Rewarding Learning

Centre Number

Candidate Number

General Certificate of Secondary Education
2014–2015

Double Award Science: Physics

MV18

Unit P1

Foundation Tier

[GSD31]

WEDNESDAY 20 MAY 2015, AFTERNOON

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.
You must answer the questions in the spaces provided.
Complete in blue or black ink only.
Answer **all ten** 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 **9(a)**.

BLANK PAGE

1 **(a)** **(i)** Explain what is meant by a renewable energy resource. [1 mark]

_____

_____

(ii) Give **two** examples of renewable energy resources. [2 marks]

1. _____

2. _____

(b) Give **one** environmental advantage in using a renewable energy resource rather than a non-renewable resource. [1 mark]

_____

_____

2 A light bulb is **designed** to change electrical energy to light energy.

Indicate in the spaces provided the energy change each of the following is **designed** to bring about.

(i) An electric kettle changes **<u>electrical</u>** energy to _____ energy. [1 mark]

(ii) A microphone changes _____ energy to _____ energy. [2 marks]

(iii) A battery changes _____ energy to _____ energy. [2 marks]

3 Patricia stands on a set of laboratory scales and the reading is 680 **N**.
She is then handed a suitcase and the reading rises to 820 **N**.

(a) (i) Calculate the weight of the suitcase. [1 mark]

Weight **=** _____ **N**

(ii) Calculate the mass of the suitcase.
Include the unit with your answer. [2 marks]

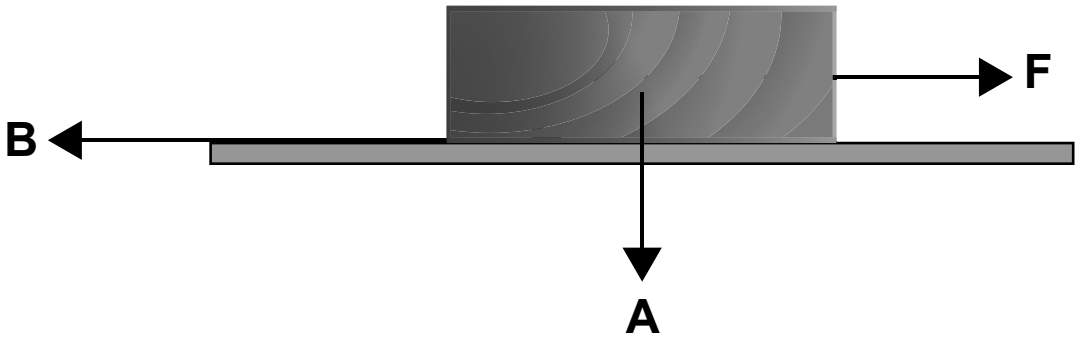
Mass **=** _____

(b) Patricia carries a sponge ball in her suitcase. The ball has a mass of 300 g and a volume of 150 cm^3. Calculate the density of the ball. [3 marks]

You are advised to show your working out.

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

4 A block of wood is pulled over a rough surface with a force **F**.



The diagram shows two other forces acting on the wood, labelled **A** and **B**.

(a) (i) Name these forces. [2 marks]

Force **A**: _____

Force **B**: _____

(ii) Another force acts on the wooden block. Draw an arrow on the diagram above to show the position and direction of this force. [2 marks]

(b) The block moves to the right at constant speed.
Is force **F** greater than, equal to or less than force **B**?
Circle the correct answer below. [1 mark]

greater than **equal to** **less than**

(c) (i) Which one of the forces (**A**, **B** or **F**) acting in the diagram on page 6 will cause energy loss? Circle the correct answer below. [1 mark]

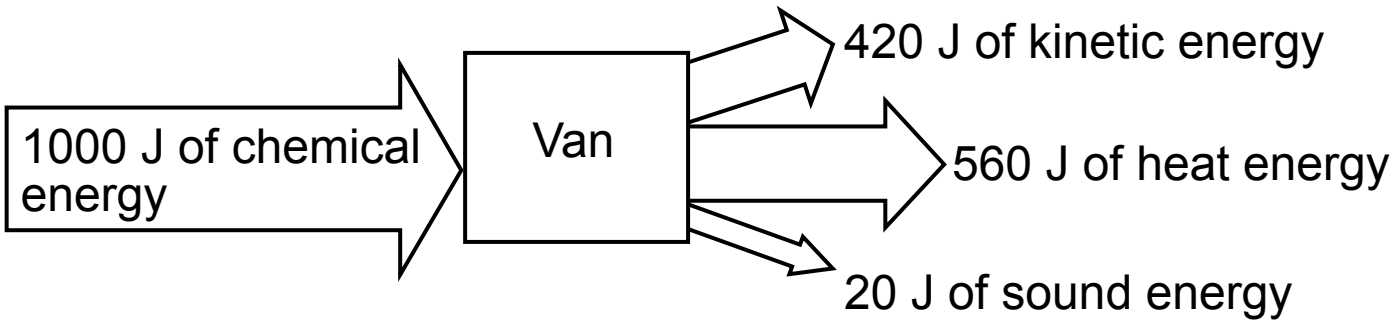
A **B** **F**

(ii) In what form will the energy be lost? [1 mark]

Energy wasted as _____

5 The engine in a van changes chemical energy to kinetic, heat and sound energy.

The diagram below illustrates the energy values in a particular situation.



280 J of the heat energy produced may usefully be used to heat the cabin to keep the driver warm.

(i) Calculate the **total** useful output energy. [2 marks]

You are advised to show your working out.

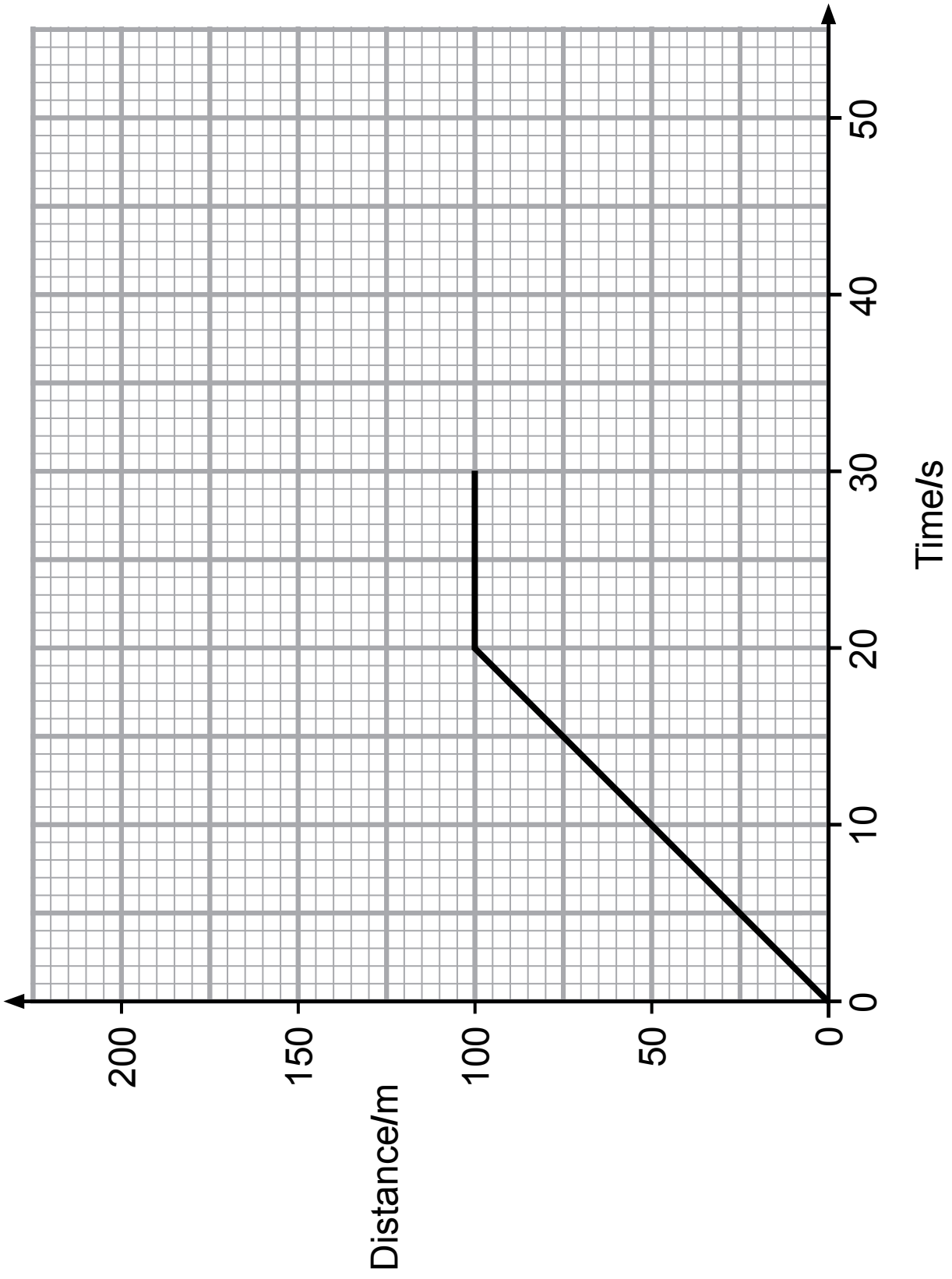
Total useful output energy **=** _____ J

(ii) Calculate the efficiency of the engine. [3 marks]

You are advised to show your working out.

Efficiency **=** _____

6 The graph below shows an incomplete plot of a distance-time graph for a student walking to school.



The school is 200 m away. The student walks at a steady speed for 20 seconds and then stops for 10 seconds. He completes the journey walking at a constant speed for a further 20 seconds.

(a) (i) How can you tell from the graph on page 10 that the student is walking at a steady speed for the first 20 seconds? [1 mark]

_____

(ii) Complete the graph on page 10 to show the final 20 seconds of the journey. [2 marks]

(b) Calculate the average speed of the student for the complete journey.

Remember the total time of the complete journey is 50 seconds. [3 marks]

You are advised to show your working out.

Average speed **=** _____ m/s

7 An atom consists of electrons, protons and neutrons.

(i) Complete the table below to show the properties and location of these particles. Some information has already been provided. [5 marks]

Particle	**Relative mass**	**Relative charge**	**Location**
Proton		**+**1	
Neutron	1		In the nucleus
Electron	1/1840		

(ii) Historically, different models have been proposed which attempted to describe the arrangement of particles in an atom.

Give the name of the first model. [1 mark]

_____

(iii) This model was replaced when two scientists proposed a much better model.

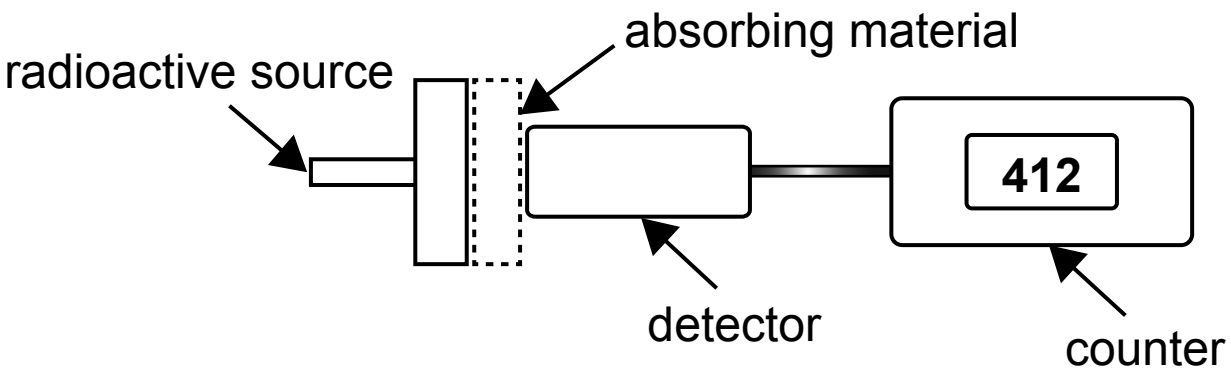
Give the name of these two scientists. [2 marks]

_____ and _____

BLANK PAGE

(Questions continue overleaf)

8 **(a)** The apparatus shown is used to investigate how different materials absorb gamma radiation.



The absorbing material is either aluminium, lead or air.

Examine the table below and insert the names of the material in the last column. [3 marks]

Count rate/ Counts per minute	**Absorbing material (aluminium, lead or air)**
802	
45	
412	

Technetium is an isotope widely used in medical imaging and has the symbol $^{99}_{43}\mathbf{Tc}$.

(b) (i) How many particles are in the nucleus of technetium? [1 mark]

_____

(ii) How many of these particles are neutrons? [1 mark]

_____

This isotope has a half-life of 211 000 years.

(iii) Beginning with 8 grams of technetium, calculate how long it would take before only 1 gram remains. [3 marks]

You are advised to show your working out.

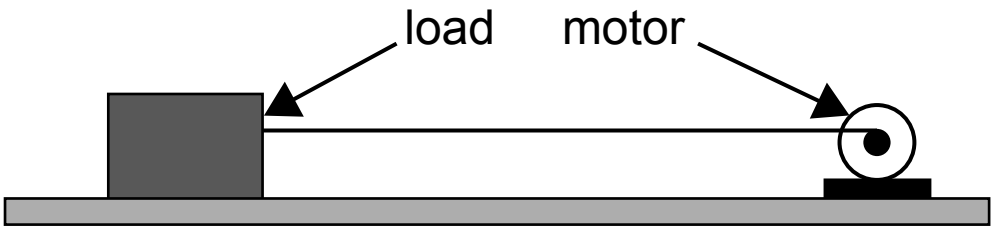
_____ years

9 **(a)** Describe an experiment to measure your personal power. [6 marks]

Your account should include:

- the apparatus you use;
- the measurements you make.

You will be assessed on your written communication skills including the use of specialist scientific terms.



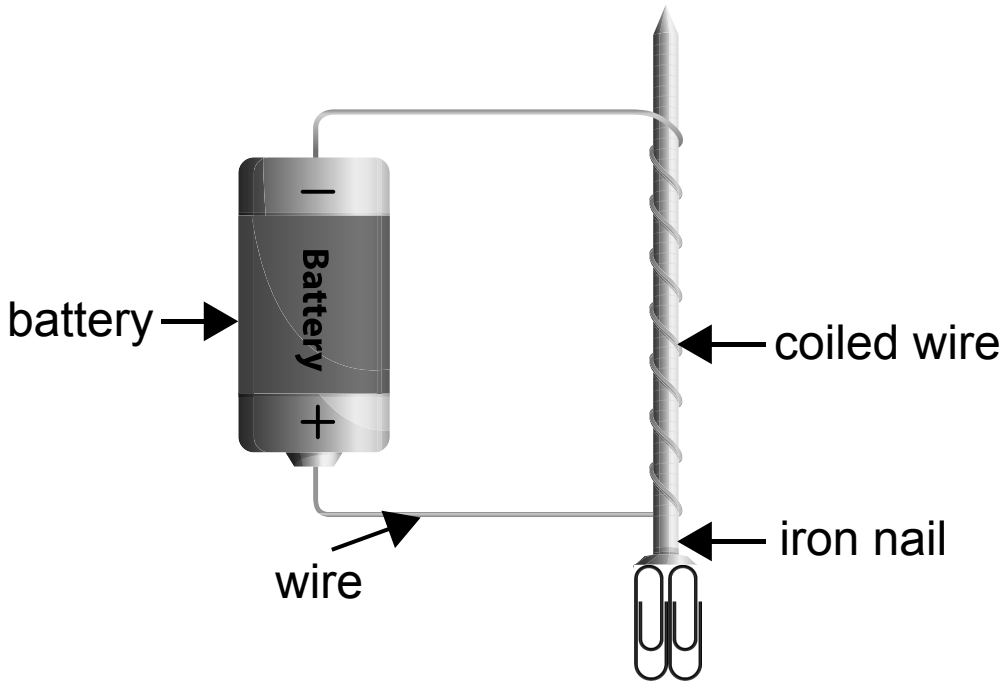
An electric motor pulls a load across a rough surface at a constant speed. The motor exerts a resultant force of 30 **N** and moves the load a distance of 1.5 **m** in a time interval of 5 seconds.

(b) Calculate the power developed by the motor. [3 marks]

You are advised to show your working out.

Power developed **=** _____ **W**

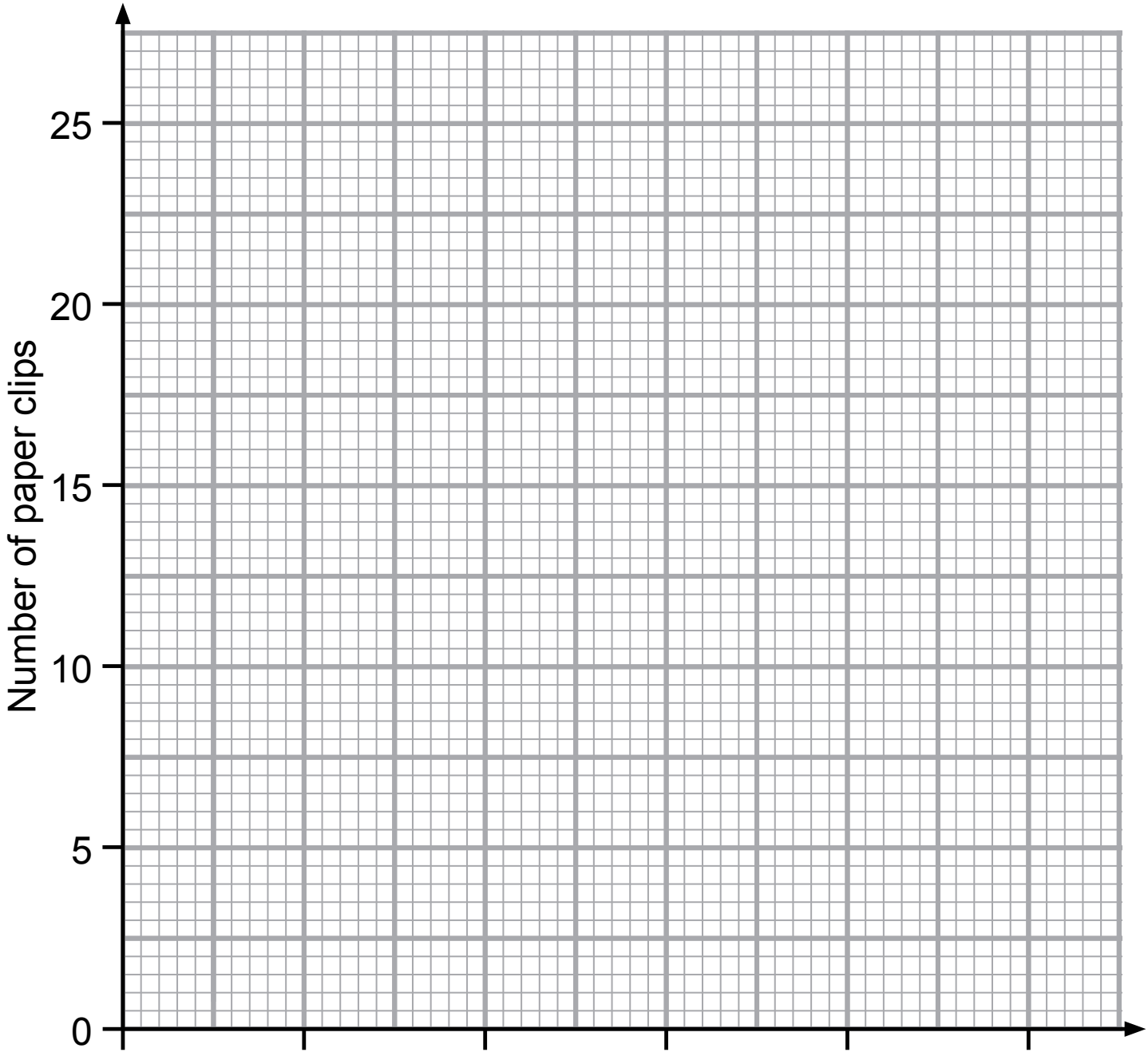
10 A large iron nail can be made into a magnet by wrapping a coil around it, as shown, and passing a current through the wire.



A student wanted to see how the number of paper clips the magnet was able to pick up depended on the size of the current passing through the wire. The current was changed to different values and the number of paper clips counted each time.

A table of results is shown below.

Current/mA	**Number of paper clips**
0	0
200	5
400	10
600	15
800	20
1000	25



You are asked to plot a graph of 'number of paper clips' against current.

(i) Choose a suitable scale for the horizontal axis, label it and include the correct unit. [3 marks]

(ii) Plot the points of 'number of paper clips' against current. [2 marks]

(iii) Draw the best-fit line. [1 mark]

(iv) Is it true to say that the number of paper clips that can be lifted is directly proportional to the current?
Circle your answer.

Yes No

Give **two** reasons for your answer. [2 marks]

1. _____

_____

2. _____

_____

(v) Use your graph to find the maximum number of paper clips that the magnet would lift when a current of 0.7 **A** is flowing.
(Hint: 1.0 **A =** 1000 **mA**) [4 marks]

You are advised to show your working out.

Number of paper clips **=** _____

THIS IS THE END OF THE QUESTION PAPER

SOURCES

Q2, Pg 4, Image of a light bulb, © imegastocker/iStock/Thinkstock.com

Q2, Pg 4, Image of kettle, © sereziny/iStock/Thinkstock.com

Q2, Pg 4, Image of microphone, © Ryan McVay/Photodisc/Thinkstock.com

Q2, Pg 4, Image of a battery, © Kuzmik_A/iStock/Thinkstock.com

Q5, Pg 8 , Image of a van, © Nerthuz/iStock/Thinkstock.com

Q10, Pg 18, Image of a battery and a screw, © Blueringmedia/iStock/Thinkstock.com; © b-d-s/iStock/Thinkstock.com

For Examiner's use only	
Question Number	**Marks**
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
Total Marks	

Examiner Number