OCR

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Thursday 12 June 2014 – Morning

GCSE TWENTY FIRST CENTURY SCIENCE PHYSICS A/ADDITIONAL SCIENCE A

A182/01 Modules P4 P5 P6 (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)

Duration: 1 hour

A182014

3110778164

Candidate forename		Candidate surname	

Centre number						Candidate number				

INSTRUCTIONS TO CANDIDATES

- Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
- Use black ink. HB pencil may be used for graphs and diagrams only.
- Answer **all** the questions.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- 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).
- Do **not** write in the bar codes.

INFORMATION FOR CANDIDATES

- The quality of written communication is assessed in questions marked with a pencil (✎).
- A list of useful relationships is printed on page **2**.
- 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 **60**.
- This document consists of **16** pages. Any blank pages are indicated.

TWENTY FIRST CENTURY SCIENCE EQUATIONS

Useful relationships

The Earth in the Universe

distance = wave speed × time

wave speed = frequency × wavelength

Sustainable energy

energy transferred = power × time

power = voltage × current

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

Explaining motion

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

$$\text{acceleration} = \frac{\text{change in velocity}}{\text{time taken}}$$

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

amount of energy transferred = work done

change in gravitational potential energy = weight × vertical height difference

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

Electric circuits

power = voltage × current

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

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

Radioactive materials

energy = mass × [speed of light in a vacuum]^2

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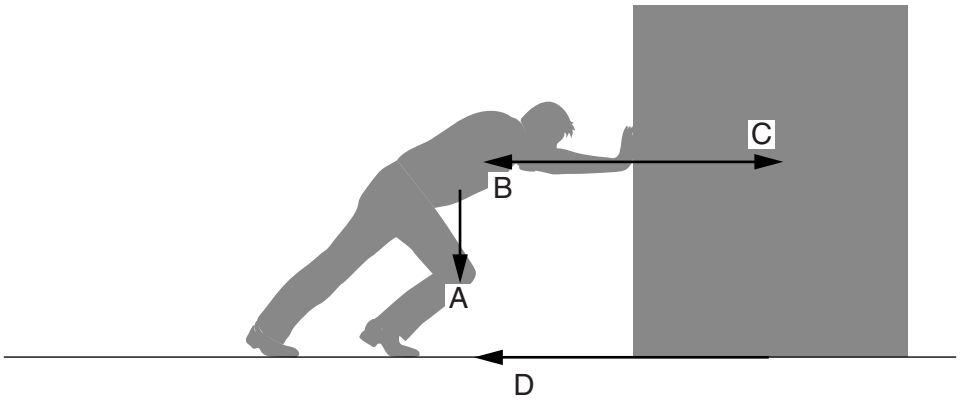
Question 1 begins on page 4

PLEASE DO NOT WRITE ON THIS PAGE

Answer **all** the questions.

1 **(a)** The picture shows a man pushing a box.
Some of the forces are shown.



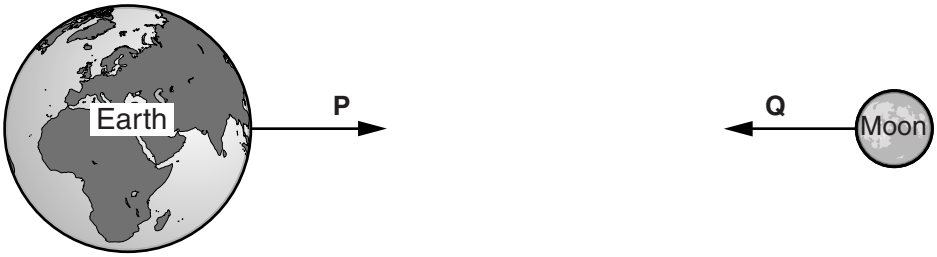
(i) Write down the letter of a force which is friction. ..... **[1]**

(ii) Write down the letter of a force which is due to gravity. ..... **[1]**

(iii) Write down the letters of two forces that are the interaction pair of forces between two objects.

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

(b) The Moon and the Earth both experience interaction forces that attract them to each other.

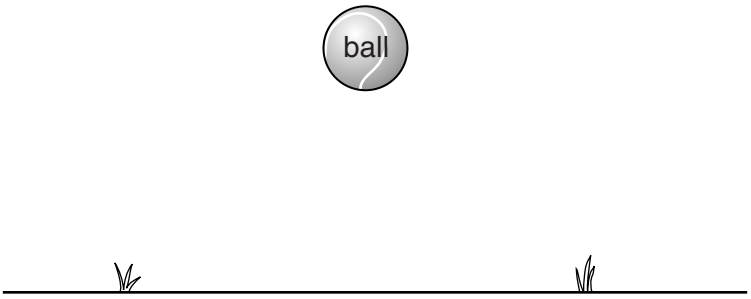


Complete the table about these forces.
Write either **Earth** or **Moon** in each box.

	The object the force acts on	**The object that exerts the force**
Force P		
Force Q		

[2]

(c) Here is a diagram of a ball falling towards the ground.



Draw **two** arrows on the diagram to show the size and direction of the interaction forces between the ball and the Earth.

[3]

[Total: 8]

2 John hits a hard ball with a bat.
The ball has a mass 0.3 kg and is travelling at a speed of 4 m/s.

(a) Calculate the momentum of the ball.

momentum = ... kg m/s **[2]**

(b) The 0.3 kg ball hits a glass window with a speed of 4 m/s. The glass will not break if the ball has a kinetic energy of less than 10 J.

Will the glass window break?
Use a calculation to help justify your answer.

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

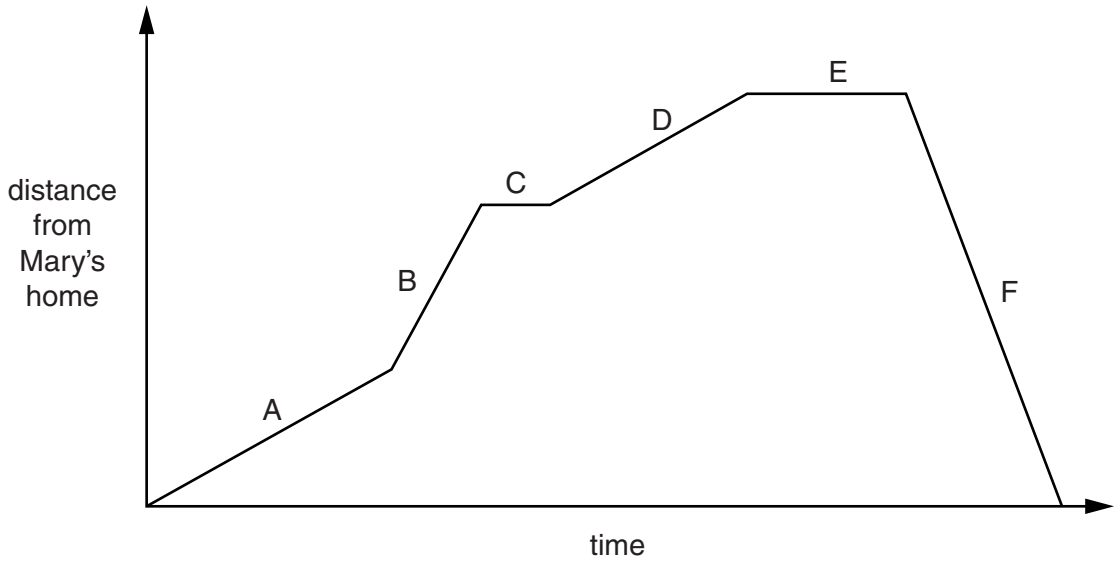
(c) How can the kinetic energy of a moving object be increased?
Put ticks (✓) in the **two** boxes next to the correct answers.

increase the speed of the object	☐
increase the mass of the object	☐
increase the friction on the object	☐
increase the time it takes to stop the object	☐
increase the gravitational potential energy of the object	☐

[2]

[Total: 7]

3 Mary went on a journey. This is the distance-time graph for her journey.



Use the graph to describe Mary's journey.

The quality of written communication will be assessed in your answer.

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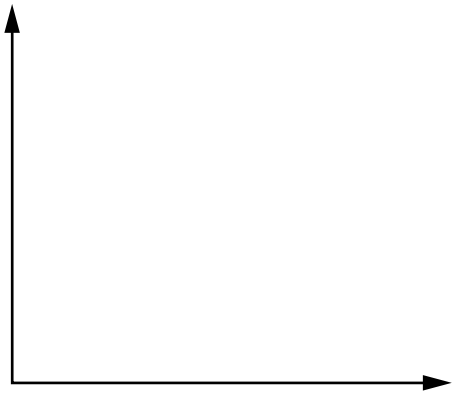
..... **[6]**

[Total: 6]

4 This data shows the relationship between the current in a wire and the power lost by the wire.

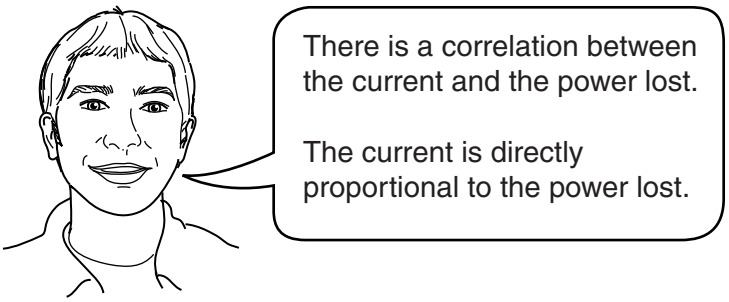
Current in amps	Power lost in watts
0.5	1
1.0	4
1.5	9
2.0	16

(a) Sketch a graph of these results on the axis below.
You do not need to plot any points.



[3]

(b) Edward looks at the data and draws conclusions.



Is Edward correct?
Justify your answer.

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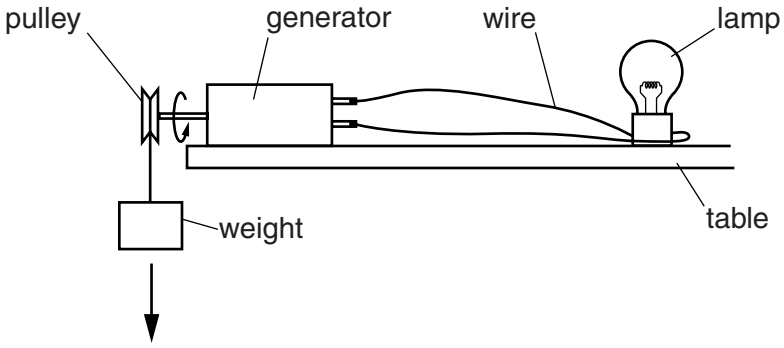
..... **[3]**

[Total: 6]

5 Rai sets up an experiment.



When Rai lets the weight fall, the generator spins and the lamp lights up.

Describe the energy transfers that allow the falling weight to light up the lamp.

The quality of written communication will be assessed in your answer.

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..... **[6]**

[Total: 6]

6 Susan is investigating electrical circuits.

(a) She starts by researching voltage.

(i) What is another name for voltage? ..... **[1]**

(ii) Complete the following sentences about voltage.
Use words from the list.

battery **charge** **current** **lamp** **wire**

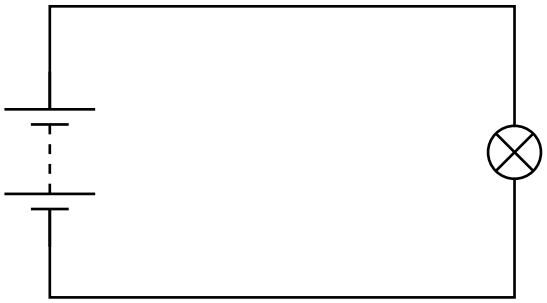
The voltage is a measure of the 'push' given to the charges in a circuit by a

..... .

The voltage between two points depends on the work done on a

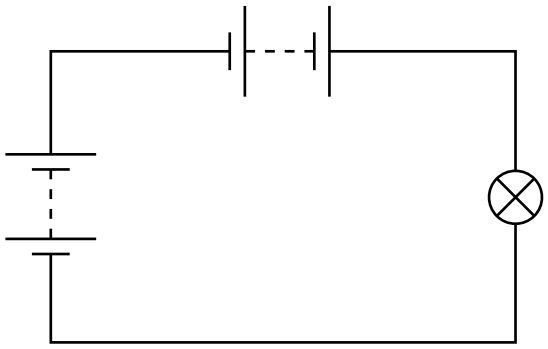
..... , as it moves between the two points. **[2]**

(b) Susan wants to measure the voltage across the battery in a simple circuit.



Add a voltmeter to the circuit diagram to show how the voltmeter should be connected to measure the voltage across the battery. **[2]**

(c) Susan adds another battery to the circuit, in **series** with the first battery.



What will happen to the voltage across the lamp and the current through it?
Put a tick (✓) in the box next to the correct answer.

voltage increases, current increases ☐

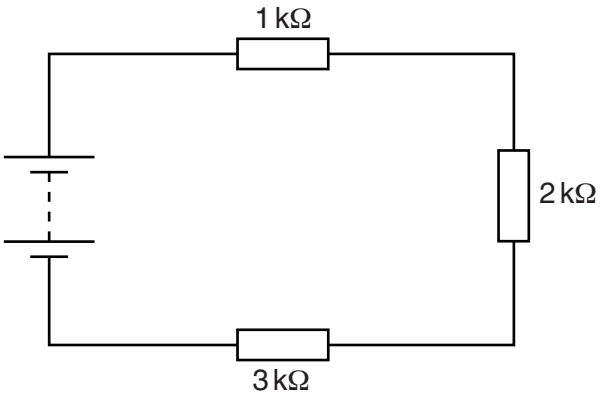
voltage increases, current decreases ☐

voltage decreases, current increases ☐

voltage decreases, current decreases ☐

[1]

(d) Susan builds a circuit with three resistors in series.



(i) Here are statements about the current in the circuit.
Put a tick (✓) in the box next to the correct statement

There is no current in the circuit. ☐

The largest current is in the 3 kΩ resistor. ☐

The smallest current is in the 3 kΩ resistor. ☐

The current is the same in all three resistors. ☐

[1]

(ii) Which resistor has the largest voltage across it?
Justify your answer.

.....

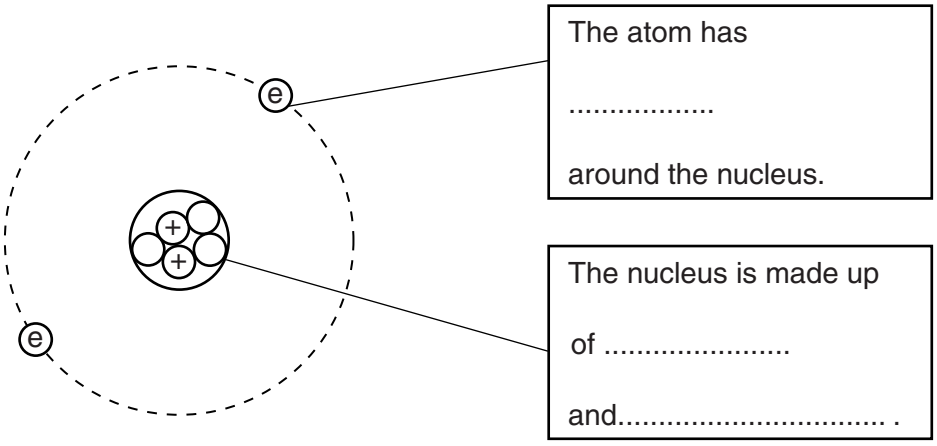
.....

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

[Total: 9]

7 This question is about ionising radiation.
Ionising radiation affects atoms.

(a) **(i)** Complete the labels on the diagram of an atom.



[3]

(ii) What is the effect of ionising radiation hitting an atom?

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

(b) Write down **two** uses for ionising radiation.

1 .....

2 .....

[2]

[Total: 7]

8 People working with radioactive sources often wear detectors to measure how much ionising radiation they are exposed to.

(a) One type of detector is a badge with photographic film covered by three different materials.

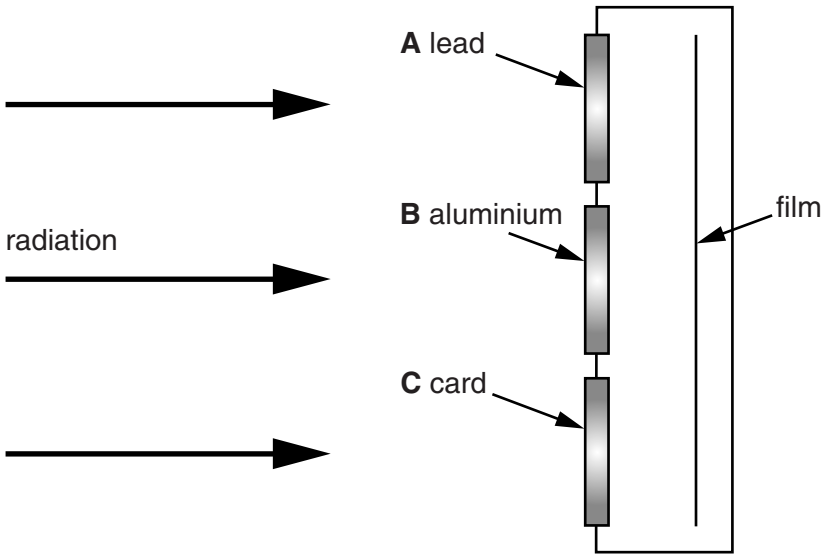
The photographic film records the amount of radiation that reaches it.

The badge has three sections.

Section **A** is covered with lead.

Section **B** is covered with aluminium.

Section **C** is covered with card.



(i) Which two sections will let gamma radiation through? .....and ..... **[1]**

(ii) Which section will let beta radiation through? ..... **[1]**

(iii) How many sections will let alpha radiation through?

Put a (ring) around the correct answer.

0 **1** **2** **3**

[1]

(b) A different film badge has four sections.

Section **P** only allows gamma through.
Section **Q** allows gamma and X-rays through.
Section **R** allows gamma, X-rays and beta radiation through.
Section **S** allows gamma, X-rays, beta radiation and visible light through.

The amount of beta radiation can be found by comparing the film behind two sections.
Which sections can be used to detect the amount of beta radiation?
Explain your answer.

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

[Total: 5]

9 The Government is considering building more nuclear reactors.

One of the arguments against using nuclear reactors to produce energy is that they produce radioactive waste.

Are people in government right to worry about the risks of the different types of radioactive waste and how they are disposed of? Explain your answer.

The quality of written communication will be assessed in your answer.

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..... **[6]**

[Total: 6]

END OF QUESTION PAPER

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