

**GENERAL CERTIFICATE OF SECONDARY EDUCATION
TWENTY FIRST CENTURY SCIENCE
ADDITIONAL SCIENCE A**
Unit 2 Modules B5 C5 P5
FOUNDATION TIER
THURSDAY 21 JUNE 2007

F A216/01

Afternoon

Time: 40 minutes

Calculators may be used.
Additional materials: Pencil
Ruler (cm/mm)



* C O P / T 4 3 3 4 2 *

Candidate
Name

Centre
Number

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Candidate
Number

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INSTRUCTIONS TO CANDIDATES

- Write your name, Centre Number and Candidate Number in the boxes above.
- Answer **all** the questions.
- Use blue or black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully and make sure you know what you have to do before starting your answer.
- Do **not** write in the bar code.
- Do **not** write outside the box bordering each page.
- WRITE YOUR ANSWER TO EACH QUESTION IN THE SPACE PROVIDED. ANSWERS WRITTEN ELSEWHERE WILL NOT BE MARKED.

INFORMATION FOR CANDIDATES

- The number of marks for each question is given in brackets [] at the end of each question or part question.
- A list of physics equations is printed on page 2.
- The Periodic Table is printed on the back page.

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

This document consists of **20** printed pages and **4** blank pages.

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 Motion of Radiation

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

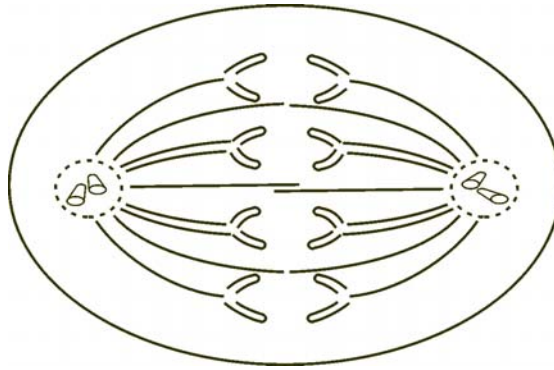
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Question 1 starts on page 4

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Answer **all** the questions.

- 1 Andrew uses a microscope to examine the cells at the tip of an onion root.



- (a) Which type of cell division is taking place in the root?

Put a tick (✓) in the correct box.

fertilisation

meiosis

mitosis

[1]

- (b) Here are the four stages, **A**, **B**, **C** and **D**, of cell growth and division in the **cell cycle**.

They are in the wrong order.

A cell divides

B chromosomes are copied

C chromosome copies move apart

D numbers of organelles increase

Fill in the boxes to show the right order. The first one has been done for you.

D			
---	--	--	--

[2]

(c) Finish each sentence by choosing the **best** word from each pair.

Put a **ring** around the correct word in each pair.

Chromosomes are made of the chemical called..... **DNA / RNA.**

This chemical contains four different..... **bases / genes.**

The chromosomes are in the..... **cytoplasm / nucleus.**

Proteins are made in the..... **cytoplasm / nucleus.**

[3]

[Total: 6]

2 This question is about growth in plants and animals.

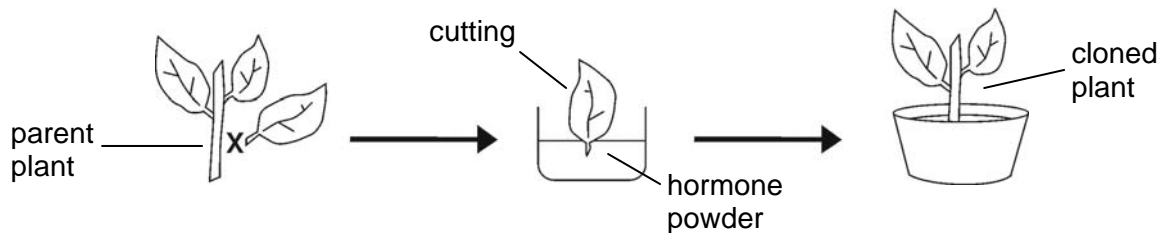
(a) Complete the following table about growth in plants and animals.

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

feature	true for both plants and animals	only plants	only animals
most continue to grow in height and width throughout their lives			
different types of tissue contain specialised cells			
some cells are still unspecialised even in adults			

[3]

(b) For many years, cuttings have been used to produce clones of plants.



The cut surface is dipped into a hormone powder before planting.

Why is hormone powder used?

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

to stop water loss

to help root growth

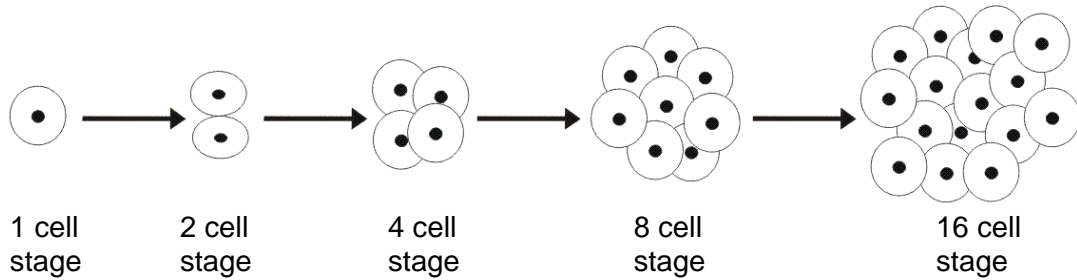
to make the plant flower

to stop disease spreading

[1]

- (c) It is now possible to produce clones of animals. This is done by removing cells from a single embryo and growing them to form identical embryos.

The human embryo grows from a single cell (zygote), which divides to form a group of cells.



- (i) At which stage, in humans, is it **not possible** to collect cells to produce identical embryos?

answer cell stage. [1]

- (ii) Why is this?

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

cells are too small to collect

cells are specialised at this stage

cells are not able to divide any further

[1]

[Total: 6]

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3 To make an embryo, an egg has to be fertilised by a sperm.

(a) How does the chromosome number in an **egg** compare with the number in a **parent** cell?

Put a tick (✓) in the correct box.

an egg has twice the chromosome
number of a parent cell

an egg has half the chromosome
number of a parent cell

an egg has the same chromosome
number as a parent cell

[1]

(b) Complete the following paragraph.

Put a **ring** around the correct word in each pair.

The egg and sperm meet to make a fertilised egg. This is called a**zygote / gamete**.

The fertilised egg divides into two cells. The chromosomes in the two cells
are**different / identical**.

The embryo grows into a baby. Each of its body cells produces only the proteins it needs.

So most of the genes in the baby's cells are**active / inactive**.

[2]

[Total: 3]

- 4 Titan is a moon near the planet Saturn. In 2004, a space probe landed on Titan and found out what gases are in its atmosphere.

An image has been removed due to copyright restrictions

Details:
a clipart-style illustration
of a space probe

This table shows the main gases in the atmosphere of Titan.

gas		percentage in Titan atmosphere
name	formula	
nitrogen		95%
methane	CH ₄	3%
argon	Ar	1%
other gases		

- (a) Complete the table by filling in the formula for **nitrogen gas**.

[1]

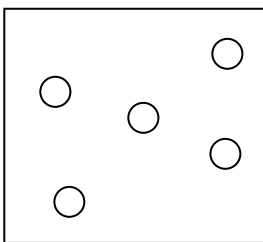
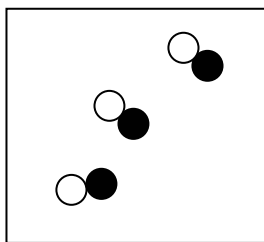
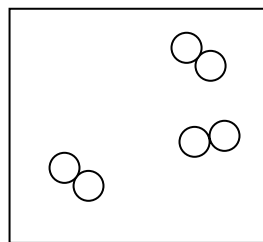
- (b) Which of the following statements are **true** and which are **false**?

Put ticks (✓) in the correct boxes.

	true	false
The gases on Titan are all ionically bonded.		
1% of the atmosphere of Titan is other gases.		
All the gases named in the table are present on Earth.		
All the gases present on Earth are named in the table.		
The data shows that there is no carbon dioxide on Titan.		

[2]

(c) Which diagram, **A**, **B** or **C**, shows the arrangement of atoms in argon gas?

**A****B****C**

answer

[1]

[Total: 4]

5 In 2003, there was a tsunami (tidal wave) in Indonesia.

Sea water flooded large areas of farmland.



(a) Sea water contains dissolved salt.

After the tsunami, water left on the farmland evaporated to form water vapour in the air.

Solid salt crystals were left behind in the soil.

Draw straight lines to connect each **substance** with the correct **state symbol**.

substance	state symbol
water	(s)
water vapour	(aq)
solid salt	(g)
salt dissolved in water	(l)

[2]

(b) Which of the following statements are true for sea water?

Put ticks (✓) in the **two** correct boxes.

Sea water is a pure element.

Sea water conducts electricity.

Sea water is a single compound.

Sea water contains dissolved ions.

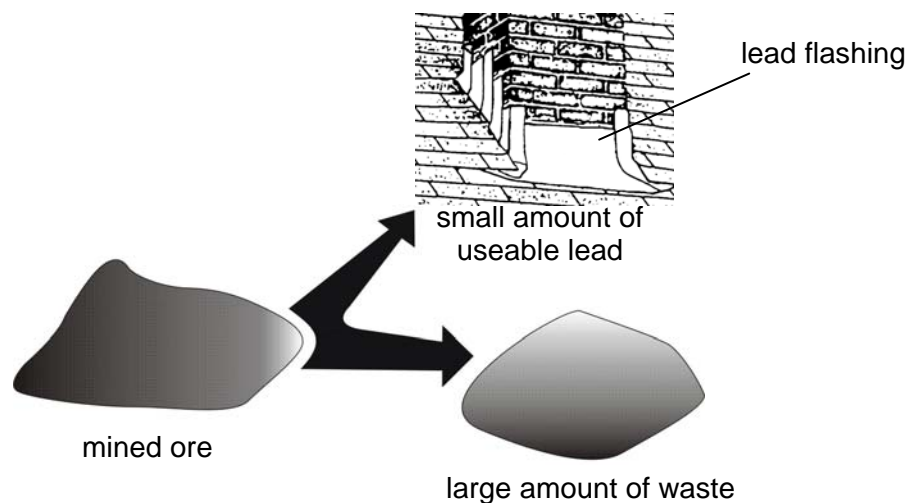
Sea water contains only one type of salt.

[2]

[Total: 4]

6 Lead is a metal that is used on roofs.

When lead is extracted, a large amount of ore has to be mined to make a small amount of lead.



(a) Why does extracting lead produce large amounts of waste?

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

Lead ore only contains a small amount of lead compounds.

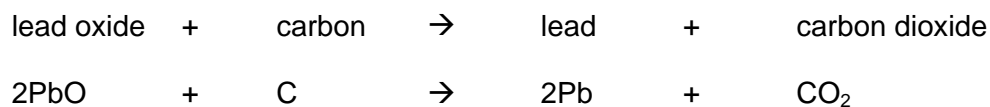
Lead ore is very heavy.

A lot of energy is needed to extract lead from lead compounds.

[1]

(b) Lead is extracted by heating lead oxide with carbon.

This is the equation for the reaction.



Complete the sentences to show what happens during the reaction.

Put a **ring** around the correct word in each pair.

During the reaction, lead oxide loses ...**carbon** / **oxygen**.

At the same time, carbon gains...**lead** / **oxygen**.

Carbon is ...**oxidised** / **reduced**.

[2]

- (c) After the extraction process, lead goes into a moulding process to make lead sheets.

This table shows some information about the properties of lead.

property	information
melting point	327 °C
boiling point	1744 °C
relative atomic mass	207
malleability	very malleable
electrical conductivity	poor compared to other metals

- (i) During the moulding process, the lead is poured out as a liquid.

Use information in the table to suggest a temperature for the moulding process.

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

100 °C

350 °C

2000 °C

[1]

- (ii) Lead sheets can be used for roofing because they are easily bent into shape.

Which property in the table shows that lead can be easily bent?

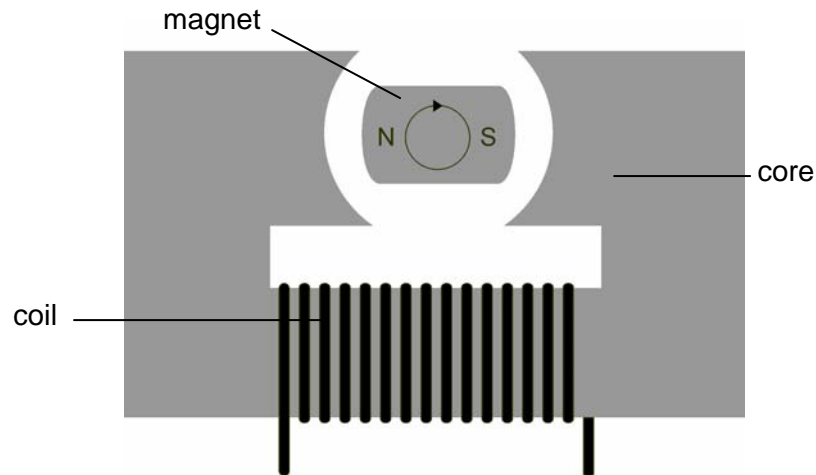
answer

[1]

[Total: 5]

7 This question is about mains electricity.

(a) Mains electricity can be generated by rotating magnets.



Use straight lines to join the **start** of each sentence to its correct **end** of sentence.

start

end

The core inside the coil ...

... to increase the a.c. voltage.

The coil has many turns of wire ...

... rotates to change the magnetic field in the core.

The magnet ...

... is made of iron.

[2]

(b) What is the mains supply voltage in our homes?

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

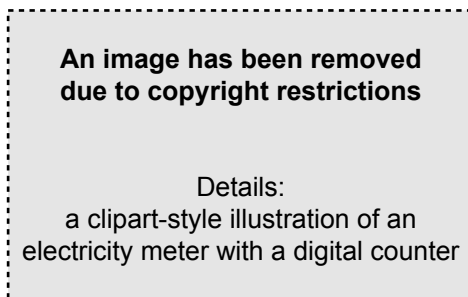
120 V

230 V

420 V

[1]

(c) This meter measures how much electricity is used in a house.



(i) Complete the sentence. Choose from this list.

- watts
- joules
- kilowatt-hours

The readings on an electricity meter are in units of [1]

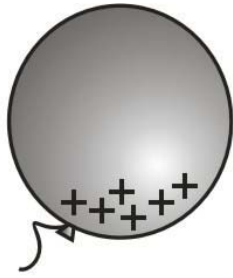
(ii) Complete the sentence. Choose from this list.

- voltage
- electric current
- energy transfer

An electricity meter measures [1]

[Total: 5]

8 Dan has a favourite party trick.



He rubs a balloon on his head.

When he removes the balloon,
his hair stands on end.

(a) Complete the sentences to explain what happens.

Choose the **best** words from the list.

repel
attract
current
positive
negative
electrons

All of the hairs gain charge.

The hairs stand on end because they each other.

This is because each hair gains transferred from the balloon.

[3]

(b) Dan's hair often stays up for a long time.

Here are some reasons. Only **one** is correct.

- A** his hair is a generator
- B** his hair is an insulator
- C** his hair is a transformer

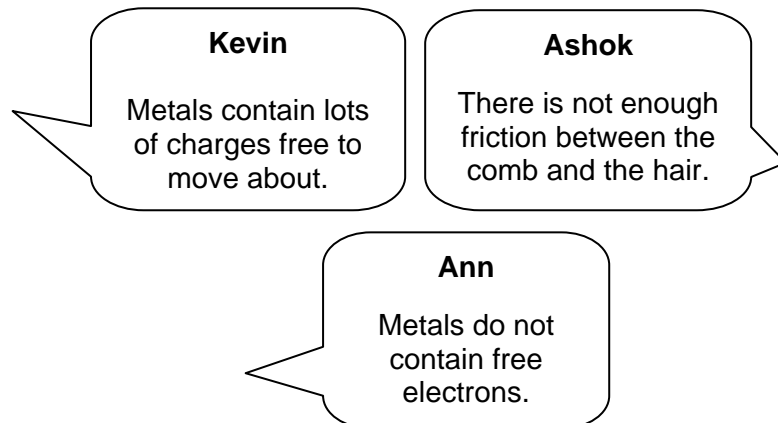
Which is the correct reason, **A**, **B** or **C**?

answer [1]

(c) Dan's hair does not stand on end when he combs it with a metal comb.

Here are some reasons.

Only one is correct.

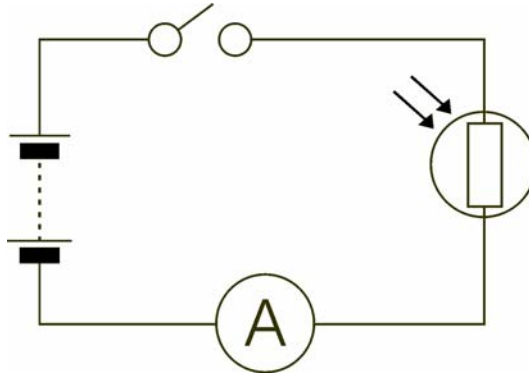


Who has the correct reason, **Ann**, **Kevin** or **Ashok**?

answer [1]

[Total: 5]

- 9 Ann builds this electric circuit.



- (a) Add a **voltmeter** to the circuit to measure the battery voltage.

Use the correct symbol.

[1]

- (b) Here are some statements about Ann's circuit.

Put ticks (✓) in the **two** correct boxes.

- | | |
|---|--------------------------|
| The battery is a source of direct current. | <input type="checkbox"/> |
| There is a voltage across the battery only when the switch is closed. | <input type="checkbox"/> |
| The ammeter measures the energy of the charge moving in the circuit. | <input type="checkbox"/> |
| The current in the circuit depends on the amount of light shining on the LDR. | <input type="checkbox"/> |

[2]

- (c) Ann closes the switch.

The current in the circuit = 0.12 A.
The voltage across the LDR = 9 V.

Here are some calculations for the resistance of the LDR.

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

$$\frac{9}{0.12} = 75\Omega$$

$$9 \times 0.12 = 1.1\Omega$$

$$\frac{0.12}{9} = 0.013\Omega$$

[1]

[Total: 4]

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 O oxygen 8	17 Cl chlorine 17	18 Ar argon 18	19 F fluorine 9	20 Ne neon 10	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 Ca calcium 20	41 Zr zirconium 40	42 Nb niobium 41	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 [223]	88 Ra radium [226]	89 Ac* actinium [227]	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	
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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.