OCR
RECOGNISING ACHIEVEMENT

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A215/01

GENERAL CERTIFICATE OF SECONDARY EDUCATION
TWENTY FIRST CENTURY SCIENCE
ADDITIONAL SCIENCE A
Unit 1 Modules B4 C4 P4 (Foundation Tier)

WEDNESDAY 23 JANUARY 2008

Afternoon
Time: 40 minutes

Candidates answer on the question paper.
Additional materials (enclosed):
None

Calculators may be used.
Additional materials: Pencil
Ruler (cm/mm)

CUP/T47966

Candidate Forename		Candidate Surname	
Centre Number		Candidate Number	

INSTRUCTIONS TO CANDIDATES

- Write your name in capital letters, your Centre Number and Candidate Number in the boxes above.
- Use blue or 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.
- Do **not** write outside the box bordering each page.
- Write your answer to each question in the space provided.

INFORMATION FOR CANDIDATES

- The number of marks for each question 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.

FOR EXAMINER'S USE		
Qu.	**Max**	**Mark**
1	3	
2	4	
3	4	
4	3	
5	4	
6	5	
7	5	
8	4	
9	5	
10	5	
TOTAL	42	

This document consists of **16** printed pages.

[Turn over

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 Bobby watches a stage magician.

The magician throws a handful of powder into a flame. The flame turns green.

Bobby realises that the powder contains copper.

(a) How does Bobby know the powder contains copper?

Put ticks (✓) in the boxes next to the **two** best reasons.

It is a magic trick.	☐
Many elements change the colour of the flame.	☐
Stage magicians always use copper.	☐
Copper conducts electricity.	☐
An element always turns the flame the same colour.	☐
Copper is cheap.	☐

[2]

(b) Bobby uses a special instrument to look at the flame.

He sees a series of lines.

Put a (ring) around the best name for a series of lines like this.

amplitude **frequency** **line spectrum** **wavelength**

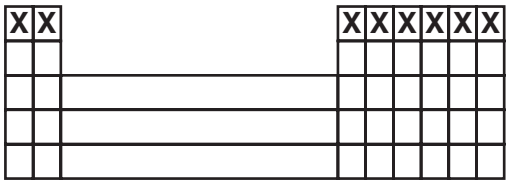
[1]

[Total: 3]

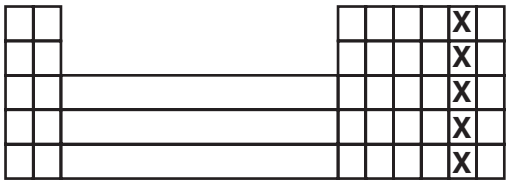
2 **(a)** Look at these diagrams of the Periodic Table.

Some elements are marked with an **X**.

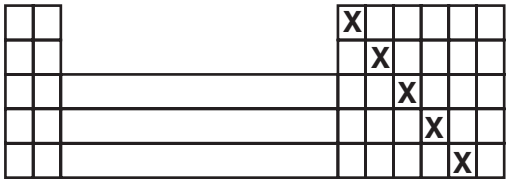
A



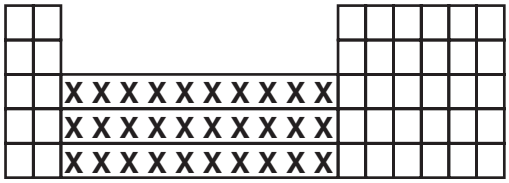
B



C



D



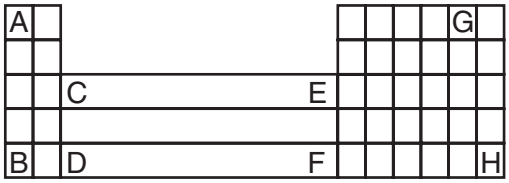
(i) Which diagram, **A**, **B**, **C** or **D**, shows a **group** of elements?

answer ..... [1]

(ii) Which diagram, **A**, **B**, **C** or **D**, shows a **period** of elements?

answer ..... [1]

(b) Which **two** letters below represent **non-metals**?

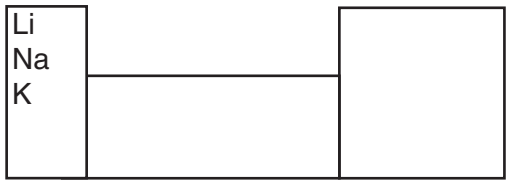


answer ..... and ..... [2]

[Total: 4]

3 Jenny studies three elements, **Li**, **Na** and **K**.

She finds this information in a data booklet.



PERIODIC TABLE

	melting point °C	boiling point °C
Li	180	1342
Na		883
K	63	

(a) Suggest a melting point for **Na**.

answer ..... [1]

(b) Suggest a boiling point for **K**.

answer ..... [1]

(c) Another data book gives the boiling point for **Li** as 1330 °C instead of 1342 °C. Jenny thinks of some reasons for this.

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

Boiling points increase each time they are measured. ☐

The measurements were made with different amounts of Li. ☐

It is difficult to measure such a high boiling point accurately. ☐

The second book rounded the numbers to the nearest ten degrees. ☐ [1]

(d) Potassium reacts with chlorine gas to make potassium chloride.

What is the formula of **potassium chloride**?

answer ..... [1]

[Total: 4]

4 Jenny fills in a table about the halogens at room temperature and pressure.

Use words from the lists below to complete the table.

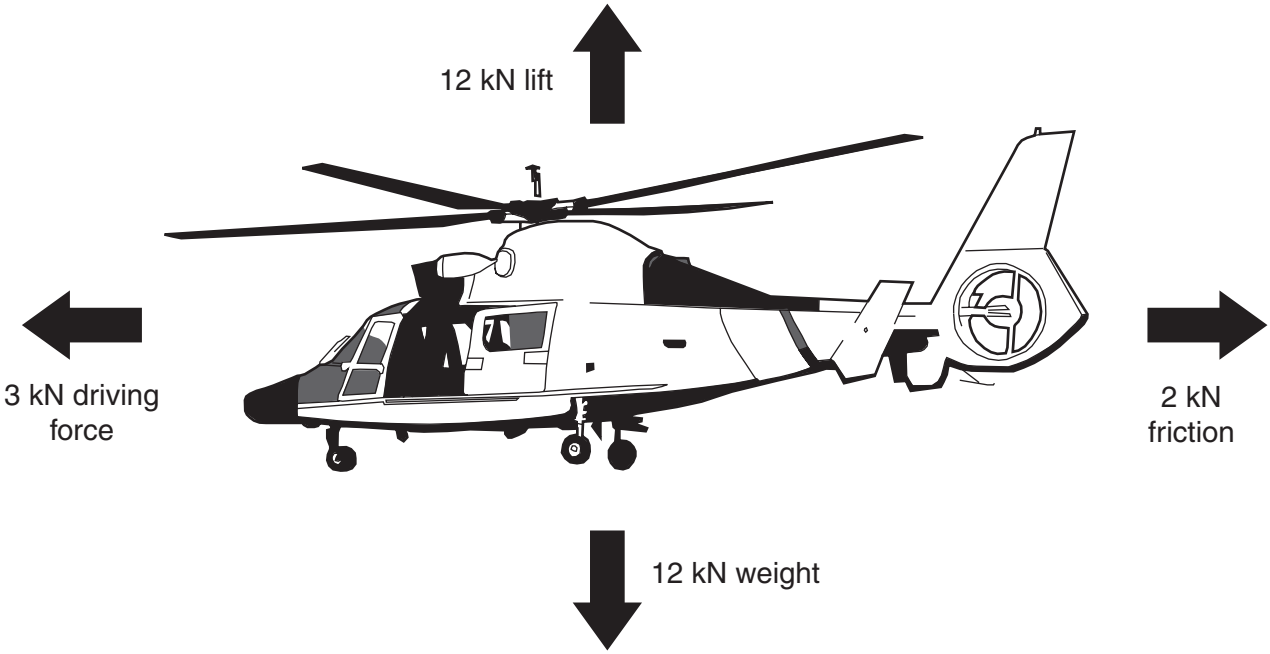
solid	**green**
liquid	**grey**
gas	**red/brown**
	white
	yellow

name of element	state of element	colour of element
chlorine		
bromine		
iodine		

[3]

[Total: 3]

5 The diagram shows the forces acting on a helicopter in level flight.



(a) What is the **direction** of the resultant force on the helicopter?

Put a (ring) around the correct answer.

backwards **downwards** **forwards** **upwards** [1]

(b) What is the **size** of the resultant force on the helicopter?

Put a (ring) around the correct answer.

1 kN **2 kN** **3 kN** **5 kN** **12 kN** [1]

(c) Which quantities will be **increasing** for the helicopter?

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

Height	☐
Weight	☐
Momentum	☐
Kinetic energy	☐
Gravitational potential energy	☐

[2]

[Total: 4]

6 Paul drives a taxi in town.

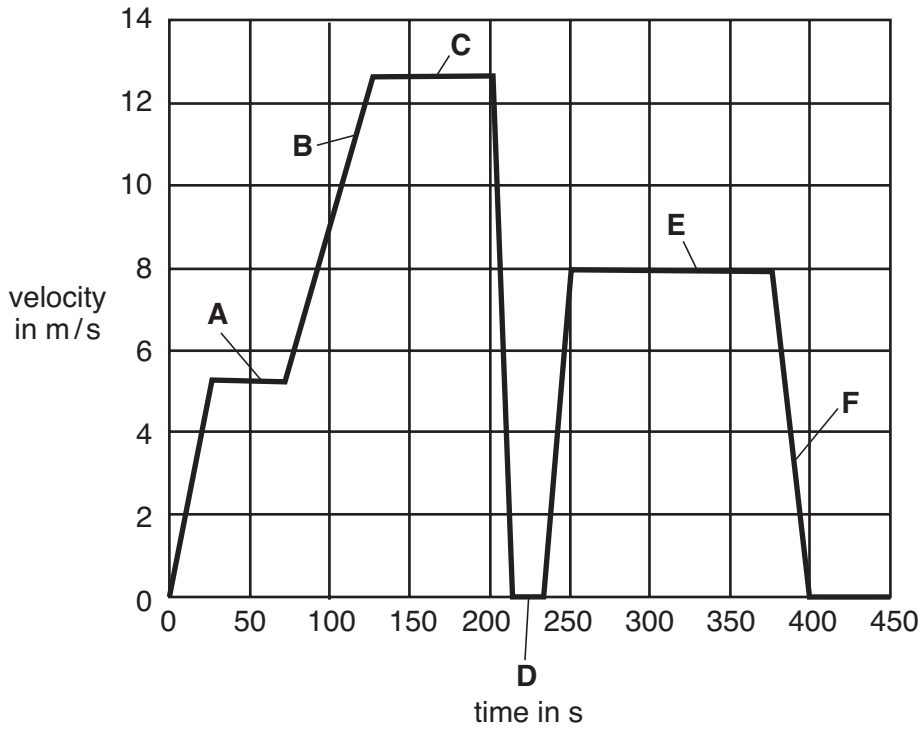
(a) A journey of 3000 m takes him 400 s.

How does Paul calculate his average speed for the journey?

Put a (ring) around the correct answer.

$\frac{3000}{400}$ **3000 × 400** $\frac{400}{3000}$ [1]

(b) Here is a velocity-time graph for Paul's journey.



Write the correct letter, **A**, **B**, **C**, **D**, **E** or **F**, in each box.

Stopped at traffic lights.	
Moving at a steady top speed.	
Slowing down at the end of the journey.	

[2]

(c) Paul wears a seat belt. He brakes suddenly at traffic lights.

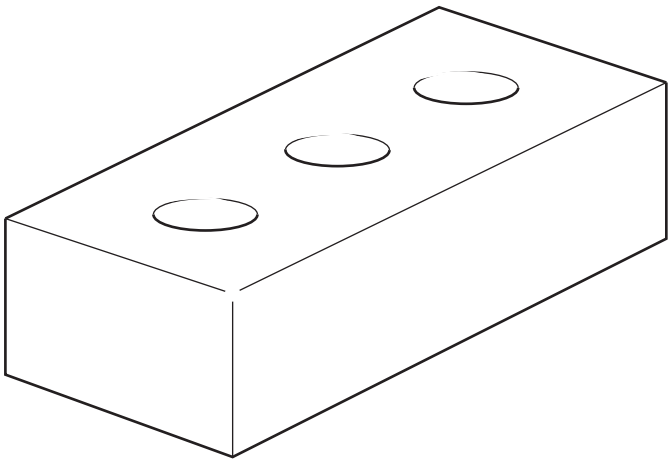
Draw a straight line from the **start** of each sentence to its correct **end**.

start	**end**
Using the brakes of the car ...	... applies a counter force to Paul.
The seatbelt in the car ...	... transfers kinetic energy by heating.
The momentum of the car ...	... is reduced by friction between tyres and road.

[2]

[Total: 5]

7 Julie drops a brick down a deep well.



The brick falls through the air until it hits the water.

(a) Finish the sentences. Choose words from this list.

gravitational potential energy

kinetic energy

mass

volume

weight

work

The brick is pulled down by its ..... .

As it falls, the brick loses .....

but gains ..... . [3]

(b) The brick has a weight of 20 N. It falls for 4 s before it hits the water.

The momentum of the brick changes as it falls through the air.

How do you calculate the change in momentum?

Put a (ring) around the correct answer.

$\frac{20}{4}$ **20 × 4** $\frac{4}{20}$ [1]

(c) The brick hits the water and slows down.

It now falls through the water at a **steady speed**.

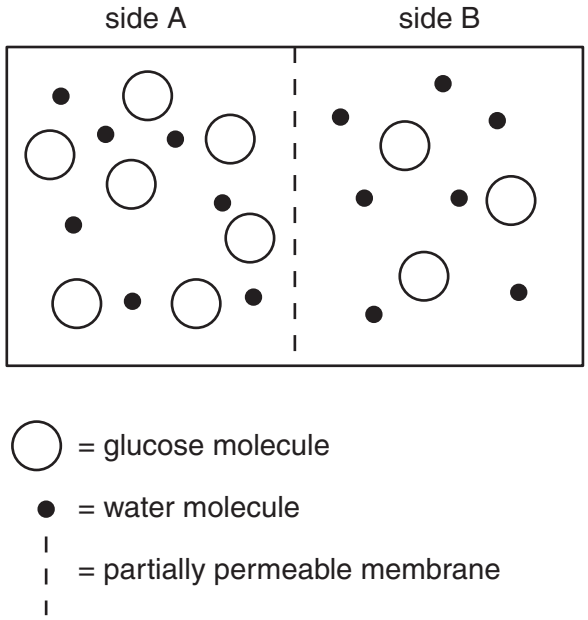
Put a tick (✓) in the box next to the **one** correct explanation for this.

Friction transfers momentum out of the brick.	☐
The brick has no weight when it is under water.	☐
Friction transfers energy from the brick by heating.	☐

[1]

[Total: 5]

8 Andrew draws a model to show osmosis.



(a) What does side B in the model represent?

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

A concentrated solution. ☐

A dilute solution. ☐

Pure water. ☐ [1]

(b) Why did Andrew include a partially permeable membrane in his model?

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

To stop glucose molecules and water molecules from passing through. ☐

To stop glucose molecules from passing through. ☐

To stop water molecules from passing through. ☐ [1]

(c) What happens to the water molecules?

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

Water molecules move mostly from side **A** to side **B**.	☐
Water molecules move mostly from side **B** to side **A**.	☐
Water molecules move equally between side **A** and side **B**.	☐
Water molecules do not move between side **A** and side **B**.	☐

[1]

(d) What will happen when Andrew adds four more glucose molecules to **side B** in his model?

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

Water molecules move mostly from side **A** to side **B**.	☐
Water molecules move mostly from side **B** to side **A**.	☐
Water molecules move equally between side **A** and side **B**.	☐
Water molecules do not move between side **A** and side **B**.	☐

[1]

[Total: 4]

9 This question is about enzymes.

(a) What are enzymes made of?

Put a (ring) around the correct answer.

carbohydrates **lipids** **proteins** [1]

(b) Enzymes can speed up the breakdown of molecules.

Which of the following statements are **true** and which are **false**?

Write **true** or **false** in the box next to each statement.

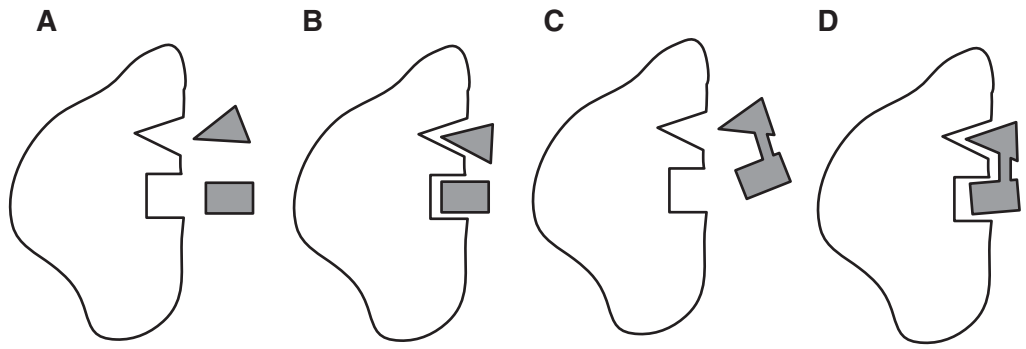
	true or **false**
Enzymes can make reactions go faster.	
Enzymes will only work in test tubes.	
Enzymes stop working at very high temperatures.	
Enzymes work best at one particular temperature.	

[2]

(c) Enzymes can speed up the breakdown of molecules.

The process involves a number of stages.

The stages are **not** drawn in the correct order.



Fill in the boxes to show the right order. The first one has been done for you.

C			

[2]

[Total: 5]

10 This question is about the kidneys.

(a) Here are some things that affect the amount of water in the body.

breathing **faeces** **respiration**

drinks **food** **sweating**

Which put water **into** the body?

Which take water **out** of the body?

Complete the table by writing the words in the correct boxes.

All of the words should be used.

water into the body	water out of the body

[3]

(b) Drinking large amounts of alcoholic drinks can cause dehydration.

Why does this happen?

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

The kidneys stop working totally. ☐

The kidneys produce more urine. ☐

The kidneys produce less urine. ☐

[1]

(c) If someone uses the drug ecstasy they produce small amounts of very strong urine.

Draw **one** straight line from the correct change in the **volume of urine** to the correct change in its **concentration** caused by the drug ecstasy.

volume of urine	concentration
greater	less dilute
smaller	more dilute
stays the same	stays the same

[1]

[Total: 5]

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.