Centre Number

Candidate Number

Rewarding Learning

General Certificate of Secondary Education
2014–2015

Double Award Science: Physics

MV18

Unit P1
Foundation Tier

[GSD31]

THURSDAY 26 FEBRUARY 2015, MORNING

TIME

1 hour, plus your additional time allowance.

INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.
Write your answers in the spaces provided in this question paper.
Answer **all nine** questions.

INFORMATION FOR CANDIDATES

The total mark for this paper is 70.
Figures in brackets printed at the end of each question indicate the marks awarded to each question or part question.
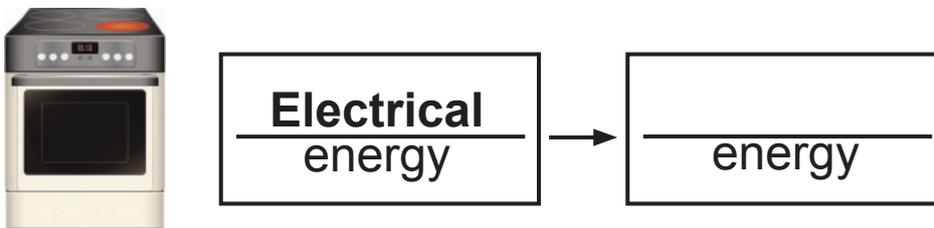Quality of written communication will be assessed in Question **7(a)**.

9638.03 **MV18**

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1 A microphone changes **sound** energy into **electrical** energy, as shown in the energy flow diagram below.

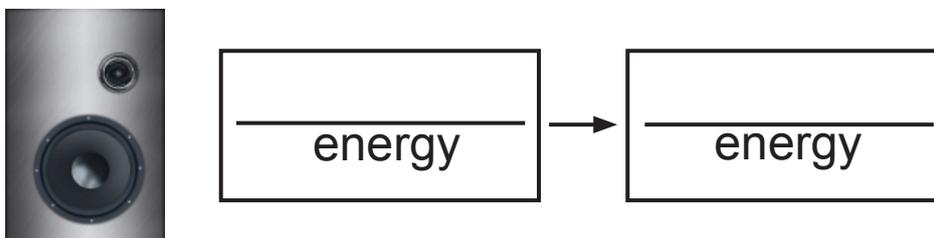| Sound energy	→	Electrical energy
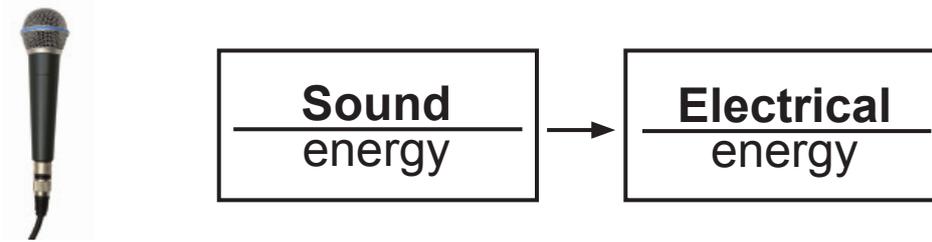
Fill in the spaces below to show the **main** types of energy changes which the device is designed to bring about.

(a) Electrical oven [1 mark]
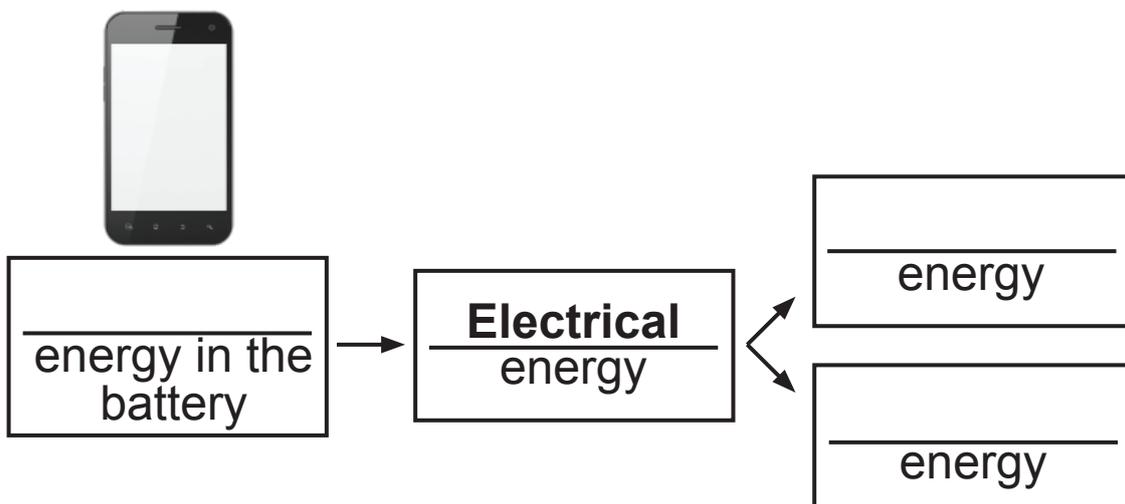
Electrical energy	→	_____ energy

(b) Loudspeaker [2 marks]

_____ energy	→	_____ energy

(c) Mobile phone [3 marks]

_____ energy in the battery	→	Electrical energy	→	_____ energy
			→	_____ energy

2 Filament light bulbs and CFL light bulbs are designed to convert electrical energy into light energy.

Filament light bulb

60 joules →

12 joules of light energy →

48 joules of heat energy →

CFL light bulb

15 joules →

12 joules of light energy →

3 joules of heat energy →

(a) Use the information above to explain fully why the government is encouraging the use of the more modern CFL light bulbs. [1 mark]

_____

_____

(b) Calculate the efficiency of the CFL light bulb. [3 marks]

You are advised to show your working out.

Efficiency **=** _____

Read the passage below.

Some islands off the west coast of Ireland have no **coal** or **oil**. The islanders depend on **wind** energy to generate electricity. When there is little demand for electricity, the islanders charge their batteries. They can use the batteries if there is no wind.

(c) (i) Name one renewable and one non-renewable energy resource mentioned in the passage above. [2 marks]

Renewable energy resource _____

Non-renewable energy resource _____

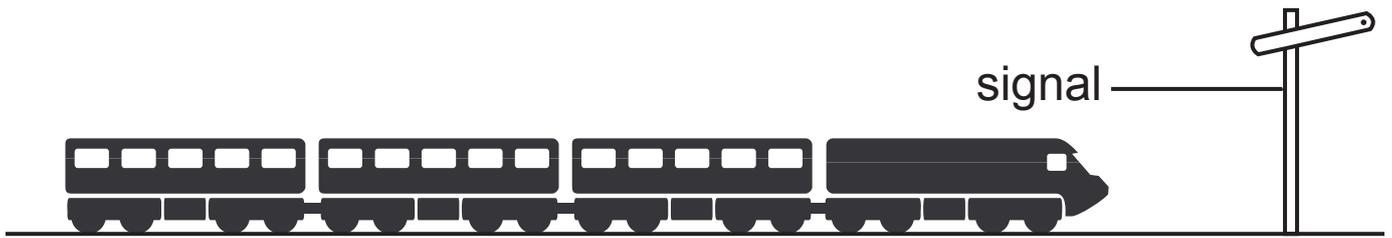**(ii)** Name one renewable and one non-renewable energy resource **not** mentioned in the passage above. [2 marks]

Renewable energy resource _____

Non-renewable energy resource _____

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(Questions continue overleaf)

3 **(a)** A train is 75 m long. The whole train takes 5 seconds to pass a signal.
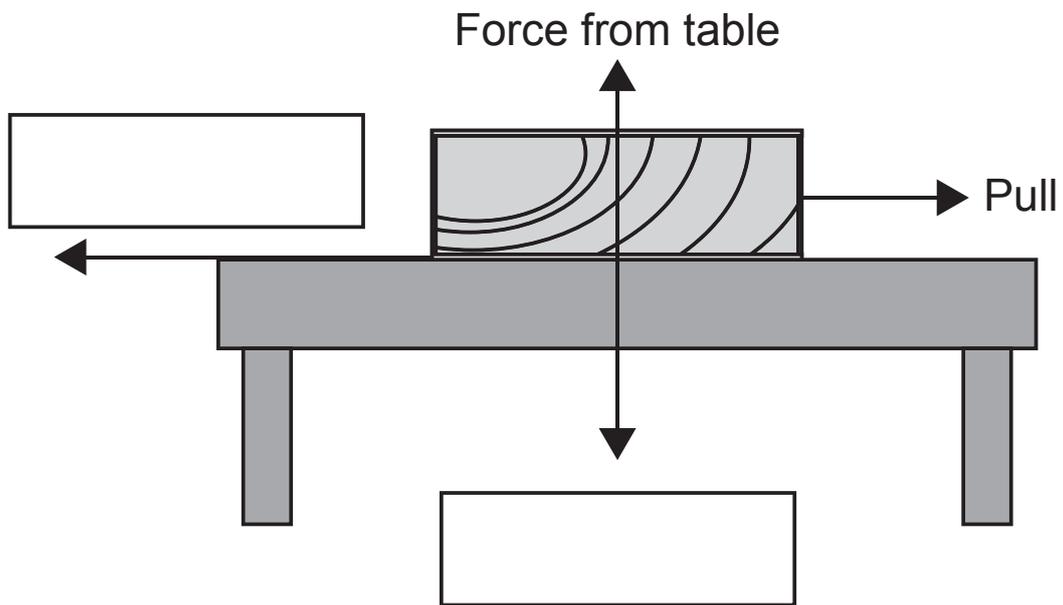
signal

Calculate the speed of the train. [3 marks]

You are advised to show your working out.

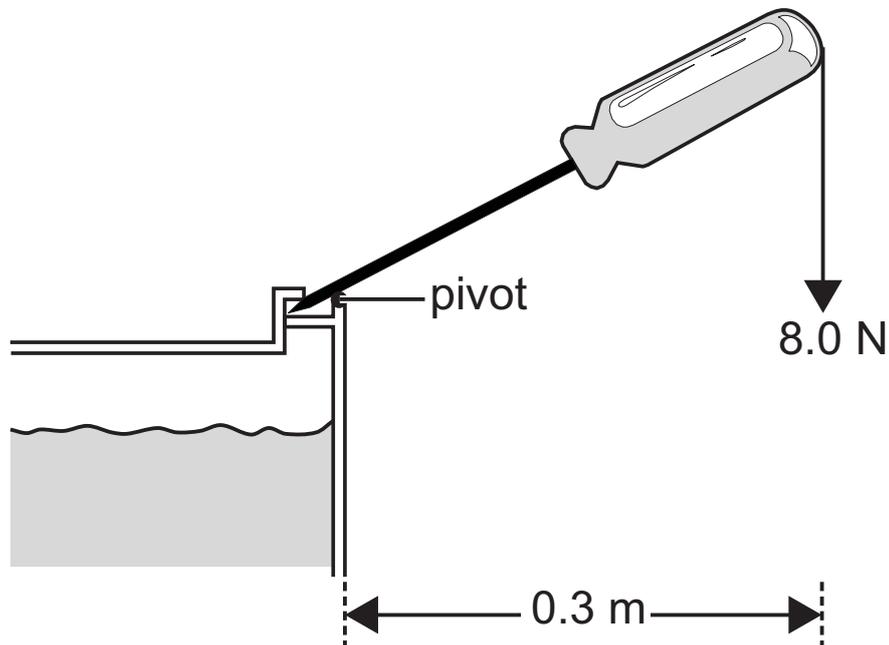Speed of train **=** _____ m/s

(b) The diagram shows a block of wood being pulled across a table.

Force from table

Pull

Complete the boxes by inserting the names of the two other forces acting on the block of wood. [2 marks]

[Turn over

The diagram shows a screwdriver being used to open a tin of paint.
The force exerted by the painter is 8.0 N.

(c) (i) Calculate the moment of the 8.0 N force about the pivot.
Remember to include the unit. [4 marks]

You are advised to show your working out.

Moment **=** _____

(ii) Tick (✓) the correct box to indicate the direction of the moment of the 8.0 N force. [1 mark]

Clockwise ☐

Vertically downwards ☐

Anticlockwise ☐

4 **(a)** Complete the following sentence. [1 mark]

An object has kinetic energy if it is _____

(b) A bus, car and athlete are travelling at 10 m/s.

Which has the greatest kinetic energy? [2 marks]

_____

Explain your answer.
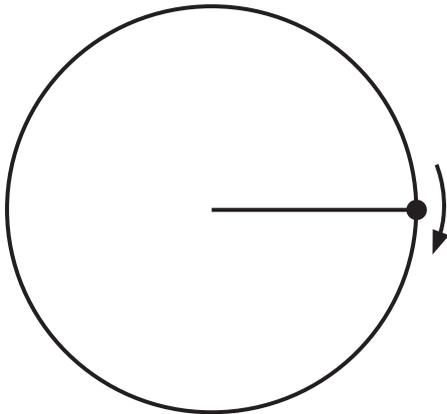
_____

_____

(c) Calculate the kinetic energy of a 60 kg cheetah moving at 5 m/s. [3 marks]

You are advised to show your working out.

Kinetic energy of cheetah **=** _____ J

5 A steel ball is whirled on a string in a horizontal circle. A bird's eye view of the situation is shown in the diagram below.

(a) Tick (✓) the correct box to show which force provides the centripetal force acting on the steel ball. [1 mark]

Friction ☐

Electric force ☐

Weight ☐

Tension ☐

(b) (i) Complete the formula below, **in words**, to find the momentum of an object. [1 mark]
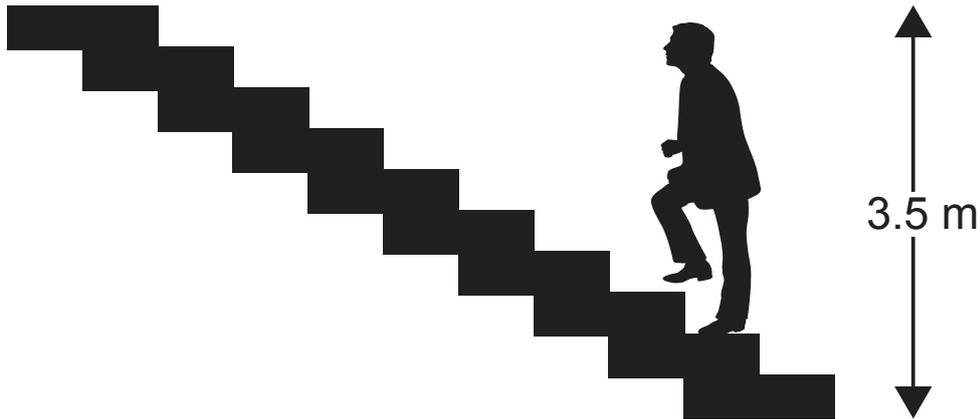
Momentum **=** _____

(ii) The steel ball has a mass of 0.5 kg and velocity of 4.0 m/s.
Calculate the momentum of the steel ball. [2 marks]

You are advised to show your working out.

Momentum **=** _____ kg m/s

6 Robert, whose mass is 70 kg, runs up a flight of stairs.

3.5 m

(a) Calculate Robert's weight in newtons. [2 marks]

Weight **=** _____ N

(b) The vertical height of the stairs is 3.5 m.
Calculate the work done by Robert. [3 marks]

You are advised to show your working out.

Work done **=** _____ J

(c) The time taken by Robert to run up the stairs is 5.0 s. Use your answer to part **(b)** to calculate the power developed by Robert. [3 marks]

You are advised to show your working out.

Power **=** _____ W

7 **(a)** Describe an experiment you would carry out to measure the density of milk. [6 marks]

In your description you should include:

- the apparatus you would use;
- the measurements you would take;
- the formula you would use to find the density.

In this question you will be assessed on your written communication skills including the use of specialist scientific terms.

_____

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(b) Metal rivets have a mass of 54 g and a volume of 20 cm^3.

Calculate the density of the metal. [2 marks]

You are advised to show your working out.

Density **=** _____ g/cm^3

8 **(a)** An atom is made up of protons, neutrons and electrons. Complete the table below to show the relative electrical charge and the location of each particle.
Two of the boxes have already been done for you. [4 marks]

Particle	Relative electrical charge	Location in the atom
Proton	**+**1	In the nucleus
Neutron		
Electron		

(b) The symbol for the nucleus of carbon-14 is shown below.

$$^{14}_{6}C$$
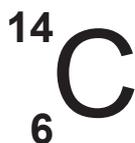
(i) How many protons does the nucleus of carbon-14 contain? [1 mark]

Number of protons **=** _____

(ii) How many electrons does a neutral atom of carbon-14 contain? [1 mark]

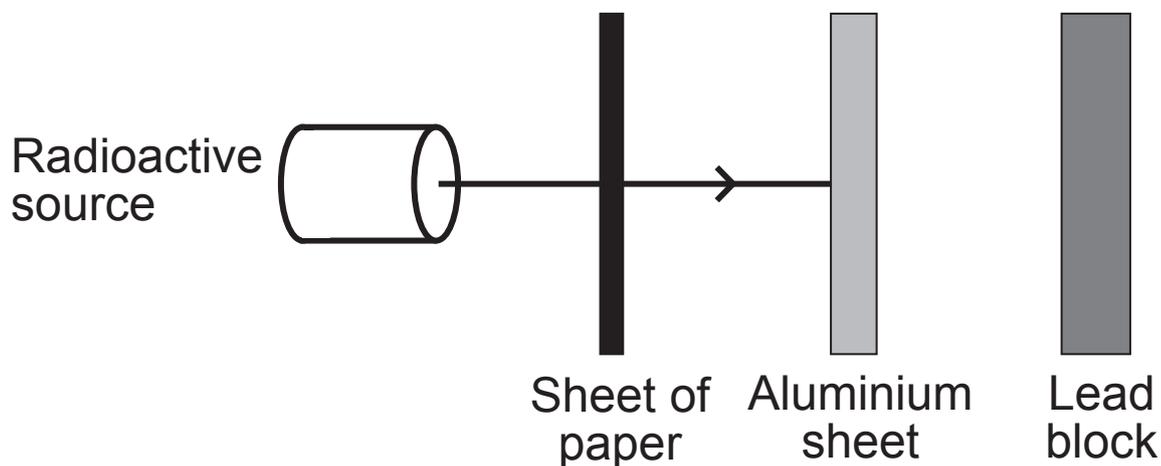Number of electrons **=** _____

(iii) How many neutrons does a neutral atom of carbon-14 contain? [1 mark]

Number of neutrons **=** _____

(c) The diagrams show two radiations being emitted by a radioactive substance and being absorbed by different materials.
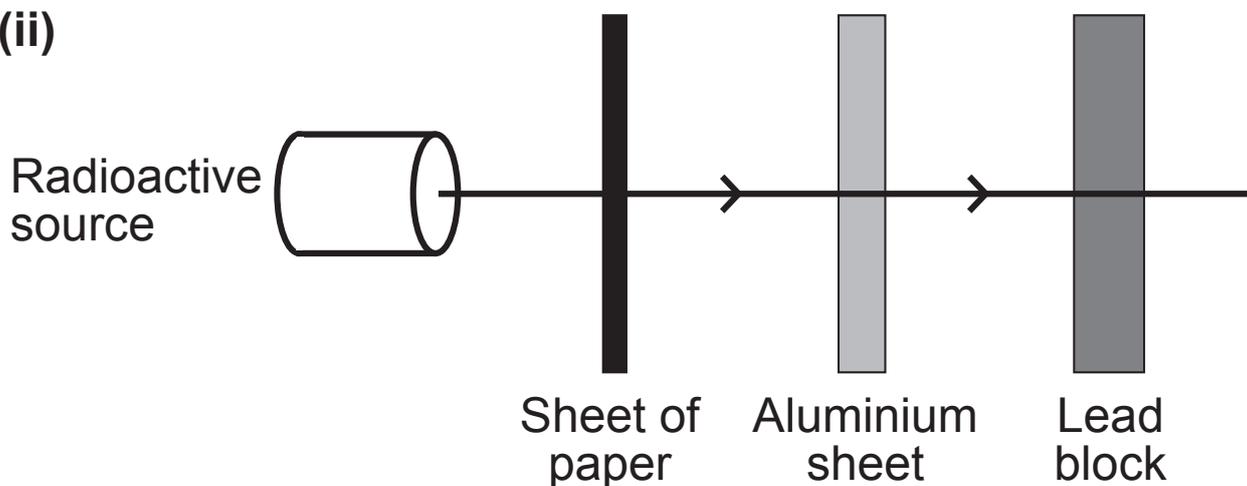
State the name of the radiation being emitted in each case, in the appropriate space. [1 mark]/[1 mark]

(i)

Radioactive source

Sheet of paper   Aluminium sheet   Lead block

Radiation = _____

(ii)

Radioactive source
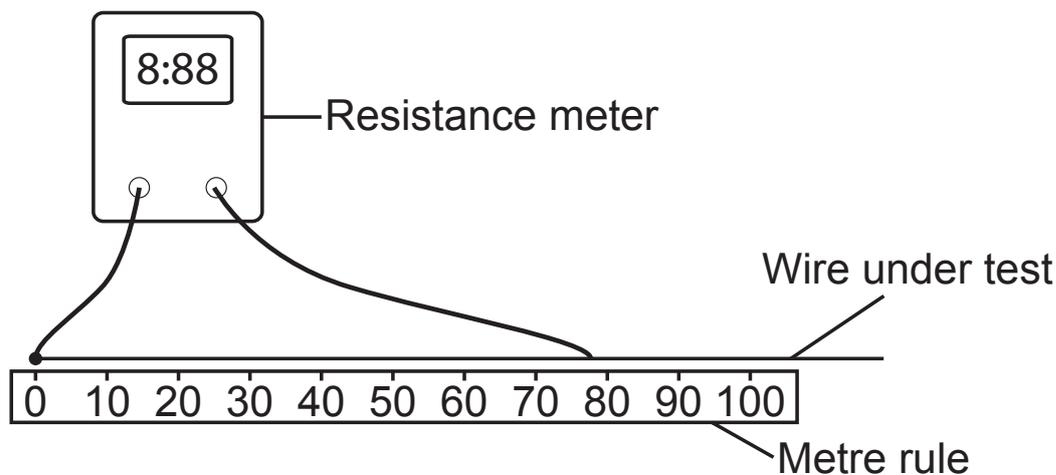
Sheet of paper   Aluminium sheet   Lead block

Radiation = _____

(iii) What name is given to the electromagnetic radiation which comes from the nucleus of a radioactive atom? [1 mark]

Radiation = _____

9 The apparatus required to investigate the factors affecting the resistance of copper wire is shown below.

According to theory, the resistance R of a copper wire is proportional to its length L and the relationship is given by the equation
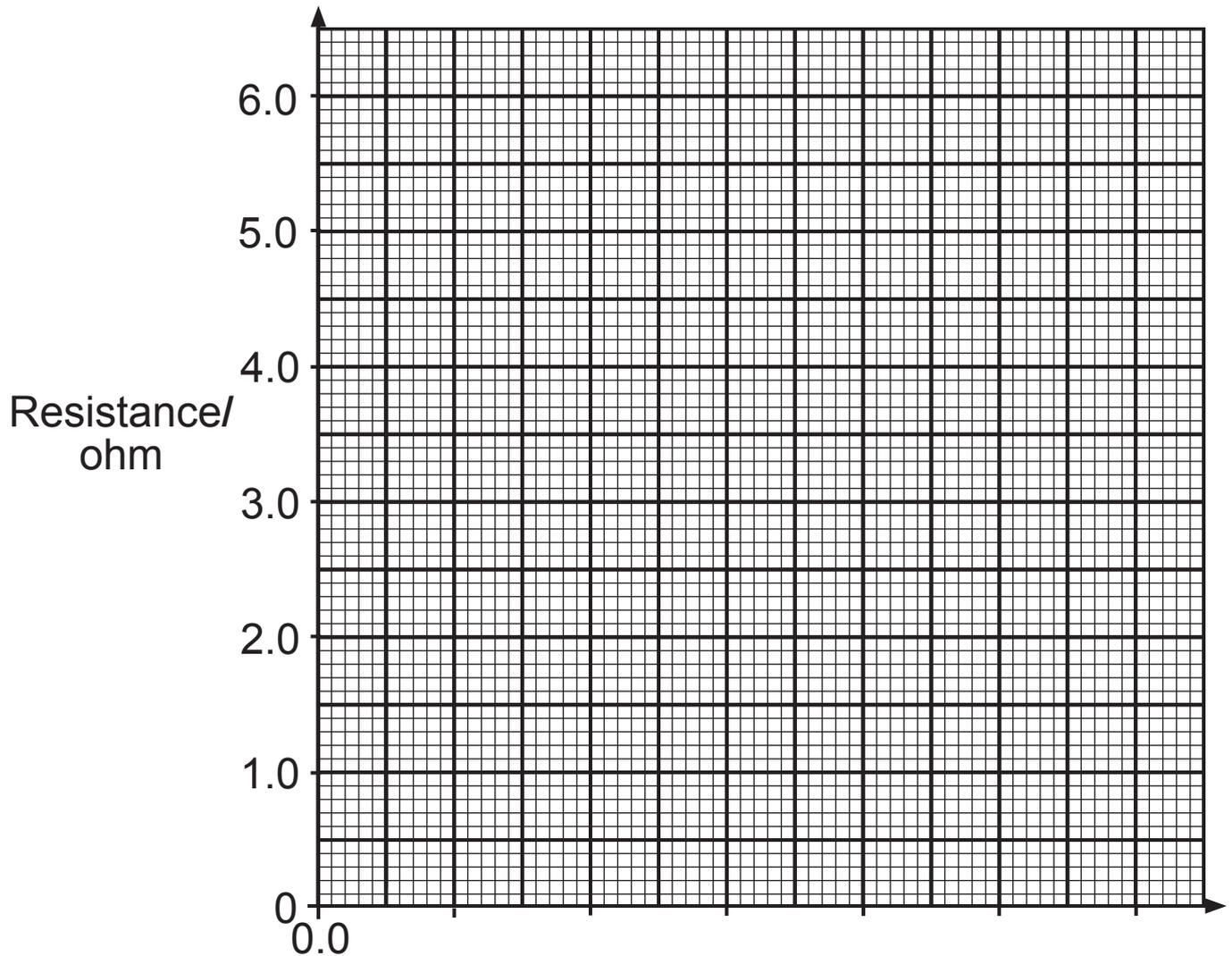
R = k × L   **Equation 9.1**

where k is a constant.

The results recorded in an experiment to verify the above relationship are in the table below.

Length/m	0.0	0.2	0.4	0.6	0.8	1.0
Resistance/ohm	0.0	1.2	2.4	3.6	4.5	6.0

(a) Choose a suitable horizontal scale and label the horizontal axis. [2 marks]

(b) Plot the points on the grid of resistance against length. [2 marks]

(c) Draw the line of best fit. [1 mark]

(d) Draw a circle around the point which does **not** show the trend in the graph. [1 mark]

(e) Use your graph to determine the constant k, in **Equation 9.1**.
Remember to include the units for k. [4 marks]

You are advised to show your working out.

k = _____: Units = _____

THIS IS THE END OF THE QUESTION PAPER

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Question Number	Marks
1	
2	
3	
4	
5	
6	
7	
8	
9	
Total Marks	

9638.03 **MV18**