

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

A217/01

Unit 3: Modules B6 C6 P6 (Foundation Tier)

Candidates answer on the Question Paper
A calculator may be used for this paper

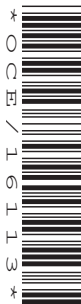
OCR Supplied Materials:
None

Other Materials Required:

- Pencil
- Ruler (cm/mm)

**Tuesday 22 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 **16** pages. Any blank pages are indicated.

TWENTY FIRST CENTURY SCIENCE EQUATIONS

Useful Relationships

Explaining Motion

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

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

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

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

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

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

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

Electric Circuits

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

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

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

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

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

The Wave Model of Radiation

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

3

Answer **all** the questions.

- 1 Jane uses her mobile phone to talk to Mike.



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

start**end**

What Jane says ...

... is affected by noise.

The quality of the signal from Jane's phone ...

... is converted into a digital code.

The wave from Jane's phone ...

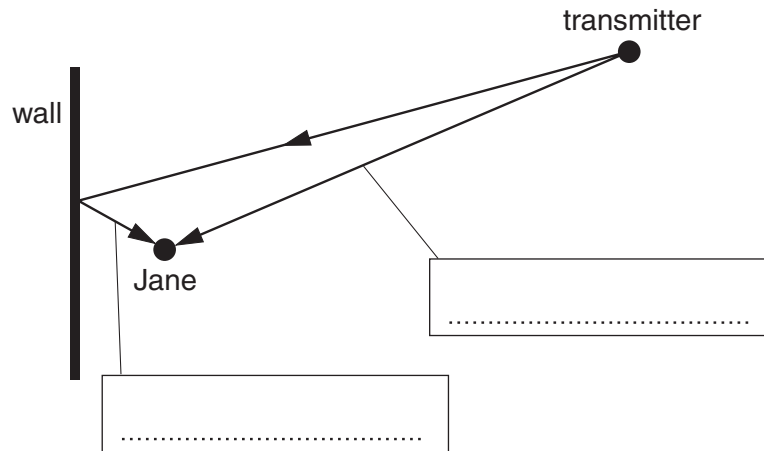
... is modulated by the digital code.

[2]

4

(b) Jane stands close to a wall.

She finds that mobile phone reception is very bad close to the wall.



(i) Write the names of the two waves from the transmitter in the boxes.

Choose words from this list.

absorbed

direct

reflected

[1]

(ii) She thinks that the bad reception is due to **destructive interference**.

Describe the process of **destructive interference**.

.....

.....

..... [2]

[Total: 5]

5

- 2 Ted shouts, making a sound wave of frequency 1500 Hz with a wavelength of 0.2 m.



- (a) What is the speed of the wave?

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

30 m/s

300 m/s

3000 m/s

30 000 m/s

[1]

- (b) Draw straight lines to link each **wave property** to its **meaning**.

wave property

meaning

intensity

waves per second

amplitude

energy per second

frequency

size of disturbance

wavelength

distance between crests

[2]

- (c) Complete the sentences below using words from this list.

increases

decreases

stays the same

The sound wave travels away from Ted.

Its amplitude as it travels away.

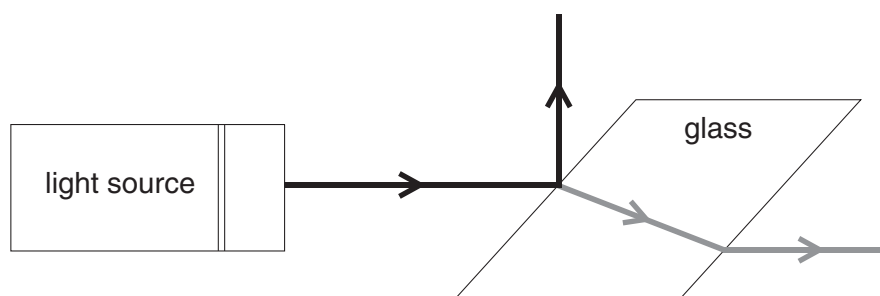
Its speed as it travels away.

[1]

[Total: 4]

6

- 3 Fiona shines a beam of light onto a block of glass.



- (a) When the light enters the glass it changes direction.

What is the name of this effect and why does it happen?

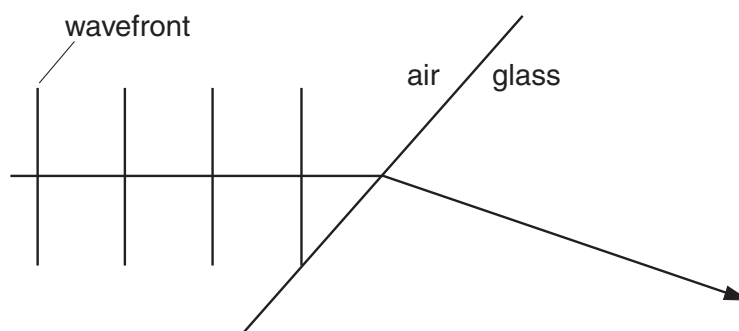
.....

.....

..... [2]

- (b) The diagram shows four wavefronts of the light as it approaches the glass surface.

Draw on the diagram the four wavefronts when they are **inside** the glass.



[1]

- (c) The light is an electromagnetic wave in the visible part of the spectrum.

Here are some electromagnetic waves.

gamma rays

radio waves

visible light

Write these waves into the correct boxes of the spectrum shown below.

	microwaves	infrared		ultraviolet	X-rays	
--	------------	----------	--	-------------	--------	--

[2]

[Total: 5]

- 4 A chemical engineer chooses an acid to clean away corrosion from pieces of metal.

(a) Which of these formulas does **not** represent an acid?

Put a ring around the correct answer.



[1]

(b) The acid she chooses is corrosive.

Put a ring around the symbol which should go on the bottle of acid to show that the acid is corrosive.



[1]

(c) The corrosion on the metal is made of metal oxide.

The metal oxide disappears when the acid reacts with it.

Some friends try to explain what happens to the oxide.



Alex
The acid eats
the oxide.

Brenda
The oxide turns
into a gas.



Donna
The oxide turns
into a salt
solution.



Charles
The acid
burns the
oxide away.



Who gives the **best** answer?

answer [1]

Turn over

8

(d) Acids will also react with alkalis.

(i) Put rings around the **two** alkalis in this list.



[2]

(ii) When an acid reacts with an alkali, two substances are formed.

What are they?

..... and [2]

[Total: 7]

5 Daisy chooses an acid to clean metals.

Acids can be bought with different levels of purity.

Some are very pure. Others still contain impurities.

(a) Suggest and explain why she chooses an impure acid to clean metals.

.....

.....

..... [2]

(b) Daisy wants to find the pH of the acid before she uses it.

Give **two** ways that she could do this.

For each method

- state what she will use
- describe what she will see.

method one

.....

.....

method two

.....

..... [2]

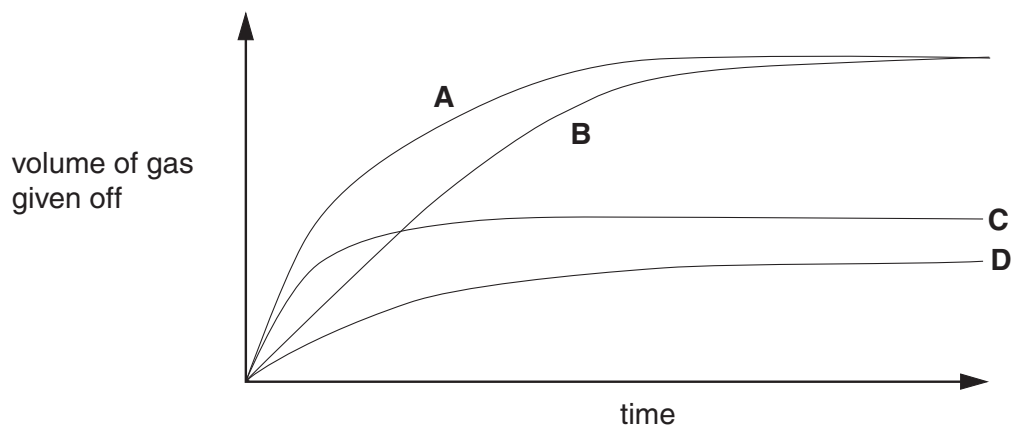
[Total: 4]

10

- 6 Some students react acid with an excess of marble chips.

They measure the amount of gas given off.

Here are the results of four different experiments, **A**, **B**, **C** and **D**.



- (a) Which **two** experiments gave the same volume of gas at the end?

answer and [1]

- (b) Which experiment gave off gas at the fastest rate at the start?

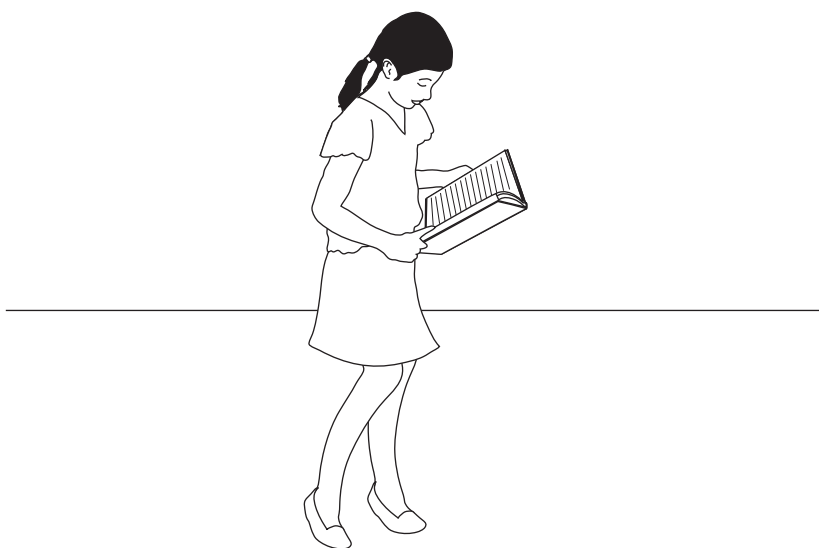
answer [1]

- (c) In which experiment did the reaction finish first?

answer [1]

[Total: 3]

- 7 Amelia is learning the words for her part in the school play.



- (a) What is happening to the information in Amelia's memory as she rehearses the play?

Put a ring around each of the **two** words which best describe what is happening.

duplication loss retrieval storage transmission

[1]

- (b) The sentences below describe what happens in her brain.

Complete the sentences below using the **best** words from this list.

axon billions experience
hundreds response thousands transmit

Amelia's brain has of neurons.

They can connect together to make pathways.

When she first reads her words, they are a new

This causes new pathways to form.

When she repeats the words, these new pathways are more likely to impulses.

[2]

12

(c) After a week of rehearsals, some of Amelia's words in the play are changed.

She has to learn new words.

How is this possible?

Put a tick (✓) in the box next to the **best** explanation.

Some neurons will stop transmitting impulses.

☐

New pathways are created by moving neurons around.

☐

New experiences remove existing pathways in the brain.

☐

The variety of potential pathways makes it possible to adapt to new situations.

☐

[1]

[Total: 4]

8 Keith is sitting near a window.

A wasp disturbs him.

Keith tries to swat the wasp, but it avoids his hand.

The wasp keeps bumping into the window as it tries to escape.

(a) Put ticks (✓) in the boxes next to the **two** correct statements.

Simple reflexes have to be learnt.

☐

Keith uses simple reflexes to swat the wasp.

☐

The wasp quickly learns to avoid Keith's hand.

☐

The wasp has difficulty in responding to new situations.

☐

The wasp relies on reflex actions for most of its behaviour.

☐

[2]

14

- (b) (i) The wasp later lands on Keith's arm and stings him.

His arm quickly moves to shake the wasp off.

This is a reflex.

Add labels to the diagram by writing the names of the two neurons in the boxes. Choose words from this list.

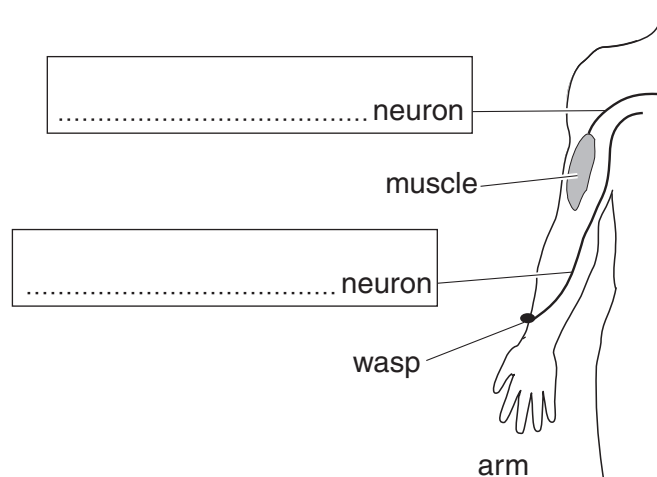
central

motor

peripheral

sensory

synapse



[2]

- (ii) The neurons in Keith's arm are part of a reflex arc.

Describe the operation of a reflex arc.

Your answer should include

- how information passes along the reflex arc
- where the neurons meet in the nervous system.

.....

.....

.....

.....

..... [3]

[Total: 7]

15

9 Scientists have studied the cerebral cortex of the brain.

(a) What is the cerebral cortex used for?

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

balance

breathing

digestion

language

[1]

(b) Give **two** methods used by scientists to map the cerebral cortex.

.....

.....

..... [2]

[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

* 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.