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)

TUESDAY 17 JUNE 2008

Morning
Time: 40 minutes

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

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

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.
- 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	4	
2	5	
3	1	
4	4	
5	4	
6	5	
7	5	
8	5	
9	4	
10	2	
11	3	
TOTAL	42	

This document consists of **19** printed pages and **1** blank page.

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

3

Answer **all** the questions.

1 **(a)** Some bottles of chemicals have hazard symbols on them.

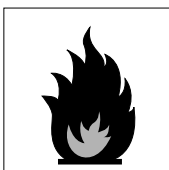Draw a straight line from each **hazard symbol** to its **meaning**.
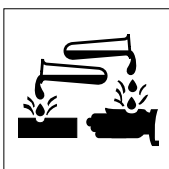
hazard symbol   **meaning**

| | corrosive |

| | toxic |

| | highly flammable |

[2]

(b) We often need to know whether a chemical is a solid, liquid or gas at room temperature.

Fill in the boxes to show if these chemicals are **solid**, **liquid** or **gas** at room temperature.

chemical	melting point in °C	boiling point in °C	solid, liquid or gas
A	114	184	
B	42	713	
C	−7	58	

[2]

[Total: 4]

[Turn over

4

2   The Periodic Table lists all the chemical elements.

   (a) The elements are all arranged in order. What is this order?

         A   alphabetical order

         B   order of mass

         C   order of proton number

         D   order of boiling point

         E   order of reactivity

         F   order of size

                                                    answer .... [1]

   (b) Use the Periodic Table at the back of this paper to find the element with atomic number = 3.

         Write down its name, symbol and relative atomic mass.

                                                    name ....

                                                    symbol ....

                                     relative atomic mass .... [3]

   (c) The electron arrangement of one element in the Periodic Table is 2.8.7.

         Put a (ring) around the group number for this element.

                          2   **3**   **7**   **8**
                                                                                          [1]

                                                                                  [Total: 5]

3 In 1859 Robert Bunsen discovered line spectra.

Mary asks her friends why line spectra are useful.

Ann
To help design the Bunsen burner

Boyle
To help discover new elements

Charles
To help explain the Periodic Table

Sam
To make narrow beams of light

Who gives the **best** answer?

answer .... [1]

[Total: 1]

[Turn over

4 A doctor tells Johnny that he should use 'low-salt' instead of normal salt.

(a) In 'low-salt', some of the sodium chloride is replaced with potassium chloride.

Why is it possible to replace sodium chloride with potassium chloride in salt?
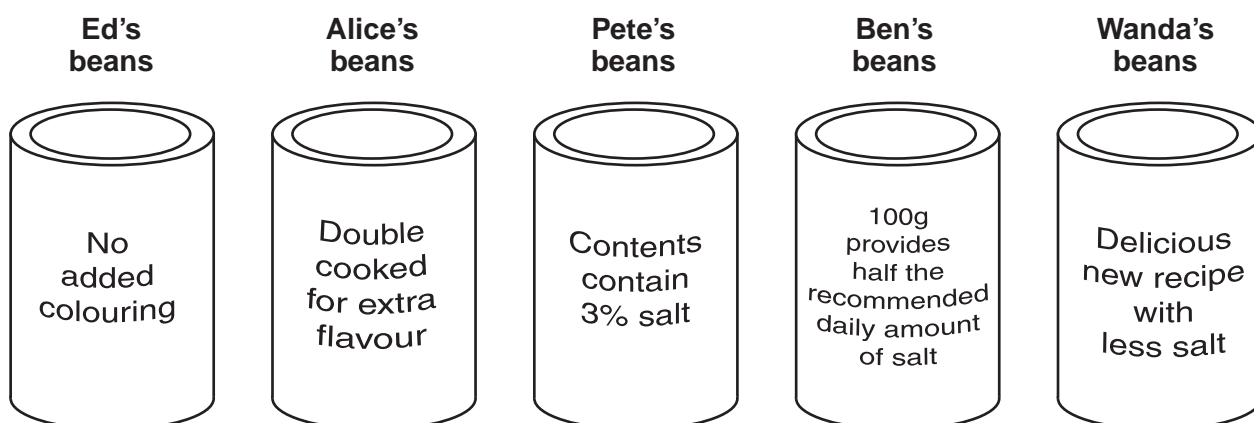
Choose the statement which is the most likely explanation.

    A   Sodium is more reactive than potassium.

    B   When salt dissolves, its ions split apart.

    C   Potassium chloride flows more easily than sodium chloride.

    D   Sodium and potassium are both in Group I.

answer .... [1]

(b) Johnny checks the amount of **salt** in different tins of baked beans.

The labels have different amounts of useful information.

Ed's beans	Alice's beans	Pete's beans	Ben's beans	Wanda's beans
No added colouring	Double cooked for extra flavour	Contents contain 3% salt	100g provides half the recommended daily amount of salt	Delicious new recipe with less salt

Fill in the boxes below to show the order of **increasing** useful information in the labels.

The first one has been done for you.

order ⟶

Alice				

[3]

[Total: 4]

5   Jake drives his car past a speed camera.

(a)   The camera takes a photograph of the car.

It takes another photograph 0.50 s later.

The photographs show that the car moves a distance of 9.0 m between the two photographs.

What is the average speed of the car?

Put a ⬭ring⬭ around the correct answer.

0.056 m/s	**4.5 m/s**	**18 m/s**	**450 m/s**

[1]

**(b)**   The car is speeding up as the photographs are being taken.

(i)   Complete the table with **true** or **false** for a car which is speeding up.

The counter force on the car is …	**true** or **false**
… equal to the driving force.	
… less than the driving force.	
… getting smaller all the time.	
… greater than the driving force.	
… in the same direction as the driving force.	
… in the opposite direction to the driving force.	

[2]

8

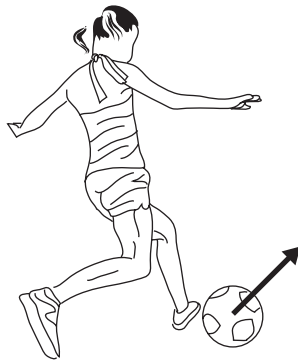**(ii)** Which of these velocity-time graphs, **A**, **B**, **C** or **D**, shows the motion of the car as it passes the speed camera?

velocity | time

A

velocity | time

B

velocity | time

C

velocity | time
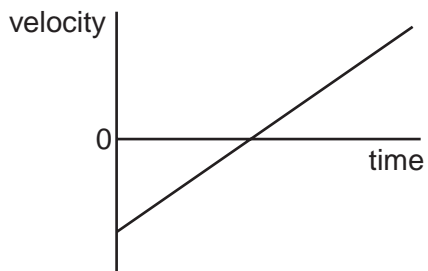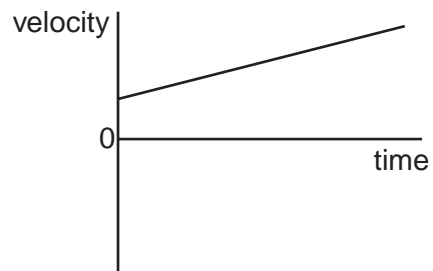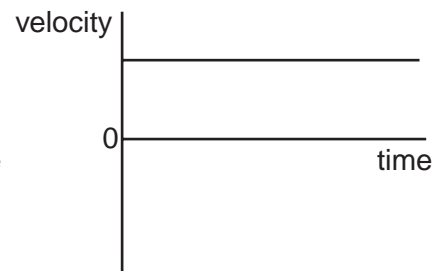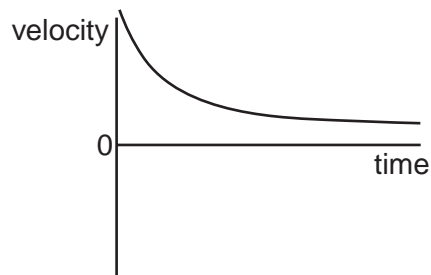
D

answer .... [1]

[Total: 4]

6 Sally plays football.

(a) When she kicks the ball, she exerts a force on it.

The direction of the force is shown in the diagram above.

One of the diagrams below shows the direction of the force on Sally's foot **from the ball**.

Draw a (ring) around the correct diagram.

[1]

(b) Sally exerts a force of 100 N on the ball for 0.25 s.

How should she calculate the change of momentum of the ball?

Put a (ring) around the correct calculation.
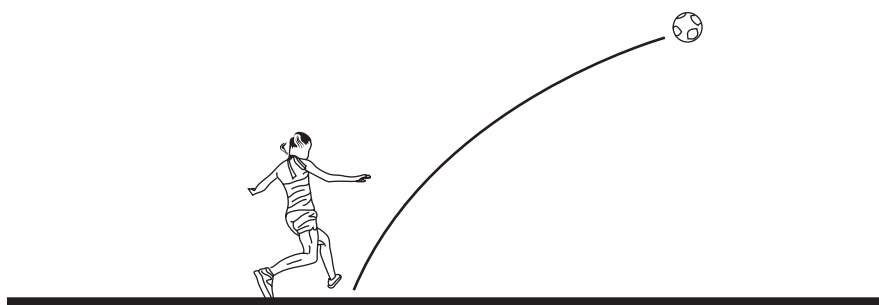
$$\frac{100}{0.25} \qquad 100 \times 0.25 \qquad \frac{0.25}{100}$$

[1]

[Turn over

(c) The diagram shows the path followed by the ball once it has left Sally's foot.

Complete the sentences. Choose words from this list.

mass   motion   weight

kinetic   momentum   gravitational

(i) As the ball rises into the air it gains …………………………… potential energy.   [1]

(ii) This is because of the work the ball does against its ……………………………. .   [1]

(iii) At the same time, the ball loses …………………………… energy.   [1]

[Total: 5]

7 Byron goes for a walk in the park.

(a) The ground under Byron's feet exerts two forces on him.

Complete the table. Choose words from this list.

You may **not** use the same word twice.

friction　　　　**mass**　　　　**reaction**　　　　**weight**

direction of force from the ground	name of force
vertical	
horizontal	

[2]

(b) Byron moves forwards at a steady speed.

Complete the sentences. Choose words from this list.

You may **not** use the same word twice.

weight　　　　**friction**　　　　**upwards**　　　　**forwards**　　　　**backwards**

To move forwards, Byron's foot has to exert a ……………………… force on the ground.

The foot does not slip because of ……………………… .

The friction exerts a ……………………… force on Byron's foot.

[3]

[Total: 5]

[Turn over

8 Dan is carrying out vigorous exercise.

He is using equipment in a gym.

(a) What happens to Dan's core body temperature to cause him to sweat?

Put a (ring) around the correct answer.

decreases   increases   stays the same

[1]

(b) Sweating is one aspect of homeostasis.

What is homeostasis?

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

the decrease in activity within the internal environment

the increase in activity within the internal environment

the maintenance of a constant internal environment

the maintenance of a constant external environment

[1]

(c) Any changes in Dan's core body temperature are detected and processed.

Different parts of the body are involved.

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

Each word may be used once, more than once or not at all.

        blood   **brain**   **heart**   **liver**   **skin**

Changes in the external temperature are detected by temperature receptors

in the ……………………………… .

Changes in the temperature of the blood are detected by temperature receptors

in the ……………………………… .

Information received from the temperature receptors is processed

by the ……………………………… .   [2]

(d) Dan loses water as he sweats.

How else can Dan lose water?

Put a (ring) around each of the **two** correct answers.

  breathing   **digesting**   **eating**   **excreting**   **respiring**

        [1]

[Total: 5]

[Turn over

9 Bacteria are able to break down and digest food.

The bacteria secrete enzymes onto the food to speed up the process.

(a) What are enzymes made of?

Put a tick (✓) in the correct box.

carbohydrates ☐

fats ☐

proteins ☐

[1]

(b) Fresh food is often stored in a refrigerator at 4 °C to keep it fresh for longer.

Why does this work?

Put a tick (✓) in the correct box.

Bacteria die at 4 °C. ☐

Enzymes work much more slowly at 4 °C. ☐

Bacteria reproduce more rapidly at 4 °C. ☐

[1]

(c) Food cooked at high temperatures can last longer than fresh food.

Five people were asked to give a reason for this.

Mike
The shape of the bacterial enzymes is changed so that they no longer fit the food molecules.

Jane
Bacterial enzymes are denatured and cannot break down the food.

Ed
The collision rate between the bacterial enzymes and the food molecules is reduced.

Got this shirt...

Ricky
Enzymes need a high temperature to work at their best.

Sarah
The rate of reaction between the bacterial enzymes and the food molecules is increased.

Which two people gave the **best** answers?

.... and .... [2]
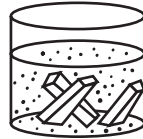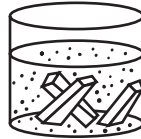
[Total: 4]

[Turn over

10   Liz uses an experiment to show the effect of different solutions on potato tissue.

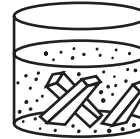She cuts up pieces of potato, measures their length, and puts them in different beakers.

After an hour, Liz measures the length of the potato pieces again.

A
dilute
sugar
solution

B
pure
water

C
highly
concentrated
sugar
solution

(a) What will happen to the length of the potato pieces in beaker **B**?

Put a (ring) around the correct answer.

length decreases   **length increases**   **length stays the same**

[1]

(b) Which process is Liz studying in her experiment?

Put a (ring) around the correct answer.

digestion   **osmosis**   **respiration**

[1]

[Total: 2]

11 Kidneys keep the correct balance of water and salt in the body.

They also carry out the process of excretion.

(a) Which of the following is **not** reabsorbed into the blood in the kidneys?

Put a (ring) around the **one** correct answer.

<div align="center">

salt   sugar   urea   water

</div>

[1]

(b) The amount of water removed by the kidneys is affected by a number of factors.

The kidneys can produce more dilute or more concentrated urine as a result.

Put a tick (✓) in the correct box for each factor.

factors	more dilute urine	more concentrated urine
An increased level of physical exercise is taking place.		
There is a high external temperature.		
Too much fluid is taken in to the body.		
Too much salt is taken in to the body.		

[2]

[Total: 3]

END OF QUESTION PAPER

18

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20

The Periodic Table of the Elements

Key

| relative atomic mass |
| atomic symbol |
| name |
| atomic (proton) number |

Example:
| 1 |
| H |
| hydrogen |
| 1 |

Group 1	Group 2											Group 3	Group 4	Group 5	Group 6	Group 7	Group 0
1	2											3	4	5	6	7	0
																	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

*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.

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