

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

**A217/01**

Unit 3 Modules B6 C6 P6  
(Foundation Tier)

**Tuesday 27 January 2009  
Afternoon**

**Duration: 40 minutes**

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)



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, however additional paper may be used if necessary.

**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 two.
- The Periodic Table is printed on the back page.
- This document consists of **20** pages. Any blank pages are indicated.

**FOR EXAMINER'S USE**

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

## 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

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

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

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

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

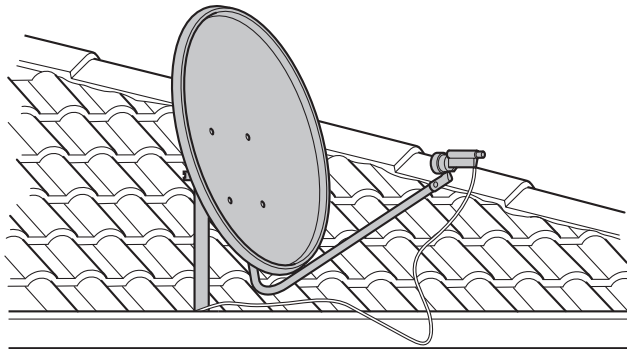
$$\text{efficiency} = \frac{\text{energy usefully transferred}}{\text{total energy supplied}} \times 100\%$$

#### The Wave Model of Radiation

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

Answer **all** the questions.

- 1 Microwaves carry signals from satellites to our homes through the atmosphere.



- (a) Here are some other waves.

Which **one** also carries signals from satellites through the atmosphere?

Put a **ring** around the answer.

**gamma**                      **radio**                      **X-rays**

[1]

- (b) A dish on the roof of a house guides the microwaves onto a receiver.

Complete the sentences.

Choose words from this list.

**absorb**            **decreases**            **doesn't change**            **increases**            **reflect**            **refract**

As the microwaves travel through the atmosphere, their intensity .....

The microwaves ..... at the dish.

This process ..... the intensity of the microwaves at the receiver.

[3]

- (c) Other waves carry signals through optical fibres.

Which **one** of these waves carries signals through optical fibres?

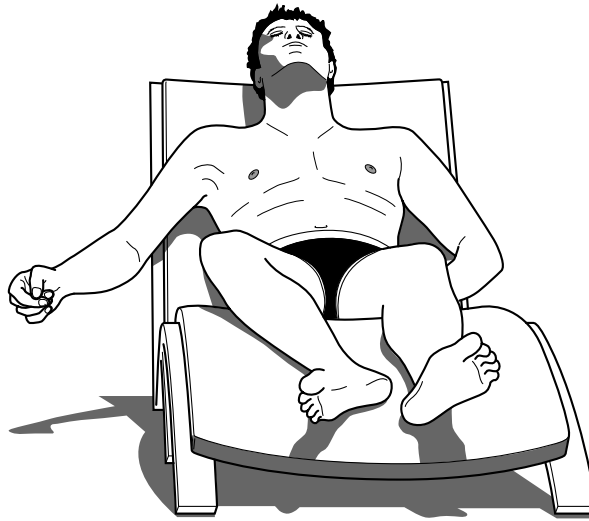
Put a **ring** around the answer.

**infrared**            **radio**                      **ultraviolet**            **X-rays**

[1]

[Total: 5]

2 Sam sunbathes on the beach.



(a) His skin absorbs photons of ultraviolet (UV) radiation.

Here is an incomplete diagram of the electromagnetic spectrum.

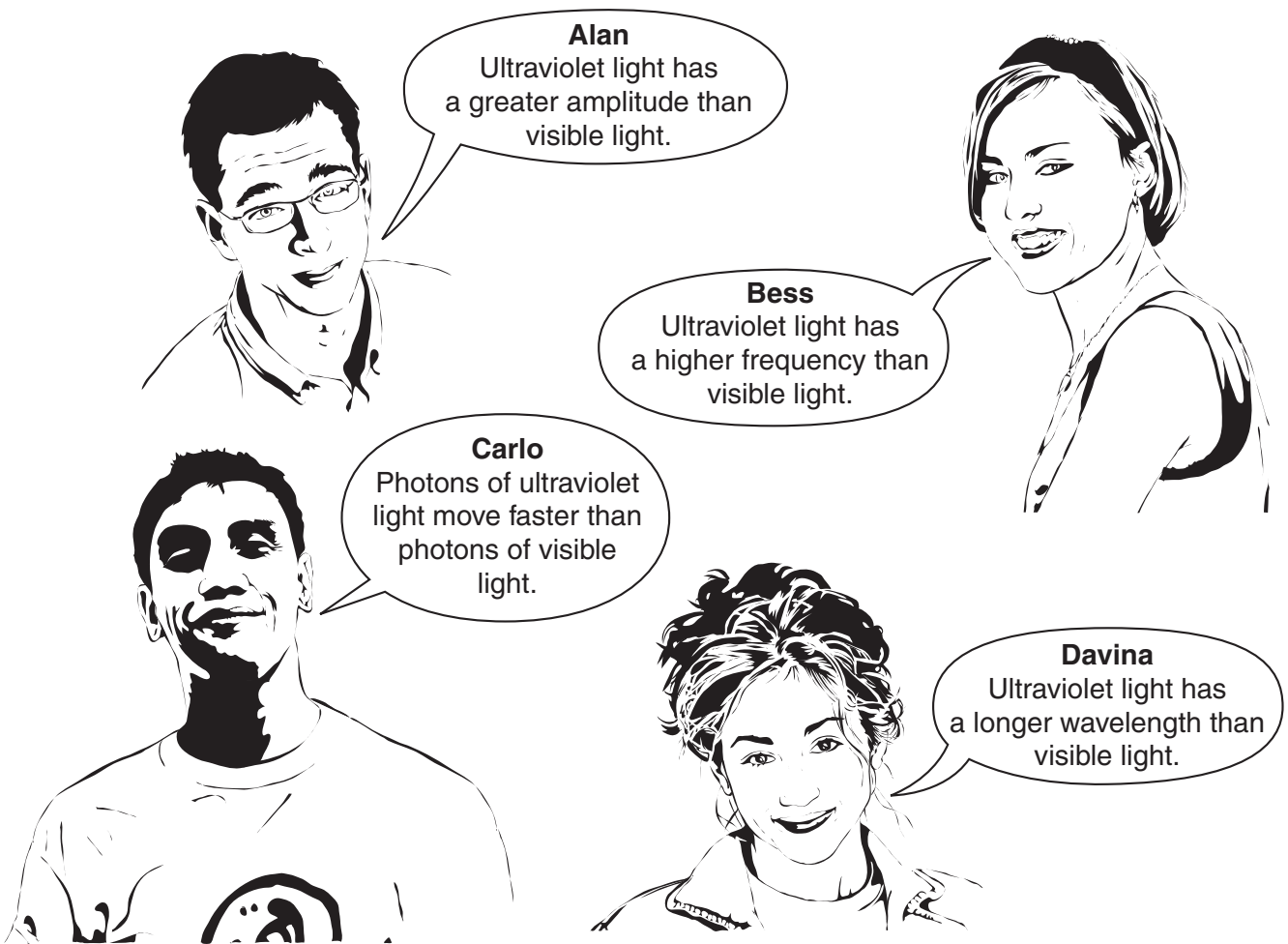
Write UV in the correct place.

	microwaves		visible		X-rays	
--	------------	--	---------	--	--------	--

[1]

(b) Photons of ultraviolet light carry more energy than photons of visible light.

Sam asks his friends the reason why.



Which of his friends gives the correct reason?

answer ..... [1]

(c) Intensity and frequency are two different properties of sunlight.

Draw a straight line to link each **property** of sunlight to its correct **description**.

property	description
intensity	the rate at which photons are absorbed
frequency	the number of waves emitted per second
	the rate at which energy is delivered by photons
	the number of photons emitted per second

[2]

(d) Sound and UV are different types of wave.

Complete the sentences.

Choose words from this list.

Use each word **only once**.

**air**      **empty space**      **longitudinal**      **transverse**

Sound is a ..... wave which can't pass through .....

UV is a ..... wave. It can travel through .....

[2]

[Total: 6]

3 Alfred looks at a compact disc (CD) in white light.

He notices that some parts of the disc appear blue. Other parts appear red.



(a) Complete the sentence.

Choose a word from this list.

**amplitude**

**intensity**

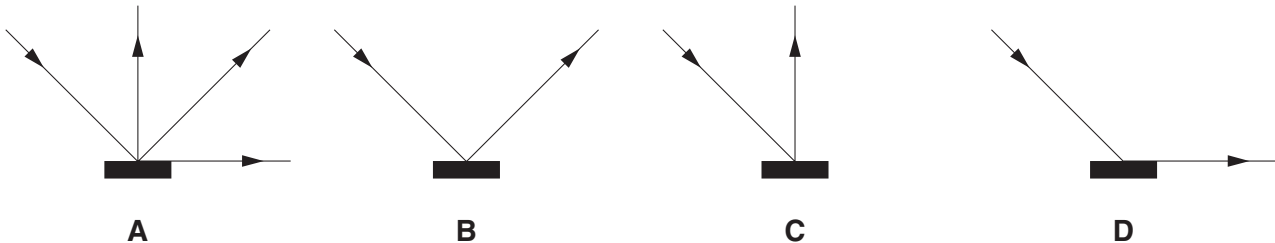
**wavelength**

**wave speed**

Red light has a different ..... to blue light.

[1]

(b) The CD contains billions of tiny mirrors. These reflect the white light.



Which **one** of the diagrams, **A**, **B**, **C** or **D**, shows light being **reflected** by a mirror?

correct diagram ..... [1]

(c) Complete each sentence by putting a **(ring)** around the correct word.

Waves of white light from different parts of the disc meet and add together.

This is called **absorption** **diffraction** **interference** **refraction**.

Waves reinforce when they arrive **in parallel** **in series** **in step** **out of step**.

This **decreases** **doesn't change** **increases** the intensity of the wave.

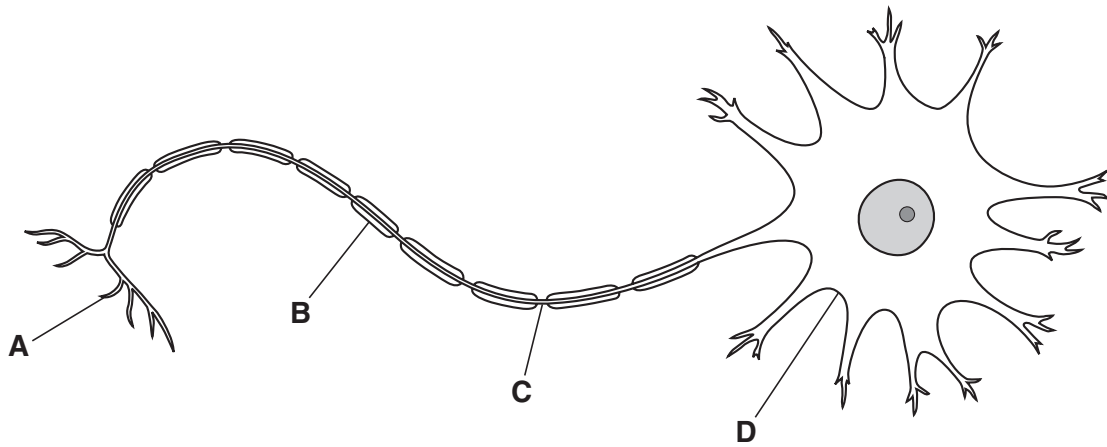
[3]

[Total: 5]

Turn over

4 Jo is learning about the nervous system.

(a) She looks at this diagram of a neuron.



(i) Which of the parts **A**, **B**, **C** or **D** is the axon?

answer ..... [1]

(ii) Which of the parts **A**, **B**, **C** or **D** is the fatty sheath?

answer ..... [1]

(b) How does a message travel along a neuron?

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

as a light ray

as a sound wave

as an electrical impulse

[1]



(c) The nervous system coordinates an animal's reflex response to a stimulus.

The sentences show how Jo's eye responds to a bright light.

They are in the wrong order.

- A** A motor neuron carries a nerve impulse to the muscles in the iris.
- B** A sensory neuron carries a nerve impulse to the brain.
- C** Light enters the eye through the pupil.
- D** Muscles in the iris contract to make the pupil smaller.

Put the letters **A**, **B**, **C** and **D** in the correct order in the boxes. The first one has been done for you.

C			
---	--	--	--

[2]

(d) A reflex arc is made up of different parts.

Complete the sentences.

Use words from this list.

**an effector**      **an impulse**      **a motor**      **a receptor**      **a stimulus**

A change in the environment is detected by .....

A response to the change is produced by .....

[2]

[Total: 7]

- 5 A child's behaviour can be due to learning or reflex actions.

Draw a straight line from each example of **behaviour** to its **type of learning or reflex action**.

**behaviour**

remembering the three times table

a baby grasping his mother's finger

putting on a coat when cold

**type of learning or reflex action**

simple reflex

learning by experience

learning by repetition

[2]

[Total: 2]

6 Edward has Alzheimer's disease.



Sometimes he does not remember what day it is.

He can still remember the friends he had at school.

(a) Which of the sentences describe Edward's memory?

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

Edward's short term memory has been damaged.

Edward's long term memory has been damaged.

Remembering today's date is a long term memory.

Remembering his school friends is a long term memory.

Edward now has no memory at all.

[2]

(b) Which part of the nervous system is concerned with memory?

Put a tick (✓) in the correct box.

reflex arc

spinal cord

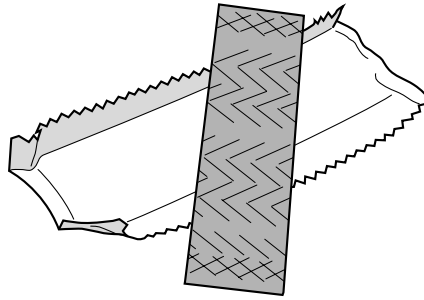
cerebral cortex

peripheral nervous system

[1]

[Total: 3]

7 Ann does an experiment with some chewing gum.



Here are the results.

what Ann does with the chewing gum	mass in g
weighs a stick of unchewed gum	8.0
weighs the same stick of gum after it has been chewed	3.0
weighs the same stick of chewed gum one week later	2.0

(a) Ann knows that a stick of gum contains several ingredients.

She knows that **pure** gum does not dissolve.

By the **end** of the experiment, what mass of ingredients had been removed?

Put a (ring) around the correct answer.

1 g

2 g

3 g

5 g

6 g

8 g

[1]

(b) During the last week the gum got lighter.

Ann asks her friends why.



Who gives the **best** answer?

..... [1]

(c) Ann's results show that 8g of fresh gum contains 2g of pure gum.

What is the percentage of pure gum in a stick of fresh gum?

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

16%

20%

25%

40%

80%

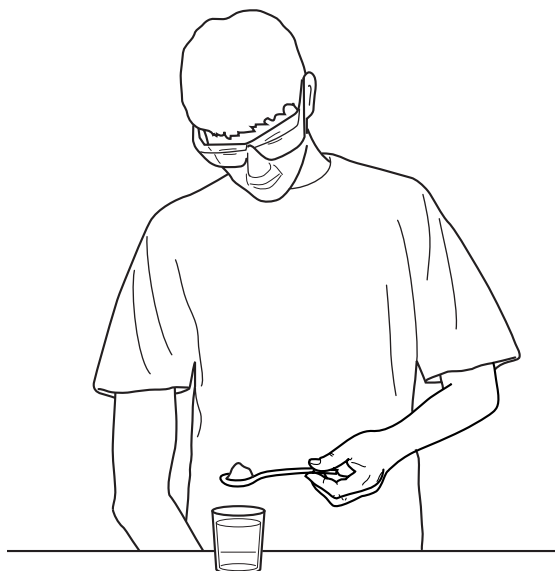
[1]

[Total: 3]

8 Tony has acid indigestion.

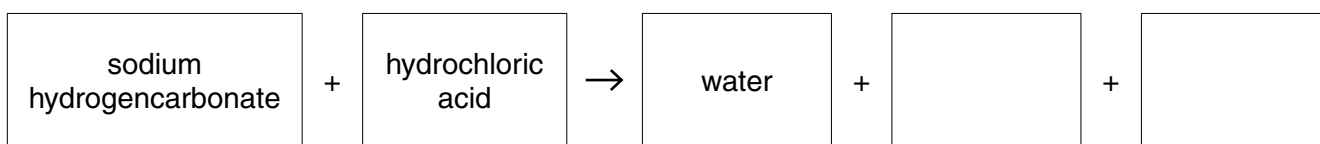
He knows that the sodium hydrogencarbonate,  $\text{NaHCO}_3$ , in his kitchen cupboard will react with acids.

He wonders if taking a spoonful will neutralise the acidity.



(a) Sodium hydrogencarbonate reacts with hydrochloric acid.

Fill in the boxes underneath the equation with the missing chemical names.



[2]

(b) Tony wonders how much acid reacts with a teaspoon of sodium hydrogencarbonate.

He weighs out a teaspoon full of sodium hydrogencarbonate and dissolves it in water.

He then carries out a titration.

Here are the stages of the process. They are in the wrong order.

- A add indicator and stir
- B stir in water to dissolve
- C add acid from the burette
- D swirl the flask
- E weigh the solid sample
- F look for a colour change

Write the correct order in the boxes. The first two have been done for you.

E	B				
---	---	--	--	--	--

[2]

(c) Tony writes down lots of readings during his titration.

- A mass of conical flask
- B volume of indicator added
- C final reading on the burette
- D initial reading on the burette
- E mass of conical flask + sample
- F mass of conical flask + solution
- G volume of water poured into the conical flask

(i) Which **two** readings from **A** to **G** will tell him the mass of the sample that he used?

..... and ..... [1]

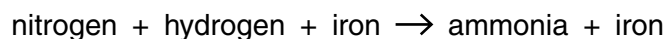
(ii) Which **two** readings from **A** to **G** will tell him the volume of acid used in the titration?

..... and ..... [1]

[Total: 6]

9 Chemical factories produce millions of tonnes of ammonia every year to make fertilisers.

Ammonia is a colourless gas made by the following reaction:



(a) Complete the table to show

- any chemicals which are used up
- any chemicals which are produced
- any chemicals which act as catalysts.

chemical used up	chemical produced	catalyst

[2]

(b) When ammonia is being formed, the volume of gas decreases.

What could the engineers measure to tell how fast the ammonia is being formed?

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

They could measure:

**change in colour**

**change in cloudiness**

**time for solid iron to disappear**

**change in pressure**

**change in surface area**

[1]



(c) Engineers are trying to improve the reaction process.

Here are two possible changes in the process.

Draw one line from each **change** in the process to its **improvement**.

<b>change</b>	<b>improvement</b>
	less waste to dispose of
use a lower pressure	less acid rain is made
	vessels don't have to be as strong
re-cycle unreacted gases	less damage to the ozone layer
	less space is needed for the factory

[2]

[Total: 5]

**END OF QUESTION PAPER**

**18**  
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