

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

Unit 2 Modules B5 C5 P5 (Foundation Tier)

**WEDNESDAY 18 JUNE 2008**

Afternoon  
Time: 40 minutes

Candidates answer on the question paper.

**Additional materials (enclosed):**

None

Calculators may be used.

**Additional materials:** Pencil  
Ruler (cm/mm)



Candidate  
Forename

Candidate  
Surname

Centre  
Number

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Candidate  
Number

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**INSTRUCTIONS TO CANDIDATES**

- Write your name in capital letters, your Centre Number and Candidate Number in the boxes above.
- Use blue or 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.

**INFORMATION FOR CANDIDATES**

- The number of marks for each question 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 two.
- The Periodic Table is printed on the back page.

**FOR EXAMINER'S USE**

Qu.	Max	Mark
1	6	
2	5	
3	3	
4	4	
5	5	
6	3	
7	2	
8	4	
9	5	
10	5	
<b>TOTAL</b>	<b>42</b>	

This document consists of **15** printed pages and **1** blank page.

## TWENTY FIRST CENTURY SCIENCE EQUATIONS

### Useful Relationships

#### Explaining Motion

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

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

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

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

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

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

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

#### Electric Circuits

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

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

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

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

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

#### The Wave Model of Radiation

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

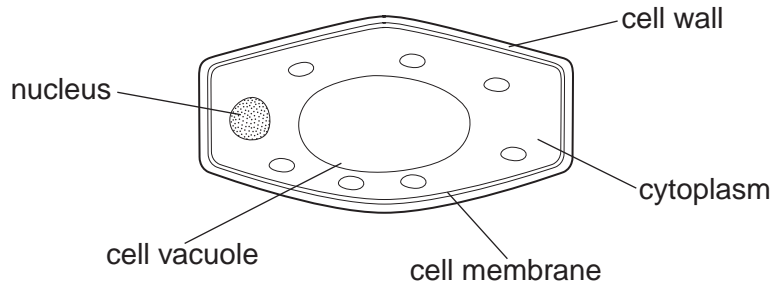
**PLEASE DO NOT WRITE ON THIS PAGE**

**Question 1 starts on page 4**

Answer **all** the questions.

1 Mike studies cells in plants and animals.

He draws a typical plant cell.



(a) The genetic code is held in the molecule, DNA.

DNA codes for the production of proteins.

Write the **name** of the correct part of the cell in each box.

Use names from the diagram.

	part of cell
where DNA is held	
where protein is produced	

[2]

(b) Mike is interested in the structure of DNA.

Complete the following sentences about DNA.

Choose words from the list.

- acids**      **bases**      **double helix**      **genes**      **single strand**      **triple helix**

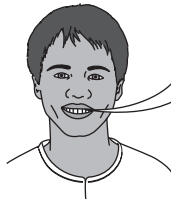
The DNA structure is in the shape of a .....

DNA contains four different .....

[2]

(c) Mike asks his friends to describe the differences between plants and animals.

Two gave wrong answers.



Some plant cells can remain unspecialised.

Hassan



The body cells in an animal do not become specialised.

Ruth



Animals can continue to grow in height throughout their lives.

Joe



Many animal cells become highly specialised.

Joss



Plants can continue to grow in height throughout their lives.

Lizzie

Which **two** people gave **wrong** descriptions of the differences between plants and animals?

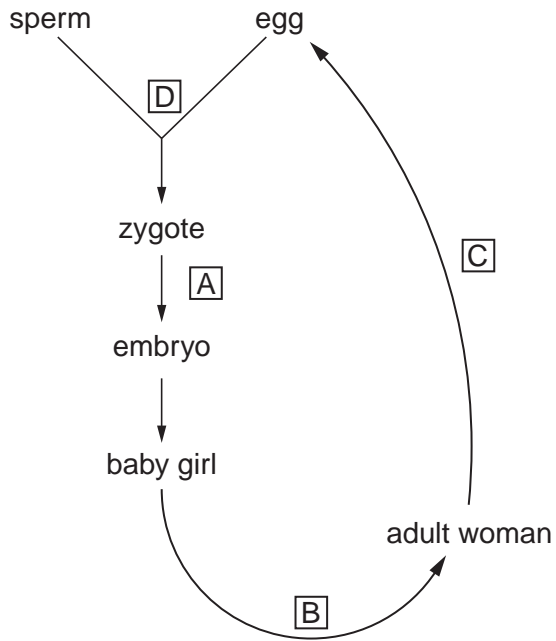
..... and ..... [2]

[Total: 6]

- 2 This baby girl has just been born.  
She is part of the human life cycle.



© Mother & Baby Picture Library / EMAP



- (a) At which stage, **A**, **B**, **C** or **D**, in the cycle does meiosis take place?

answer ..... [1]

- (b) The chromosome number in most human body cells is 46.

Put a **ring** around the number of chromosomes in human cells produced by meiosis.

**2**                      **23**                      **46**                      **92**                      [1]

- (c) Mitosis also takes place in the human life cycle.

What happens to the chromosome number when body cells divide by mitosis?

Put a **ring** around the correct answer.

**doubles**                      **halves**                      **quarters**                      **stays the same**                      [1]

(d) One of the stages in the human life cycle is the formation of a zygote.

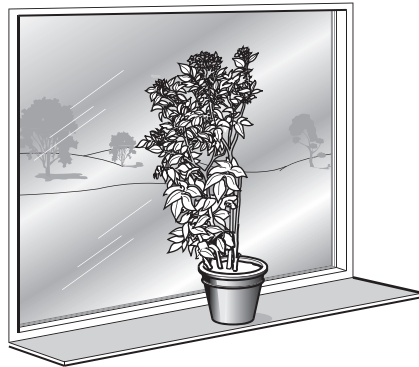
Put ticks (✓) in the boxes to show if the statements about the zygote are **true** or **false**.

<b>The zygote contains ...</b>	<b>true</b>	<b>false</b>
... a unique combination of chromosomes.		
... a set of chromosomes from each parent.		
... only chromosomes from the mother.		
... twice the number of chromosomes found in the sperm.		
... half the number of chromosomes found in the egg.		

[2]

[Total: 5]

3 This plant is growing towards the window.



(a) (i) What process causes the plant to grow towards the window?

Put a (ring) around the correct word.

**phototropism**

**reproduction**

**respiration**

[1]

(ii) How does the plant benefit from this process?

Complete the sentence.

Choose from this list.

**carbon dioxide**

**light**

**oxygen**

**water**

This process helps the plant to get more .....

[1]

(b) People prefer to buy plants with leaves growing in all directions.



What is the best way of producing plants like **A**?

Put a tick (✓) in the correct box.

grow them with an overhead source of light

grow them in the dark

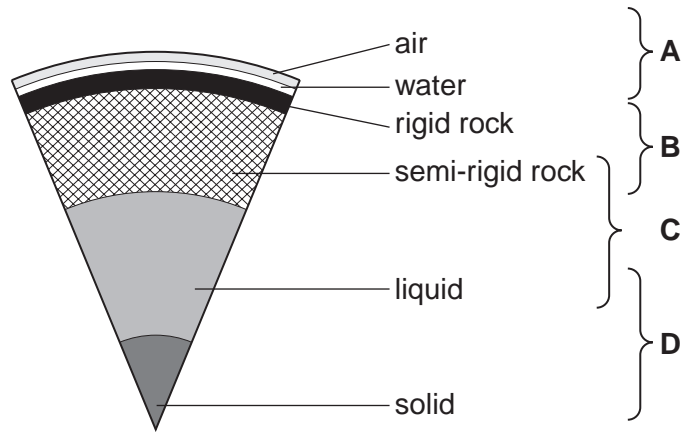
grow them next to windows

[1]

[Total: 3]



4 The Earth is made of different layers.



(a) Which layer, **A**, **B**, **C** or **D**, is the lithosphere?

answer ..... [1]

(b) Here are some elements which are in the lithosphere.

Put a **ring** around each of the **three** most abundant elements.

**aluminium**

**chlorine**

**helium**

**hydrogen**

**silicon**

**oxygen**

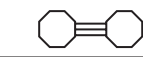

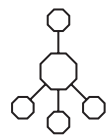
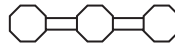
[3]

[Total: 4]

5 The Earth's atmosphere contains different gases.

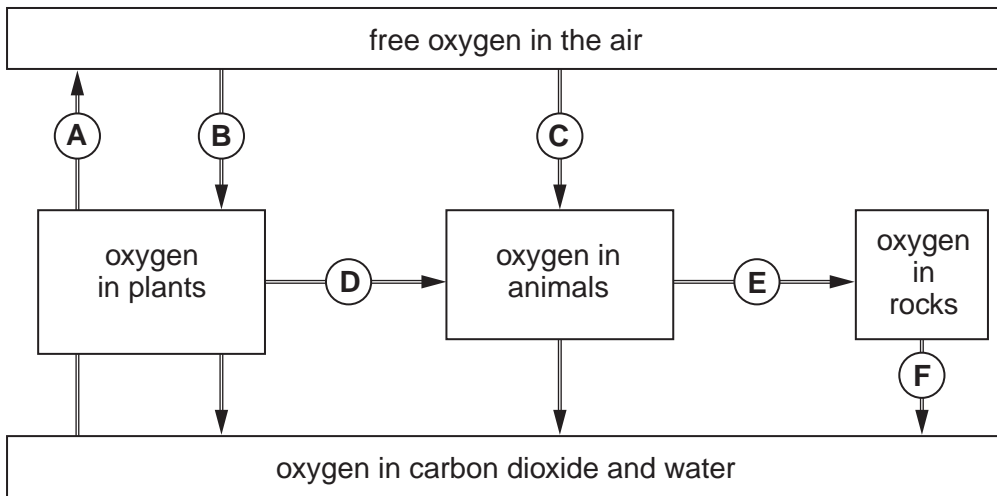
(a) Draw a straight line from the **formula** of each gas to its **name**.

Draw a straight line from the **formula** of each gas to its **structure**.

name	formula	structure
nitrogen	Ar	
argon	N <sub>2</sub>	
carbon dioxide	CH <sub>4</sub>	
methane	CO <sub>2</sub>	

[3]

(b) Tony draws a diagram of an oxygen cycle.



(i) Most of these stages take place fairly quickly.

Which stage, **A**, **B**, **C**, **D**, **E** or **F**, is most likely to keep the oxygen out of the air for millions of years?

answer ..... [1]

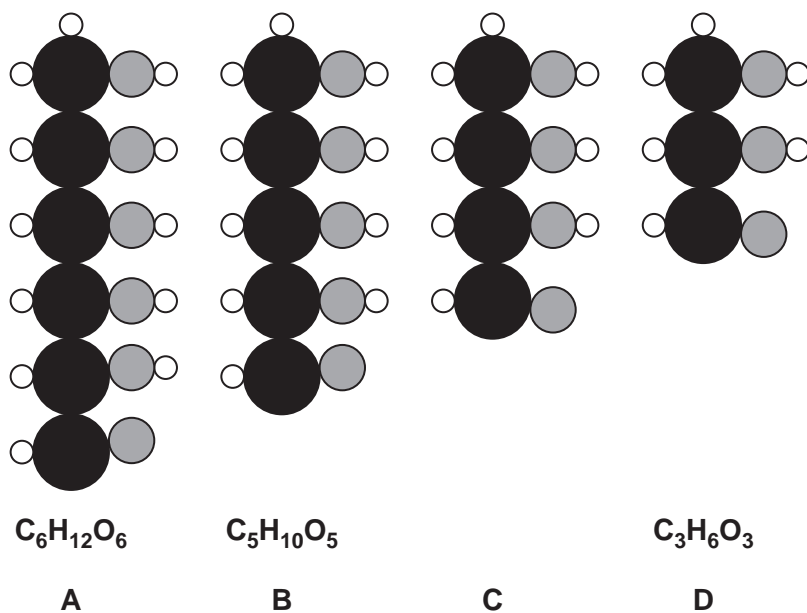
(ii) Give the letter for **one** stage which removes oxygen from the air. ....

Give the letter for **one** stage which puts oxygen into the air. .... [1]

[Total: 5]

6 There are different types of sugar. Each is made from the elements carbon, hydrogen and oxygen.

Here are diagrams of four of them.



(a) Which sugar, **A**, **B**, **C** or **D**, has the most oxygen atoms in one molecule?

answer ..... [1]

(b) Put a ring around the symbol below which stands for a **hydrogen** atom.



[1]

(c) What is the molecular formula of sugar **C**? .....

[1]

[Total: 3]

7 Some metals are extracted from a metal compound by melting the compound and then electrolysing it.

Which **two** of these substances, when melted, can be electrolysed to produce metals?

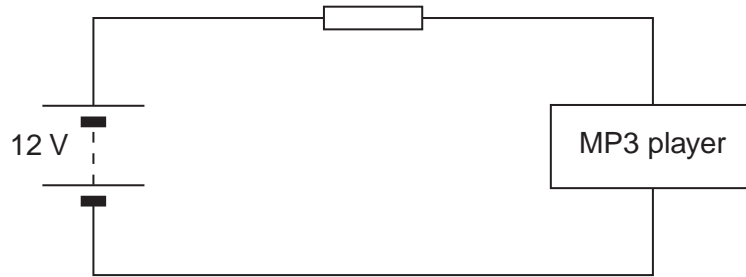
- |                 |                 |                 |
|-----------------|-----------------|-----------------|
| aluminium oxide | carbohydrate    | DNA             |
| protein         | silicon dioxide | sodium chloride |

..... and ..... [2]

[Total: 2]

8 Jo likes to listen to her MP3 player in the car.

She uses this circuit to connect her MP3 player to the 12 V car battery.



(a) When the MP3 player is switched on, the potential difference across it is 1.5 V and the current in it is 0.05 A.

What is the power of her MP3 player?

Put a (ring) around the correct answer.

**0.033 W**

**0.075 W**

**30 W**

[1]

(b) Complete the sentences. Choose words from the list.

**charge**

**power**

**resistance**

**temperature**

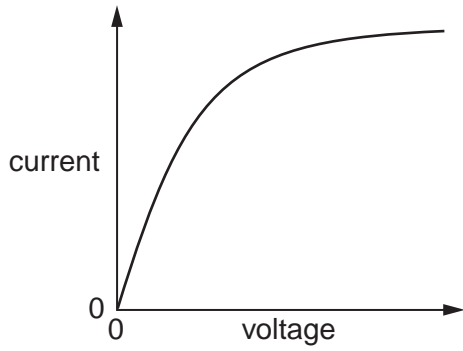
**voltage**

The resistor resists the flow of ..... through the MP3 player.

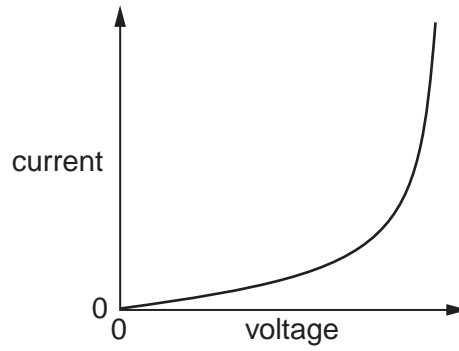
This results in an increase in ..... for the resistor.

[2]

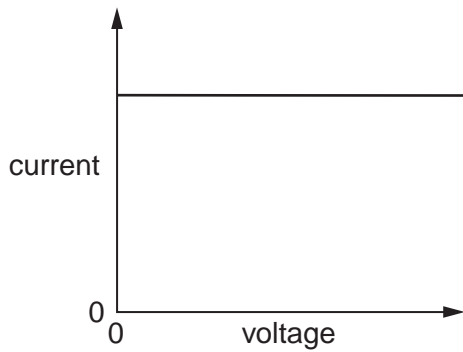
(c) Which of these graphs, **A**, **B**, **C** or **D**, shows how the current in the resistor depends on the voltage across it?



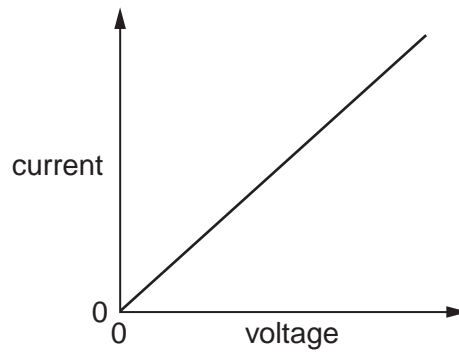
**A**



**B**



**C**

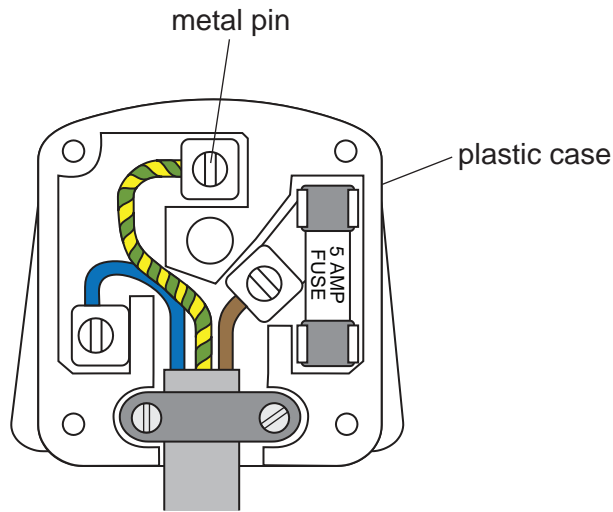


**D**

answer ..... [1]

[Total: 4]

9 Julie investigates the mains plug on her computer.



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

<b>start</b>	<b>end</b>
The metal pin ...	... arrives at the plug at 230 V.
The plastic case ...	... has no free electrons for an electric current.
The mains supply ...	... has free electrons to make an electric current.

[2]

(b) Complete the sentences about the mains electricity supply.

Choose from the list.

- a.c.**      **d.c.**      **h.t.**      **generators**      **inductors**      **transformers**

The mains electricity to our homes is .....

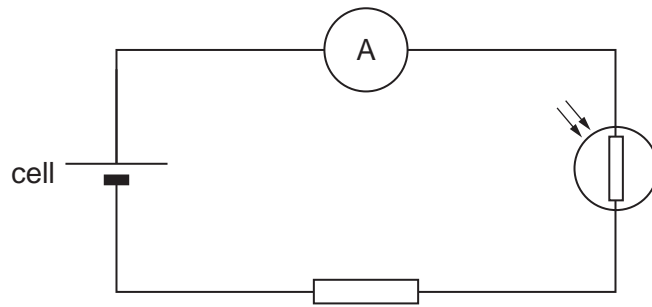
It is made by ..... in power stations.

Its voltage can be changed by .....

[3]

[Total: 5]

10 Daniel builds this circuit. It contains an LDR.



- (a) Put a **ring** around the LDR. [1]
- (b) Draw a straight line from each **component** of the circuit to its **function**.

component	function
cell	has a variable resistance
ammeter	has a constant resistance
LDR	pushes electrons around the circuit
	measures flow of electrons around the circuit

[3]

(c) Complete the sentence. Choose words from the list.

**bigger than**

**smaller than**

**the same as**

The current in the ammeter is ..... the current in the resistor. [1]

[Total: 5]

**END OF QUESTION PAPER**

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# The Periodic Table of the Elements

1	2	3	4	5	6	7	0										
7 Li lithium 3	9 Be beryllium 4	11 Na sodium 11	12 C carbon 6	13 Al aluminium 13	14 N nitrogen 7	15 P phosphorus 15	16 S sulfur 16	17 Cl chlorine 17	18 Ar argon 18								
19 K potassium 19	20 Ca calcium 20	21 Sc scandium 21	22 Ti titanium 22	23 V vanadium 23	24 Cr chromium 24	25 Mn manganese 25	26 Fe iron 26	27 Co cobalt 27	28 Ni nickel 28	29 Cu copper 29	30 Zn zinc 30	31 Ga gallium 31	32 Ge germanium 32	33 As arsenic 33	34 Se selenium 34	35 Br bromine 35	36 Kr krypton 36
37 Rb rubidium 37	38 Sr strontium 38	39 Y yttrium 39	40 Zr zirconium 40	41 Nb niobium 41	42 Mo molybdenum 42	43 Tc technetium [98]	44 Ru ruthenium 44	45 Rh rhodium 45	46 Pd palladium 46	47 Ag silver 47	48 Cd cadmium 48	49 In indium 49	50 Sn tin 50	51 Sb antimony 51	52 Te tellurium 52	53 I iodine 53	54 Xe xenon 54
55 Cs caesium 55	56 Ba barium 56	57 La* lanthanum 57	72 Hf hafnium 72	73 Ta tantalum 73	74 W tungsten 74	75 Re rhenium 75	76 Os osmium 76	77 Ir iridium 77	78 Pt platinum 78	79 Au gold 79	80 Hg mercury 80	81 Tl thallium 81	82 Pb lead 82	83 Bi bismuth 83	84 Po polonium [209]	85 At astatine [210]	86 Rn radon [222]
87 Fr francium 87	88 Ra radium 88	89 Ac* actinium 89	104 Rf rutherfordium [261]	105 Db dubnium [262]	106 Sg seaborgium [266]	107 Bh bohrium [264]	108 Hs hassium [277]	109 Mt meitnerium [268]	110 Ds darmstadtium [271]	111 Rg roentgenium [272]	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.