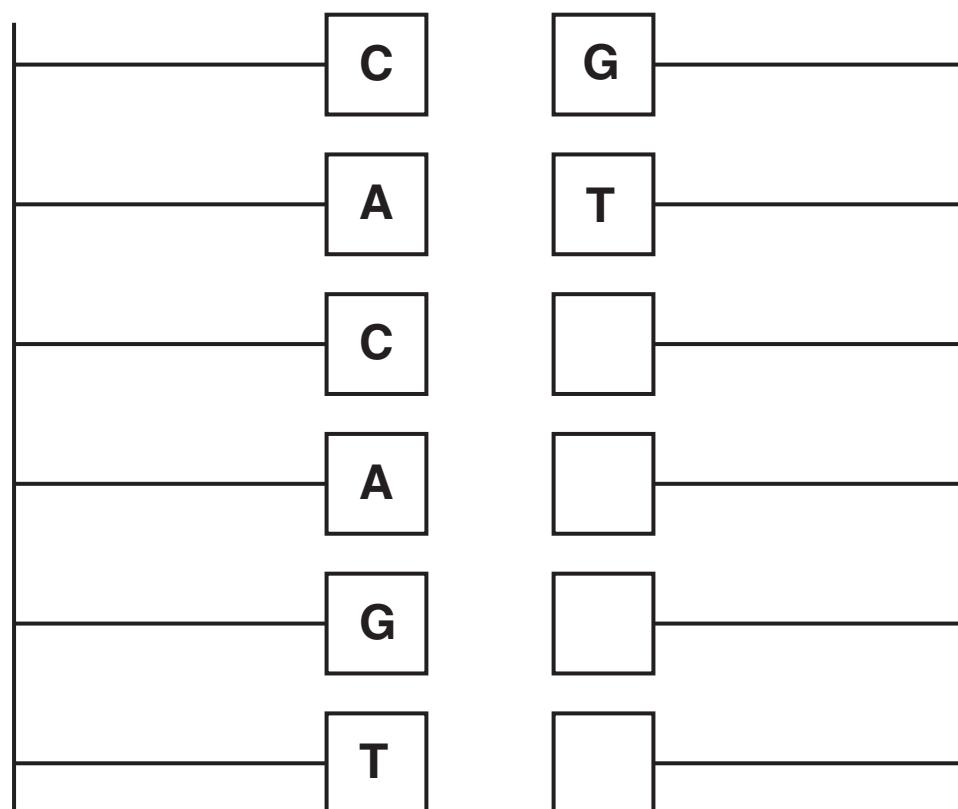
[1]

(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

31

The Periodic Table of the Elements

1	2													3	4	5	6	7	0
																			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.