

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

A215/01

Unit 1: Modules B4 C4 P4 (Foundation Tier)

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

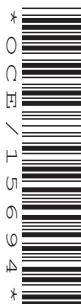
OCR Supplied Materials:
None

Other Materials Required:

- Pencil
- Ruler (cm/mm)

**Wednesday 26 May 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 **20** pages. Any blank pages are indicated.

TWENTY FIRST CENTURY SCIENCE EQUATIONS**Useful Relationships****Explaining Motion**

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

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

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

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

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

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

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

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

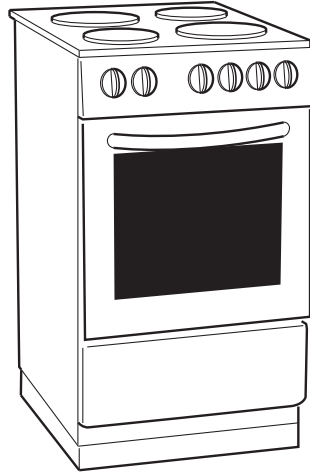
$$\text{wave speed} = \text{frequency} \times \text{wavelength}$$

3

Answer **all** the questions.

- 1 Petra roasts a chicken in the oven.

The oven contains a control system that keeps it at 180 °C.



- (a) Petra's body has a control system that keeps it at 37 °C.

Draw a straight line to match each **part** of a control system with its **function**.

part	function
effector	detects stimuli
receptor	produces the responses
processing centre	receives information and coordinates the responses

[2]

- (b) While working in the kitchen, Petra becomes too hot.

Describe one way her temperature control system cools her down.

.....

.....

..... [2]

[Total: 4]

4

2 Billy breathes air into his lungs.

Oxygen moves from the air into his red blood cells.

(a) How does the oxygen move into his red blood cells?

Put a ring around the correct answer.

active transport

diffusion

homeostasis

osmosis

[1]

(b) Each sentence below has three options to link the beginning and the end of the sentence.

For each sentence put a ring around the correct phrase.

The air Billy breathes in contains ...

less oxygen than

the same amount of oxygen as

more oxygen than

... the air he breathes out.

The blood going into Billy's lungs contains ...

less oxygen than

the same amount of oxygen as

more oxygen than

... the blood leaving his lungs.

The air Billy breathes out contains more ...

nitrogen

carbon dioxide

urea

... than the air he breathes in.

[2]

5

(c) Billy breathes air in through his nose.

This warms the air.

This helps to keep Billy's body at a constant temperature.

Why is it important for Billy's body to have a constant temperature?

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

Molecules need energy to collide with proteins.

☐

Chemical reactions go better when the temperature is high.

☐

Enzymes need a specific temperature to work at their best.

☐

Cells change shape at low temperatures.

☐

[1]

[Total: 4]

3 Carl runs a race on a hot day.

He sweats a lot.

(a) What happens to the concentration of his blood plasma during the race?

Put a (ring) around the correct answer.

becomes more dilute

stays the same

becomes more concentrated

[1]

(b) Carl's kidneys filter sugar, urea, salt and water from his blood.

Some of the water is reabsorbed.

How much of other substances is reabsorbed?

Write about

- sugar
- urea
- salt.

.....

.....

.....

.....

..... [3]

(c) Some drugs would change the volume and concentration of Carl's urine.

Put a (ring) around the correct words to complete each sentence.

Alcohol results in a **greater / smaller** volume of **more / less** dilute urine.

Ecstasy results in a **greater / smaller** volume of **more / less** dilute urine.

[2]

[Total: 6]

7

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4 Some watch batteries contain lithium atoms.

(a) The symbol for lithium is Li.

Lithium is element number 3.

Find lithium in the Periodic Table.

(i) Which group is lithium in?

Put a ring around the correct answer.

1 2 3 4 5 6 7 8

[1]

(ii) Complete the table for the structure of a lithium atom.

relative atomic mass	
number of electrons	
number of protons	

[2]

(iii) Some students suggest why each element is where it is in the Periodic Table.

Who gives the correct answer?

Alex
The elements are
arranged
alphabetically.



Brenda
The elements are
arranged in order
of number of protons.



Daisy
The most reactive
elements come
first.



Charles
The elements are
arranged in order
of the date they
were discovered.



answer [1]

9

- (b) The lithium atoms in the battery give off electrons.



How many electrons does a lithium atom give off when it reacts?

answer [1]

- (c) Lithium batteries should not be cut open.

This is because lithium reacts with water.

Put ticks (✓) in the boxes next to the **two** products of this reaction.

reaction with water		first product		second product
		lithium oxide ☐		oxygen ☐
		or		or
lithium + water	→	lithium chloride ☐	+	hydrogen ☐
		or		or
		lithium hydroxide ☐		carbon dioxide ☐

[2]

10

(d) Brenda's teacher drops a small piece of lithium into a beaker of water.

Tick (✓) one box in each column to describe what happens to the lithium.

The first one has been done for you.

tick one from this column	tick one from this column	tick one from this column	tick one from this column
it floats ✓	no movement at all	it gets smaller	no visible reaction
it sinks	some movement	it stays the same size	it produces bubbles
it sinks to the bottom then rises	violent movement	it gets larger	it catches fire

[2]

[Total: 9]

5 Chlorine gas is added to water to make the water safe to drink.

(a) How does this make the water safe?

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

(b) Chlorine is a very poisonous gas.

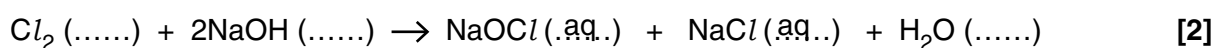
Suggest the most important safety precaution for people working with chlorine gas.

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

(c) Chlorine gas reacts with sodium hydroxide solution.

Write state symbols, s, l, g, aq, to complete the equation for this reaction.

Some have been done for you.



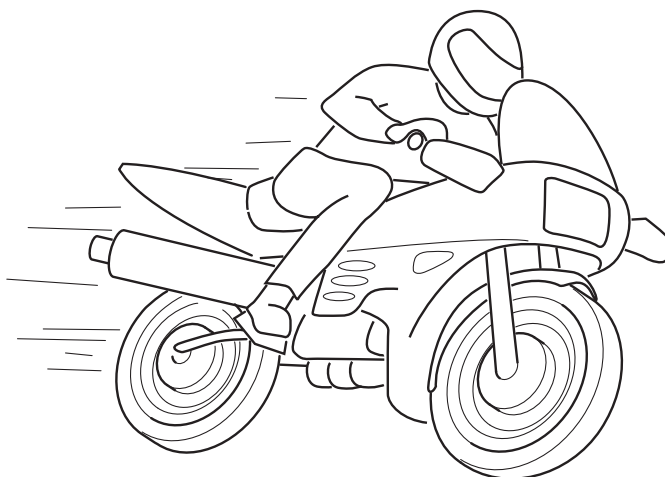
(d) Sodium will react with chlorine. The reaction makes sodium chloride.

Write a **word equation** for this reaction.

..... [1]

[Total: 5]

- 6 Sylvia tries out her motorbike on a race track.



She gets to her top speed from a standing start in a distance of 200 m.

To do this, her motorbike has to exert a constant horizontal force of 600 N.

Sylvia and her motorbike weigh 1500 N.

- (a) Calculate the work done on her motorbike as it travels 200 m.

work done = J [2]

- (b) Work done on a motorbike increases its kinetic energy.

The work done on Sylvia's motorbike is more than its final kinetic energy.

Write about

- why the work done is more than the kinetic energy
- what happens to the missing energy.

.....

.....

.....

..... [2]

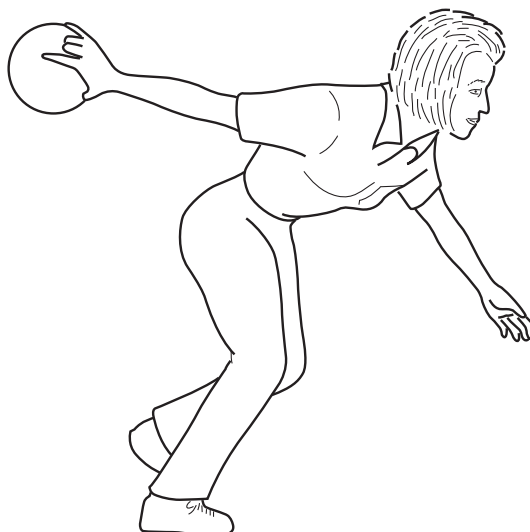
[Total: 4]

13

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- 7 Mel goes bowling.



- (a) Mel stands on one foot to deliver the ball.

Two forces act **on** her foot **from** the floor.

Complete the sentences. Choose from this list.

friction

mass

reaction

The horizontal force is called

The vertical force is called [2]

- (b) Mel exerts a force of 40 N on the ball for 0.5 seconds.

Put a (ring) around the correct calculation of the momentum she gives the ball.

$$\frac{40}{0.5}$$

$$40 \times 0.5$$

$$\frac{0.5}{40}$$

[1]

15

- (c) The 10kg ball leaves her hand with a speed of 2 m/s and rolls along the lane at a steady speed.

- (i) Here are some statements about the ball as it rolls along the lane at a steady speed.

Put a tick (✓) in the box next to the **one** correct statement.

The weight of the ball decreases as it rolls along the track.

☐

The ball's momentum increases as it moves along the track.

☐

The ball travels a distance of 1.0 metres in every 0.5 second.

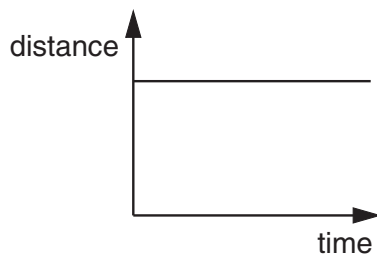
☐

The velocity of the ball increases as it moves along the track.

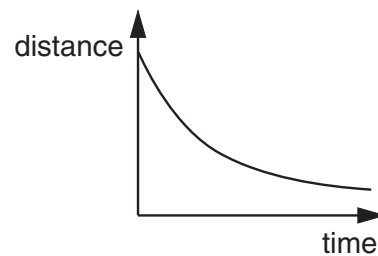
☐

[1]

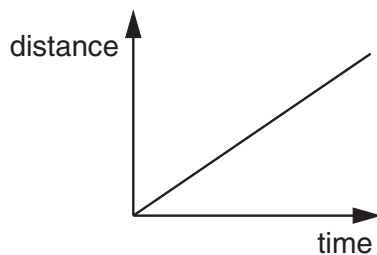
- (ii) Which of these distance-time graphs shows the ball moving at a steady speed?



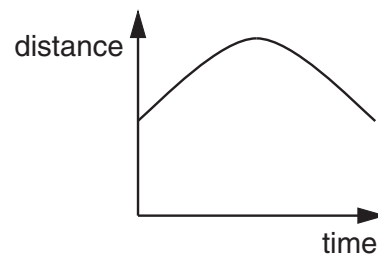
A



B



C

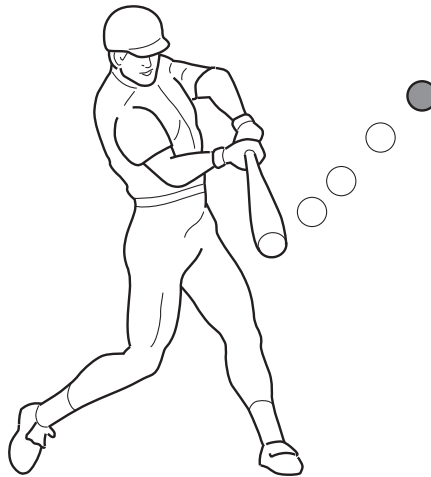


D

answer [1]

[Total: 5]

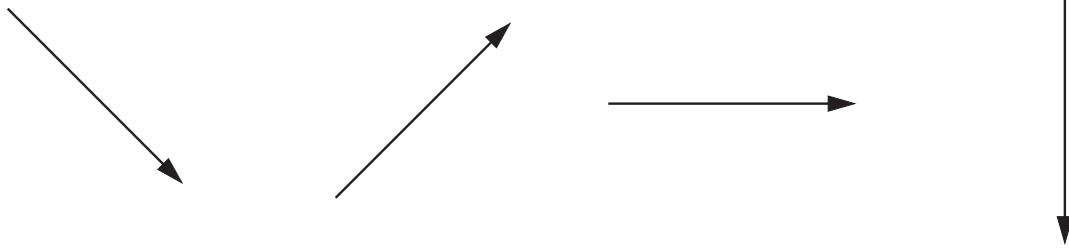
8 Matt hits a ball with his bat.



(a) The ball **rises** into the air away from Matt when it is struck by the bat.

Which of these arrows shows the direction of the force of the bat on the ball?

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



[1]

(b) Put a **ring** around the correct phrase to complete each sentence.

The force of the bat on the ball is ...

greater than

smaller than

the same as

... the force of the ball on the bat.

The force of the bat on the ball acts ...

in a direction at right angles to

in the same direction as

in the opposite direction to

... the force of the ball on the bat.

[2]

17

(c) Correctly complete the sentences.

Choose words from this list.

gravitational potential

kinetic

light

weight

The ball rises into the air, gaining energy.

As it rises, the ball loses energy. [2]

[Total: 5]

END OF QUESTION PAPER

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* 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.