Candidate Forename		Candidate Surname	

Centre Number						Candidate Number				

OXFORD CAMBRIDGE AND RSA EXAMINATIONS
GENERAL CERTIFICATE OF SECONDARY EDUCATION

A215/01

TWENTY FIRST CENTURY SCIENCE

ADDITIONAL SCIENCE A

UNIT 1: Modules B4 C4 P4
Foundation Tier

WEDNESDAY 26 MAY 2010: Morning
DURATION: 40 minutes

SUITABLE FOR VISUALLY IMPAIRED CANDIDATES

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

OCR SUPPLIED MATERIALS:

None

OTHER MATERIALS REQUIRED:

Pencil
Ruler (cm/mm)

READ INSTRUCTIONS OVERLEAF

DC (CW/SW) MEP60304 29564/1

INSTRUCTIONS TO CANDIDATES

- **Write your name clearly in capital letters, your Centre Number and Candidate Number in the boxes on the first page.**
- **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.**
- **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 pages 4–5.**
- **The Periodic Table is provided separately.**

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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 in the direction of the force

change in energy = work done

change in GPE = weight × 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

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

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]

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) The sentence below and the two on the facing page each have 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]

(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 <u>BEST</u> 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]

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QUESTION 3 STARTS ON PAGE 12

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]

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]

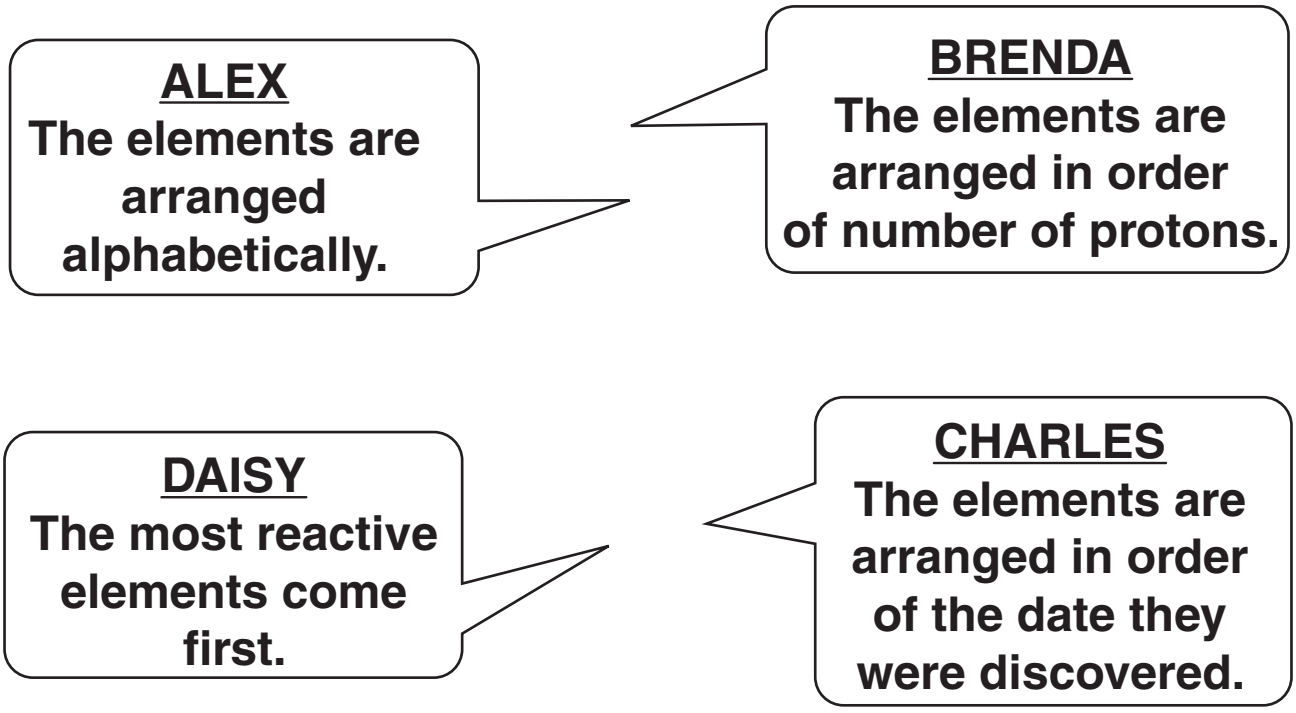
(ii) Complete the table for the structure of a lithium atom.

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?



answer _____ [1]

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

$$Li \rightarrow Li^{+} + e^{-}$$

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]

(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.

Cl_2 (____) + 2NaOH (____) →

NaOC*l* (aq) + NaC*l* (aq) + H_2O (____)

[2]

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

Write a <u>WORD EQUATION</u> 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]

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.

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

[1]

(c) The 10 kg 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 <u>ONE</u> correct statement.

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

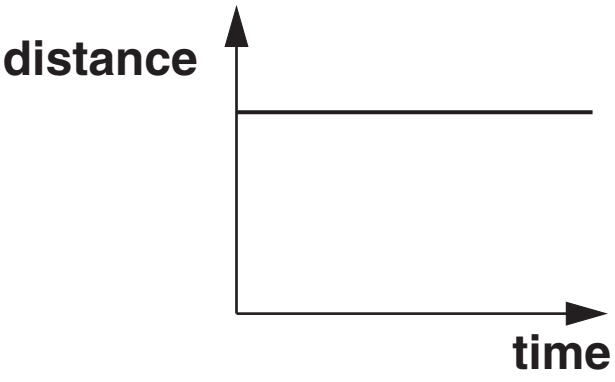
The ball's momentum increases as it moves along the track. ☐

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

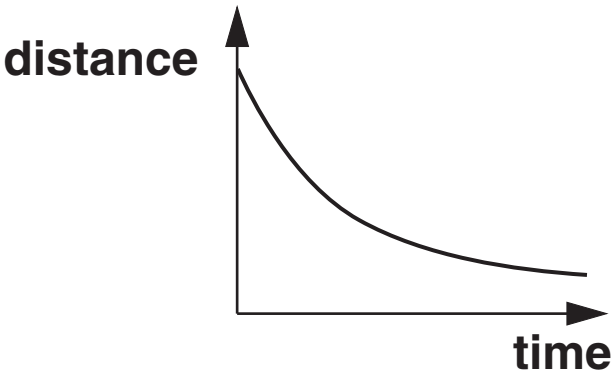
The velocity of the ball increases as it moves along the track. ☐

[1]

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



A



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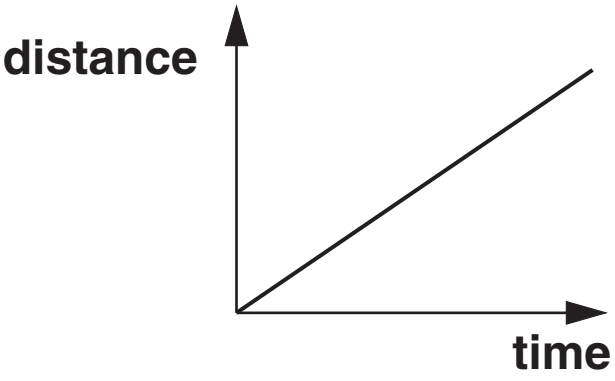
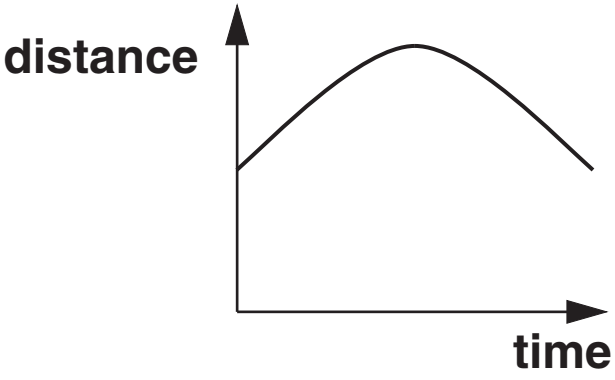


C



D

answer _____ **[1]**

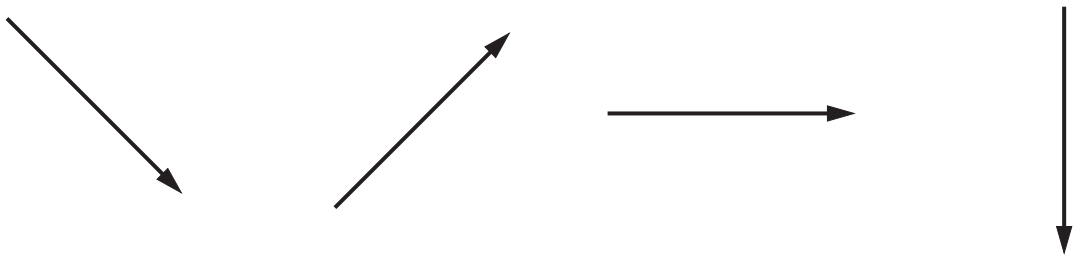
[Total: 5]

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 of the two sentences below.

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]

(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

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.