OCR
RECOGNISING ACHIEVEMENT

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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
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

Candidate Forename		Candidate Surname	

Centre Number						Candidate Number				

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

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

momentum = mass × velocity

change of momentum = resultant force × time for which it acts

work done by a force = force × distance moved by the force

change in energy = work done

change in GPE = weight × vertical height difference

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

Electric Circuits

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

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

energy transferred = power × time

power = potential difference × current

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

The Wave Model of Radiation

wave speed = frequency × 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

[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
	$NaCl_2$
potassium chloride	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
		wear protective clothing
	toxic	
		do not swallow or inhale
	irritant	evacuate the area

[4]

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

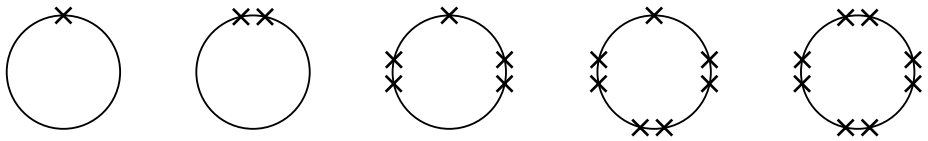
Put a (ring) around the element that is **most similar** to chlorine.

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?

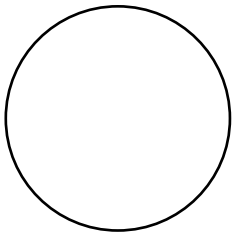
answer ..... **[1]**

(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.

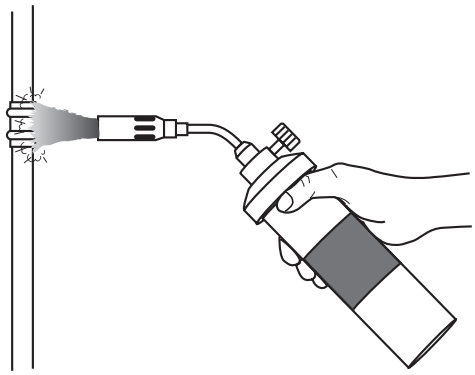
On the diagram below, show the electron arrangement for the outer shell of the **ion** of element D.



[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?

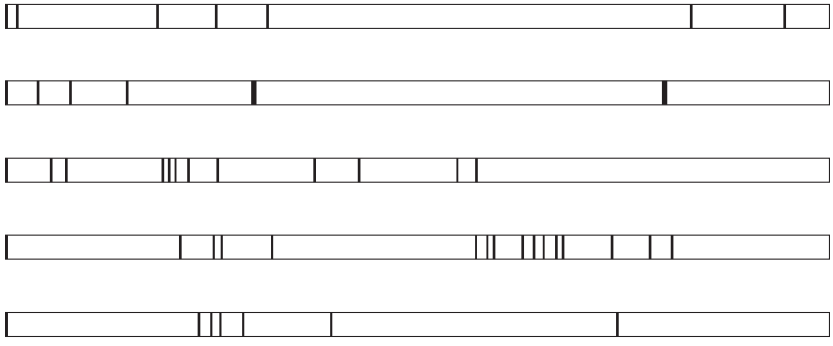
Put a tick (✓) in the box next to the correct explanation.

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.

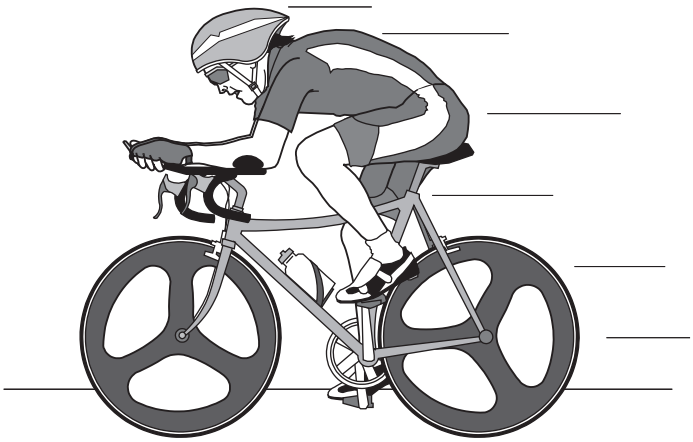


Which element, **A**, **B**, **C**, **D** or **E**, caused the colour of the flame?

answer ..... **[1]**

[Total: 2]

6 Jake rides a bike in a race.

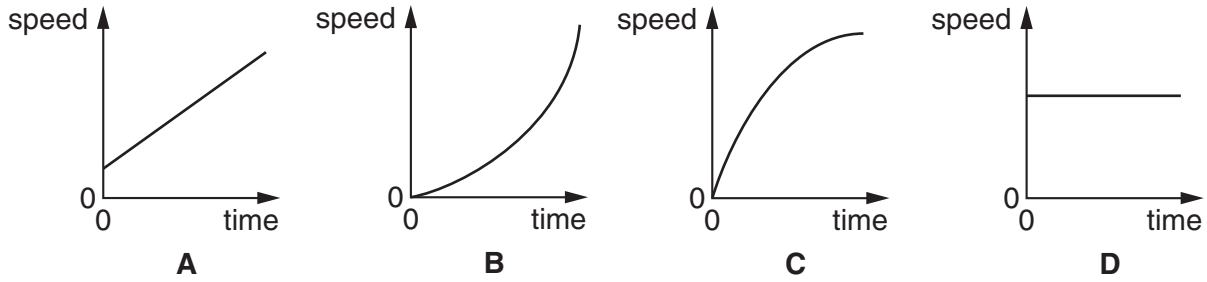


(a) He travels a distance of 100 m in just 8 s from a standing start.
What is the correct way of calculating his average speed?

Put a (ring) around the correct answer.

$\frac{100}{8}$ **100 x 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.

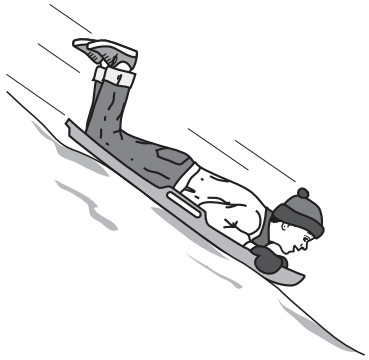
Put a tick (✓) in the box next to the **best** reason for wearing a helmet.

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 x 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]

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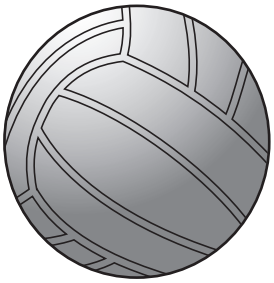
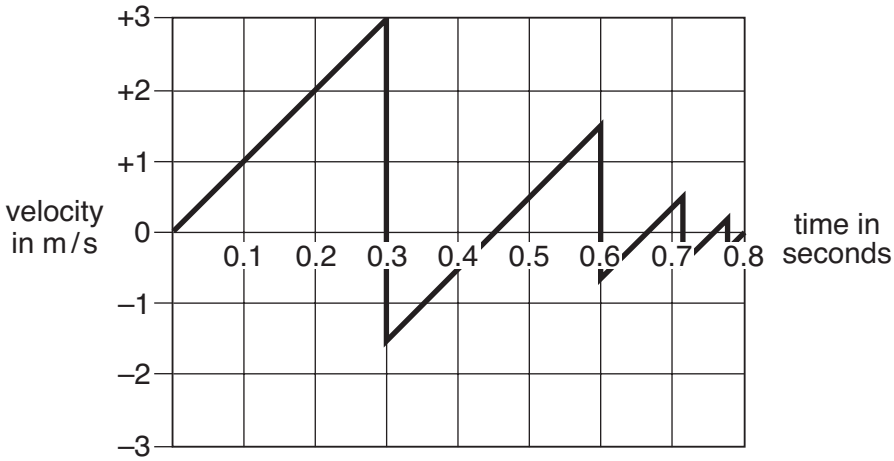
Question 8 starts on page 14.

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											3	4	5	6	7	0
							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