OCR
RECOGNISING ACHIEVEMENT

F

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)

Monday 25 January 2010
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.

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

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

Electric Circuits

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

$$\frac{\text{voltage across primary coil}}{\text{voltage across secondary coil}} = \frac{\text{number of turns in primary coil}}{\text{number of turns in secondary coil}}$$

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 Sue is a doctor.

She treats patients for either heat stroke or hypothermia at different times of the year.

(a) Draw straight lines from each **symptom** to the correct **condition**.

Draw straight lines from each **treatment** to the correct **condition**.

symptom	condition	treatment
rapid pulse rate		wrap in wet towels
shivering	hypothermia	insulate the patient
slurred speech		keep the patient as still as possible
dry skin	heat stroke	use a fan

[4]

(b) **(i)** Sue takes the temperature of a patient suffering from **heat stroke**.

Put a (ring) around the temperature she is most likely to find.

34 °C **37 °C** **40 °C**

[1]

(ii) Sue takes the temperature of a patient suffering from **hypothermia**.

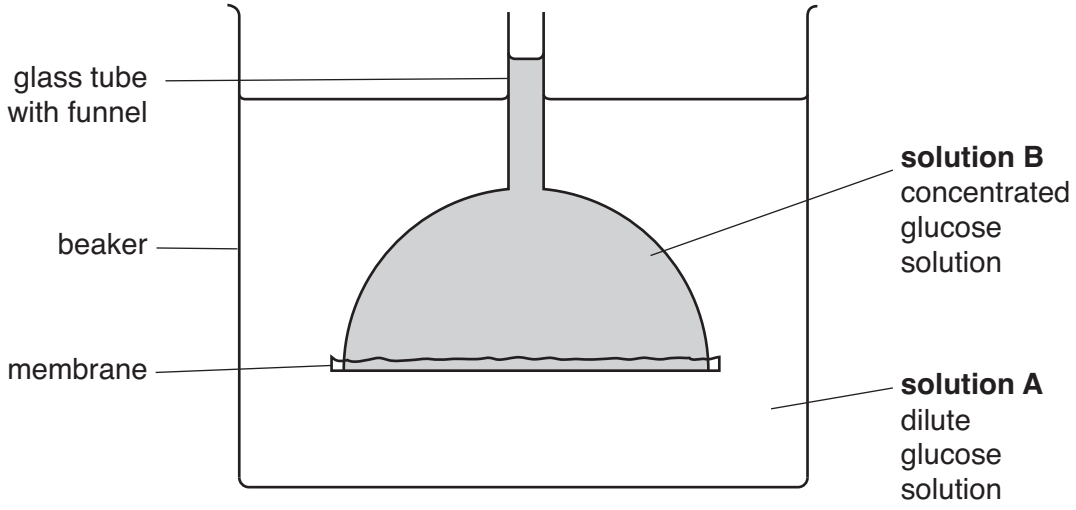
Put a (ring) around the temperature she is most likely to find.

34 °C **36 °C** **38 °C** **40 °C** **42 °C**

[1]

[Total: 6]

2 Barry sets up an experiment to investigate osmosis.



(a) What type of membrane should Barry use to investigate osmosis?

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

(b) Barry sees that the level in the tube goes up.

Put a tick (✔) in the box next to the correct reason.

only water moves from **solution A** to **solution B** ☐

only glucose moves from **solution A** to **solution B** ☐

both water and glucose move from **solution A** to **solution B** ☐

[1]

(c) Barry repeats the experiment. He wants to change his experiment so that the level in the tube does not change.
What should he do?

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

add more water to **solution A** ☐

add more glucose to **solution A** ☐

warm up **solution A** ☐

[1]

[Total: 3]

3 Tina investigates the effect of temperature on enzymes.
She uses the enzyme catalase to break down hydrogen peroxide.
She collects the oxygen gas given off by the reaction.
Here are some of her results.

temperature of catalase and hydrogen peroxide in °C	volume of gas collected in 1 minute in cm^3
20	18
30	36
40	40
90	

(a) Suggest and explain how much gas will be produced at 90 °C.

.....

.....

..... **[2]**

(b) Tina tries to use a different enzyme to break down hydrogen peroxide.

Use the lock and key model to explain why this will not work.

.....

.....

.....

..... **[3]**

[Total: 5]

4 Atoms are made up of protons, neutrons and electrons.

(a) The charge and the mass of protons, neutrons and electrons are not the same.

Draw straight lines to join each type of **particle** to its **charge**.

Draw straight lines to join each type of **particle** to its **relative mass**.

charge	particle	relative mass
0	proton	almost zero
–1	neutron	1
+1	electron	

[2]

(b) Many chemical changes involve ions.

Draw **one** line between the two boxes which **best** describe what an ion is.

A crystal lattice …	… which has gained or lost electrons.
or	or
A group of atoms …	… which has gained or lost protons.
or	or
An atom or a group of atoms …	… which has gained or lost neutrons.
or	or
An atom …	… which has moved from one group to another.

[2]

[Total: 4]

5 David's teacher does an experiment using sodium.

(a) The sodium is stored in a bottle of oil.
Why must it be stored in oil?

.....

.....

..... **[2]**

(b) Sodium is in group 1 of the Periodic Table.
Here is an outline of the Periodic Table.
The cross (X) shows one of the group 1 metals.

Put crosses (X) in **two more** boxes that are group 1 metals.

X								

[1]

(c) The teacher puts a small piece of sodium into a beaker of water.

State two things you would **see** happen in the beaker.

.....

.....

..... **[2]**

(d) David watches a firework display. He suspects that a firework contains sodium compounds.
What is the clue that makes him suspect this?

Put a tick (✔) in the box next to the **best** answer.

The firework burns rapidly.	☐
The firework makes a strong smell.	☐
The firework produces grey smoke.	☐
The firework burns with a yellow flame.	☐

[1]

[Total: 6]

6 Bromine is a toxic and corrosive liquid.

(a) Which two safety symbols should be on bottles of bromine?

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




[1]

(b) The symbol for a bromine molecule is Br_2.

Which of these diagrams could be of a bromine molecule?

Put a (ring) around the correct answer.

[1]

(c) Bromine reacts with sodium to make sodium bromide.

Use the spaces to write a word equation for this reaction.

	+		→	

[1]

(d) Solid sodium bromide is ionic.

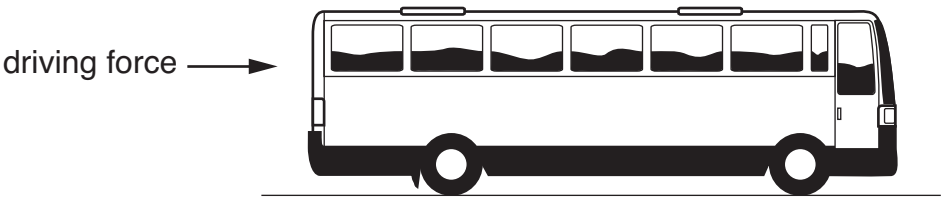
Draw **one** line between the boxes to describe what happens to the ions when solid sodium bromide dissolves in water.

Ions are in the solid at the start.		Ions then spread through the liquid.	
or		**or**	
Ions form when the solid dissolves.		Ions then sink to the bottom of the liquid.	

[1]

[Total: 4]

7 Joe drives a bus along a level road.



(a) A driving force acts forwards on the bus when it is moving at a steady speed.

Explain why the driving force does not increase the speed of the bus.

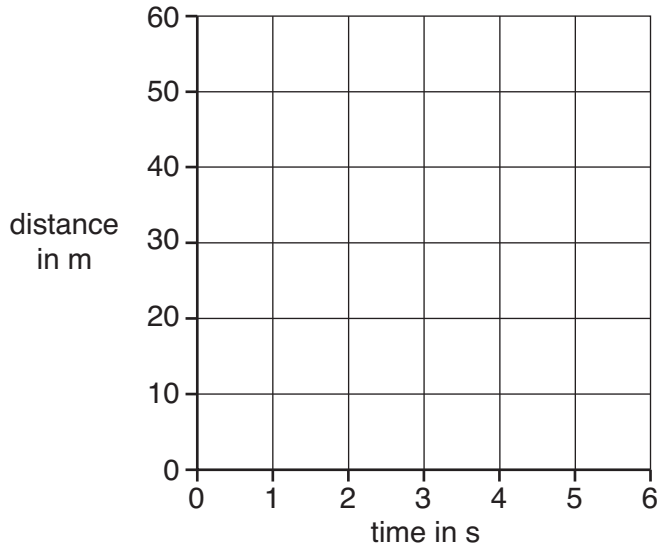
.....

.....

..... **[2]**

(b) On the axes below, sketch a **distance-time** graph for the bus as it travels at a steady speed of 15 m/s.

Start the graph at the point 0,0.



[2]

[Total: 4]

8 A small jet aircraft is speeding up along a runway.

(a) The engines exert a force of 6000 N on the aircraft as it moves along the runway.
Which calculation shows the change of momentum of the aircraft in 12 s?

Put a (ring) around the correct answer.

$\frac{6000}{12}$ $\quad$ 6000×12 $\quad$ $\frac{12}{6000}$

[1]

(b) Put a (ring) around the correct choice in each sentence.

The jet engines increase the forward speed of the aircraft.

The engines do this by pushing gas **backwards / forwards**.

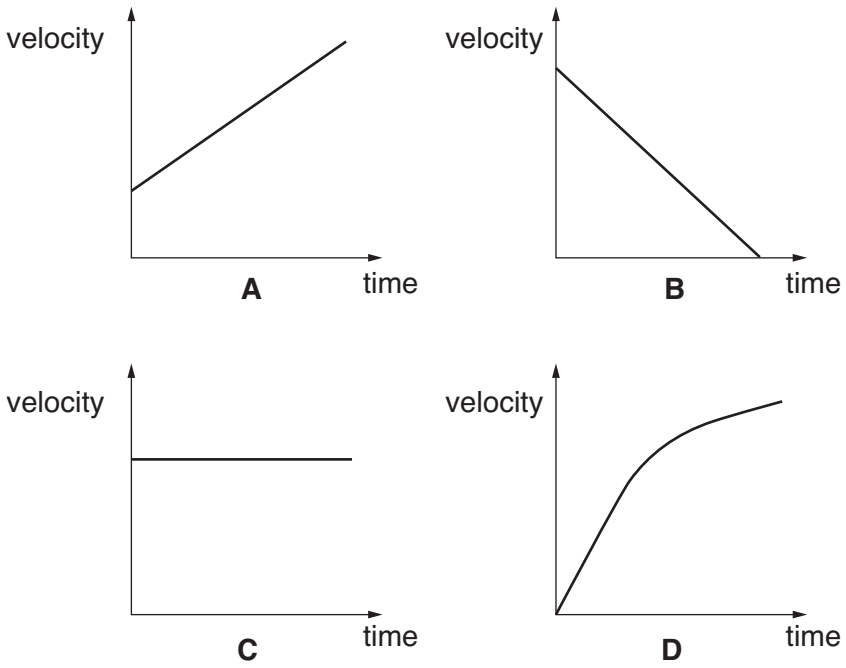
The force needed on the gas is in the **backwards / forwards** direction.

This results in a force on the engines in the **same / opposite** direction.

The force on the engines is **greater than / the same as / smaller than** the force on the gas.

[2]

(c) Which of these **velocity-time** graphs shows a steadily increasing velocity?



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

(d) The aircraft takes off when it has a forward velocity of 48 m/s.

Put a tick (✔) in the box next to the correct meaning of the word **velocity**.

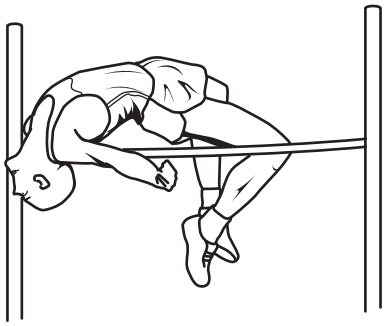
The velocity of an object is ...

... how fast its speed is changing.	☐
... its speed and direction of motion.	☐
... how fast its direction is changing.	☐

[1]

[Total: 5]

9 Jim takes part in a high jump contest.



(a) Complete the sentences.

Choose words from this list.

gravitational potential **kinetic** **momentum** **work**

Jim stands 10 m away from the high jump.

He runs towards the high jump, gaining ..... energy.

He then jumps up to the bar, gaining ..... energy.

[2]

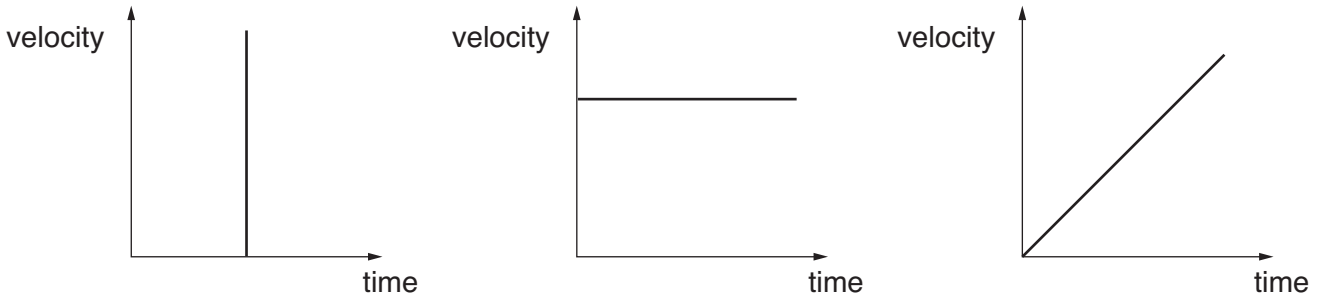
(b) Jim has a mass of 65 kg. Just before he jumps up, his velocity is 10 m/s.

Who has the correct way of calculating his momentum?

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

(c) Jim clears the bar and falls back to the ground.

Put a (ring) around the correct **velocity-time** graph for Jim as he falls vertically to the ground.



[1]

(d) Jim stops moving when he lands.

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

His kinetic energy is lost through heating.	☐
He gains momentum through friction.	☐
He loses weight through reaction.	☐

[1]

[Total: 5]

END OF QUESTION PAPER

PLEASE DO NOT WRITE ON THIS PAGE

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