

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

Unit 1 Modules B4 C4 P4
 (Foundation Tier)

A215/01

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)

Wednesday 21 January 2009
Afternoon

Duration: 40 minutes



A 2 1 5 0 1 *

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 2.
- The Periodic Table is printed on the back page.
- This document consists of **16** pages. Any blank pages are indicated.

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

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 John is watching a marathon.
The weather is cold and windy.

(a) How will John's body react to the cold?

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

He will sweat less.

He will feel hungry.

He will start to sweat.

He will start to shiver.

He will stop shivering.

[2]

(b) If John gets too cold he will suffer from hypothermia.

(i) What is hypothermia?

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

When the core body temperature is above 35 °C.

When the core body temperature is exactly 35 °C.

When the core body temperature is below 35 °C.

[1]

(ii) Which of these symptoms might John show if he has hypothermia?

Put a **ring** around each of the **three** correct answers.

confusion

coughing

drowsiness

panting

sneezing

slurred speech

[3]

[Total: 6]

2 Selina is running in a marathon.



(a) During the race Selina gets hot.

The sentences **A**, **B**, **C**, **D**, **E** and **F** describe how her body cools down. They are in the wrong order.

- A** The sweat evaporates from her body.
- B** Her brain stimulates her sweat glands.
- C** Her muscles are respiring and producing heat.
- D** The sweat glands produce more sweat.
- E** The sweat carries heat away from her body.
- F** Her brain detects an increase in body temperature.

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

					E
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[4]

(b) Selina takes a drink of water while she is running.

(i) Why does Selina need to drink?

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

To keep her body warm.

To replace the water lost by sweating.

To help her muscles contract efficiently.

[1]

(ii) Which organ in the body regulates the amount of water in the blood?

Put a ring around the correct answer.

heart

kidney

liver

[1]

(iii) These activities can affect the amount of urine produced.

- A** drinking alcohol
- B** taking Ecstasy
- C** eating a lot of salt
- D** exercising

Put the letters **A**, **B**, **C** and **D** into the correct column of the table to show if they **increase** or **decrease** the volume of urine.

increase in urine volume	decrease in urine volume

[2]

[Total: 8]

3 Swimming pools always smell of chlorine.
This is because chlorine is added to the water.

(a) Why do we add chlorine to swimming pools?

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

To make the water taste better.

To give the water a green colour.

To remind you that the water is not fresh.

To kill microbes in the water.

[1]

(b) Chlorine gas has the formula Cl_2 .

Emily draws diagrams of different molecules.

There are two diagrams in her list that could show chlorine gas.

Put **(rings)** around the **two** diagrams that could show chlorine gas.



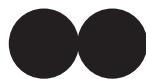
A



B



C



D



E



F

[1]

(c) Chlorine will form different compounds.

Draw lines to match the name of each **compound** to its **formula**.

compound

formula

KCl

sodium
chloride

KCl_2

NaCl

potassium
chloride

NaCl_2

PCl

PCl_2

[2]

(d) Chlorine is a hazardous chemical. Containers of any chemical which might be dangerous must have a hazard symbol.

Emily wants to know about three chemical hazards, so she finds some information on the internet.

For each **hazard**, draw **one** line to its **symbol** and **one** line to **how to deal with the hazard**.

symbol	hazard	how to deal with the hazard
	flammable	keep away from naked flames
	toxic	wear protective clothing
	irritant	do not swallow or inhale
		evacuate the area

[4]

(e) Which other element has the most similar chemical properties to chlorine?

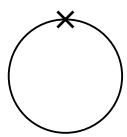
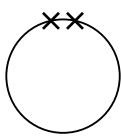
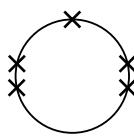
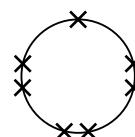
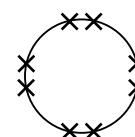
Put a **ring** around the element that is **most similar** to chlorine.

argon bromine iodine nitrogen sodium

[1]

[Total: 9]

4 The diagrams show the electrons in the **outer** shell of different elements from the Periodic Table.

**A****B****C****D****E**

(a) Which diagram could be for an element in Group 7?

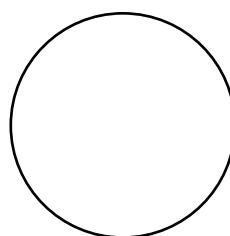
answer [1]

(b) Which diagram could be for an element with properties **similar** to sodium?

answer [1]

(c) Element **D** will form an ion with a single **negative** charge.

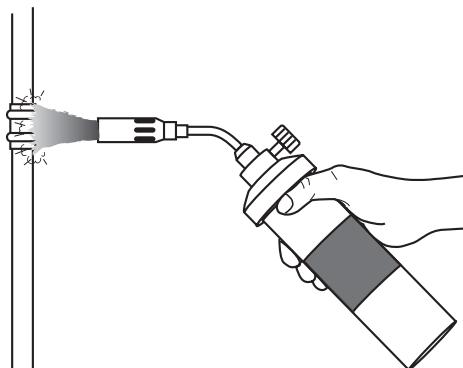
On the diagram below, show the electron arrangement for the outer shell of the **ion** of element D.



[1]

[Total: 3]

5 A plumber uses a blowtorch to mend a water pipe.
When the blowtorch flame touches the pipe the flame goes green.



(a) Why does the flame turn green?

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

Some copper has got into the flame.

Some chlorine has got into the flame.

The copper is reacting with chlorine.

Some copper is starting to melt.

[1]

(b) Emily uses a spectroscope to look at the flame.

This is what she sees.



She finds the spectra of five different elements in a book.



A



B



C



D



E

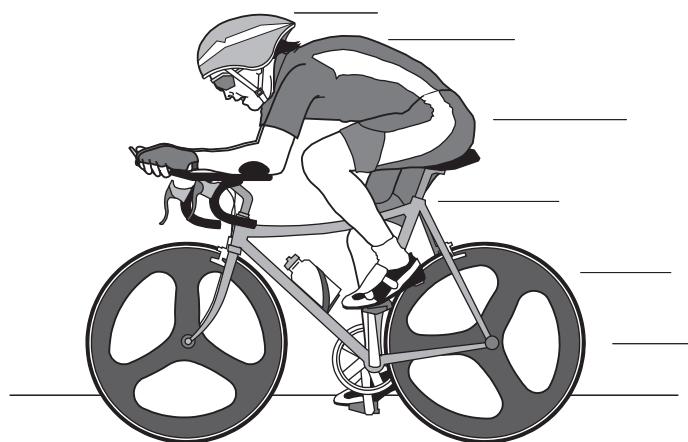
Which element, **A**, **B**, **C**, **D** or **E**, caused the colour of the flame?

answer [1]

[Total: 2]

10

6 Jake rides a bike in a race.



(a) He travels a distance of 100 m in just 8 s from a standing start. What is the correct way of calculating his average speed?

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

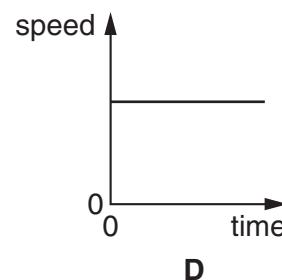
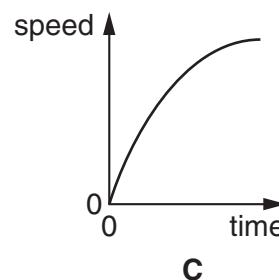
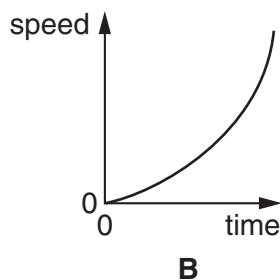
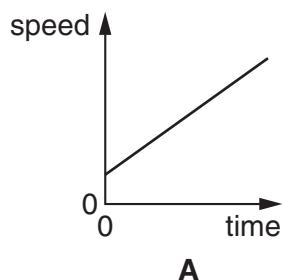
$$\frac{100}{8}$$

$$100 \times 8$$

$$\frac{8}{100}$$

[1]

(b) Here are some speed-time graphs.



Which graph, **A**, **B**, **C** or **D**, shows Jake reaching his top speed from a standing start?

answer [1]

(c) Jake is moving at his top speed.

Complete the sentences. Choose words from this list.

backwards
equal to
forwards
greater than
opposite
same
smaller than

Jake's speed is constant.

The size of the counter force is the size of the driving force.

The counter force and driving force act in the direction.

[2]

(d) Jake wears a cycle helmet.

Put a tick (✓) in the box next to the **best** reason for wearing a helmet.

To shade his head so that it keeps cool.

To increase the time it takes for his head to stop in a crash.

To decrease the kinetic energy of his head as he speeds up.

[1]

[Total: 5]

7 Dave uses a sled to slide down a hill.



(a) What is the name of the force which pulls Dave down the hill?

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

friction

reaction

weight

[1]

(b) The sled moves a vertical distance of 20 m down the slope.

Dave and his sled have a combined weight of 600 N.

How should Dave calculate his change of gravitational potential energy (GPE)?

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

$$\frac{600}{20}$$

$$600 \times 20$$

$$\frac{20}{600}$$

[1]

(c) Put a **ring** around the correct word in each sentence.

Dave slides down the hill.

He loses **gravitational potential / kinetic / heat** energy.

His **momentum / weight / height** increases as he gets faster.

[2]

(d) Draw lines to connect each **force on the sled** to its **direction**.

force on the sled

direction of force

weight

vertically down

vertically up

up the slope

friction

down the slope

[1]

[Total: 5]

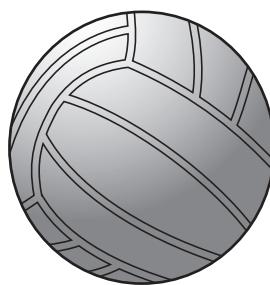
13

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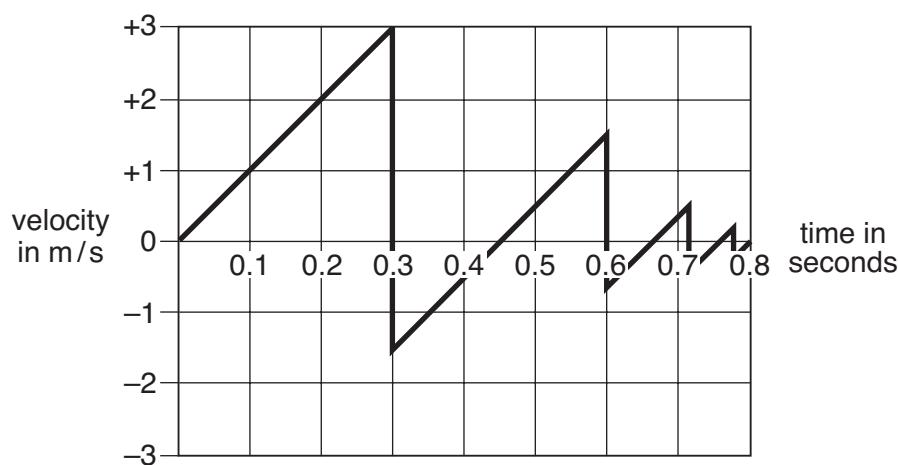
Question 8 starts on page 14.

PLEASE DO NOT WRITE ON THIS PAGE

8 Dan drops a ball onto the floor. The ball bounces several times.



The graph shows how the velocity of the ball changes with time.



(a) When is the velocity of the ball negative?

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

when the velocity is increasing

when the velocity is decreasing

when the ball is moving upwards

when the ball is falling downwards

[1]

(b) Complete the sentences.

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

decreases increases stays the same

As the ball falls towards the floor its velocity

This is because its gravitational potential energy,

so its kinetic energy

If there is no air resistance, the total energy of the ball as it falls.

[3]

[Total: 4]

END OF QUESTION PAPER

The Periodic Table of the Elements

1 2

1	H	hydrogen	1
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Key		
relative atomic mass	atomic symbol	name
atomic (proton) number		

7	Li	lithium	3
9	Be	beryllium	4
23	Na	sodium	11

3	4	5	6	7	0	16	19	20
1	2	4	5	6	7	14	16	18
7	Li	lithium	3	11	12	14	16	19
9	Be	beryllium	4	12	C	N	O	Ne
11	Na	sodium	11	13	carbon	nitrogen	oxygen	neon
13	Al	aluminium	13	14	14	15	16	18
15	Si	silicon	14	15	15	16	17	18
17	P	phosphorus	15	16	16	17	18	19
19	S	sulfur	16	17	17	18	19	20
21	Cl	chlorine	17	18	18	19	20	21
23	Ar	argon	18	19	19	20	21	22
25	Ne	neon	19	20	20	21	22	23

16

Elements with atomic numbers 112-116 have been reported but not fully authenticated

* 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