Rewarding Learning

Centre Number

71

Candidate Number

General Certificate of Secondary Education
2013

# Double Award Science: Physics

Unit P2

Higher Tier

[GSD62]

MV18

THURSDAY 13 JUNE, MORNING

## TIME

1 hour 15 minutes, plus your additional time allowance.

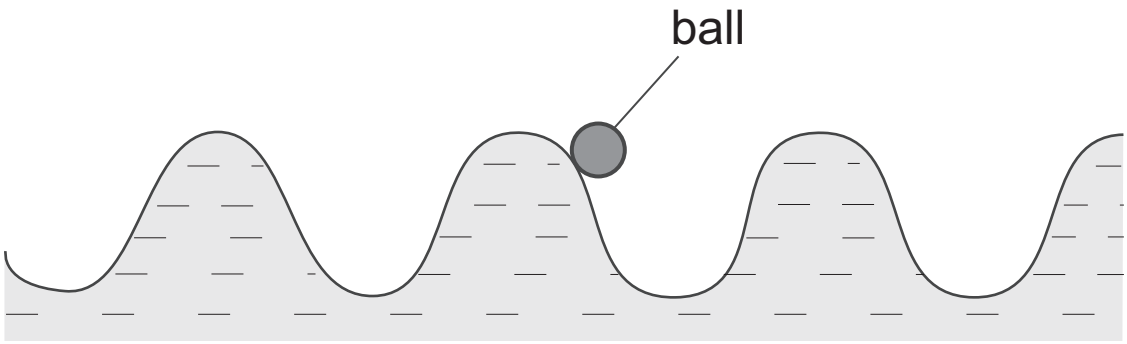
## INSTRUCTIONS TO CANDIDATES

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 eight** questions.

## INFORMATION FOR CANDIDATES

The total mark for this paper is 90.
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 **3(b)**.

**1** Water waves travel on the surface of a pond.




A ball sits on the water as the wave passes.

**(i)** Describe the motion of the ball as the wave passes.

Choose your answer by placing a tick (✓) in one of the boxes below. [1]

| | |
|---|---|
| The ball vibrates sideways about the same position. | ☐ |
| The ball vibrates up and down. | ☐ |
| The ball moves closer to the side of the pond. | ☐ |

Jamie observes that the ball oscillates 5 times during a 20 second time interval.

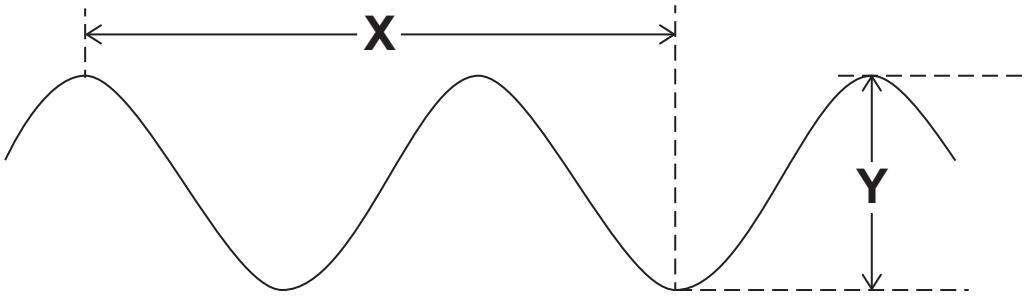
**(ii)** How many waves are produced each second? [1]

_____ waves each second

**(iii)** What is the frequency of the wave?
Remember to include the correct unit. [2]

Frequency = _____

**(iv)** Jamie is told that the amplitude of the wave is 5 cm and its wavelength is 12 cm. Part of the wave is shown below with two dimensions "X" and "Y" marked.




Record the distances "X" and "Y" below. [2]

Distance X = _____ cm

Distance Y = _____ cm

**(v)** Use your answer to part **(iii)** to calculate the speed of the water wave in cm/s. Remember the wavelength of the wave is 12 cm. [3]

**You are advised to show your working out.**

Speed = _____ cm/s

**(vi)** Water waves belong to a family of waves called transverse waves. Give two other examples of transverse waves. [2]

1. _____

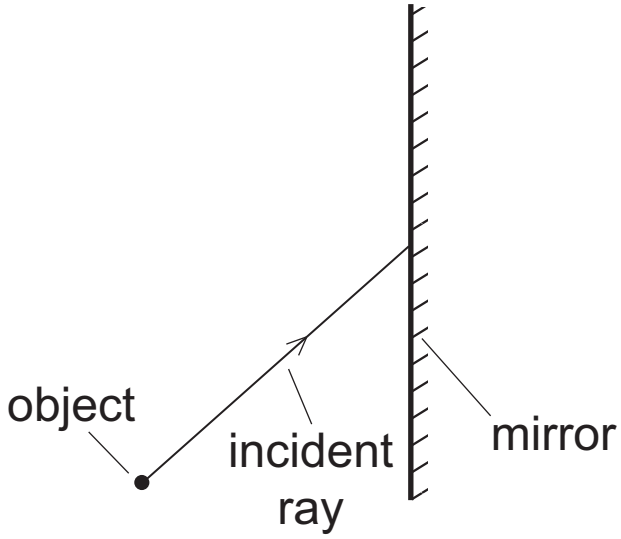
2. _____

**2** In a plane mirror the image of an object is as far behind the mirror as the object is in front.

**(a) (i)** Give **one** other property of the image in a plane mirror. [1]

_____

Claire draws a ray diagram to show how we see the image in a plane mirror. The diagram is incomplete.




**(ii)** Draw in the normal. Label it N. [1]

**(iii)** Draw the reflected ray and mark its direction. [1]

**(iv)** Draw on the diagram the position of the eye if the image is to be seen. [1]

The diagram below shows some members of the electromagnetic spectrum arranged in order of increasing wavelength.

increasing wavelength

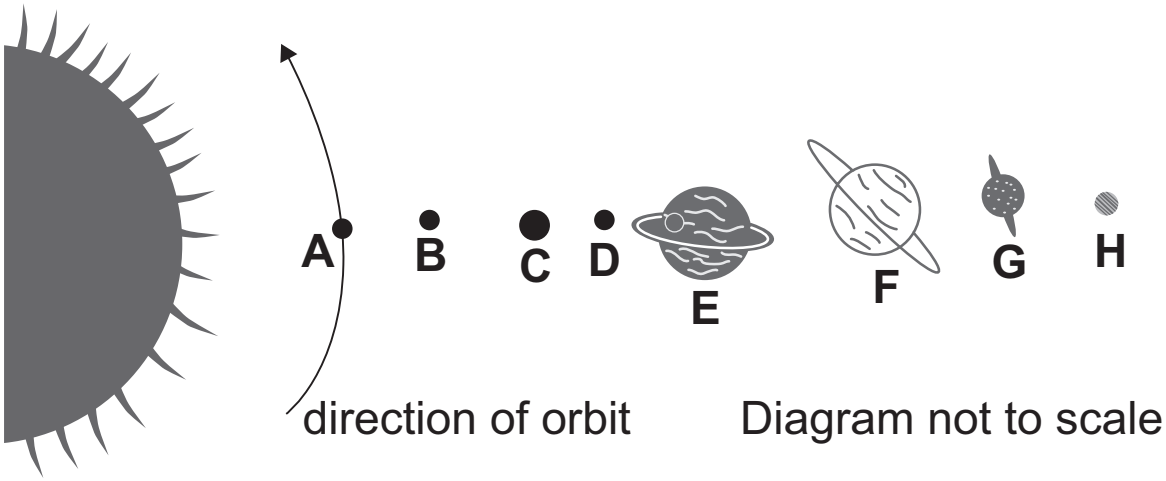
| | | | | | | |
|---|---|---|---|---|---|---|
| gamma rays | X-rays | | visible | infrared | | radio |

**(b) (i)** Label the two members which are missing. [2]

**(ii)** State a property which all electromagnetic waves have in common. [1]

_____

**3** The following diagram shows the planets in our Solar System.




**(a) (i)** Name planets C and D. [1]/[1]

Planet C _____

Planet D _____

**(ii)** Use a curved arrow to indicate the direction of orbit of planet E. [1]

**(iii)** State the name of one of the gas planets. [1]

_____

**(b)** Scientists believe that the Solar System was formed from a cloud of gas and dust.

Describe the different stages in the formation of the Solar System. [6]

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

**(c)** An artificial satellite orbits the Earth.

**(i)** Name the attractive force which keeps the satellite in orbit. [1]

_____

**(ii)** State two uses of artificial satellites. [2]

1. _____

2. _____

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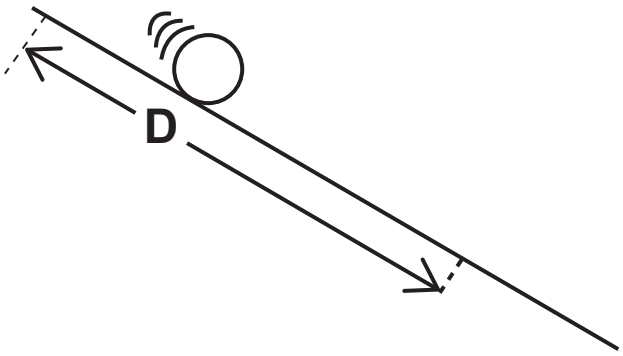
**(Questions continue overleaf)**

**4** A pupil timed a ball moving down a slope.




The time taken for the ball to travel a distance D was measured on three occasions and the average time T was recorded. This was then repeated for different distances.

| Distance D in m | 0.0 | 0.5 | 1.0 | 1.5 | 2.0 | 2.5 |
|---|---|---|---|---|---|---|
| Average time T in s | 0.0 | 1.4 | 2.0 | 2.5 | 2.8 | 3.2 |
| $T^2$ in $s^2$ | 0.0 | | | 6.3 | | |

The pupil is told that distance D is related to time T by the equation

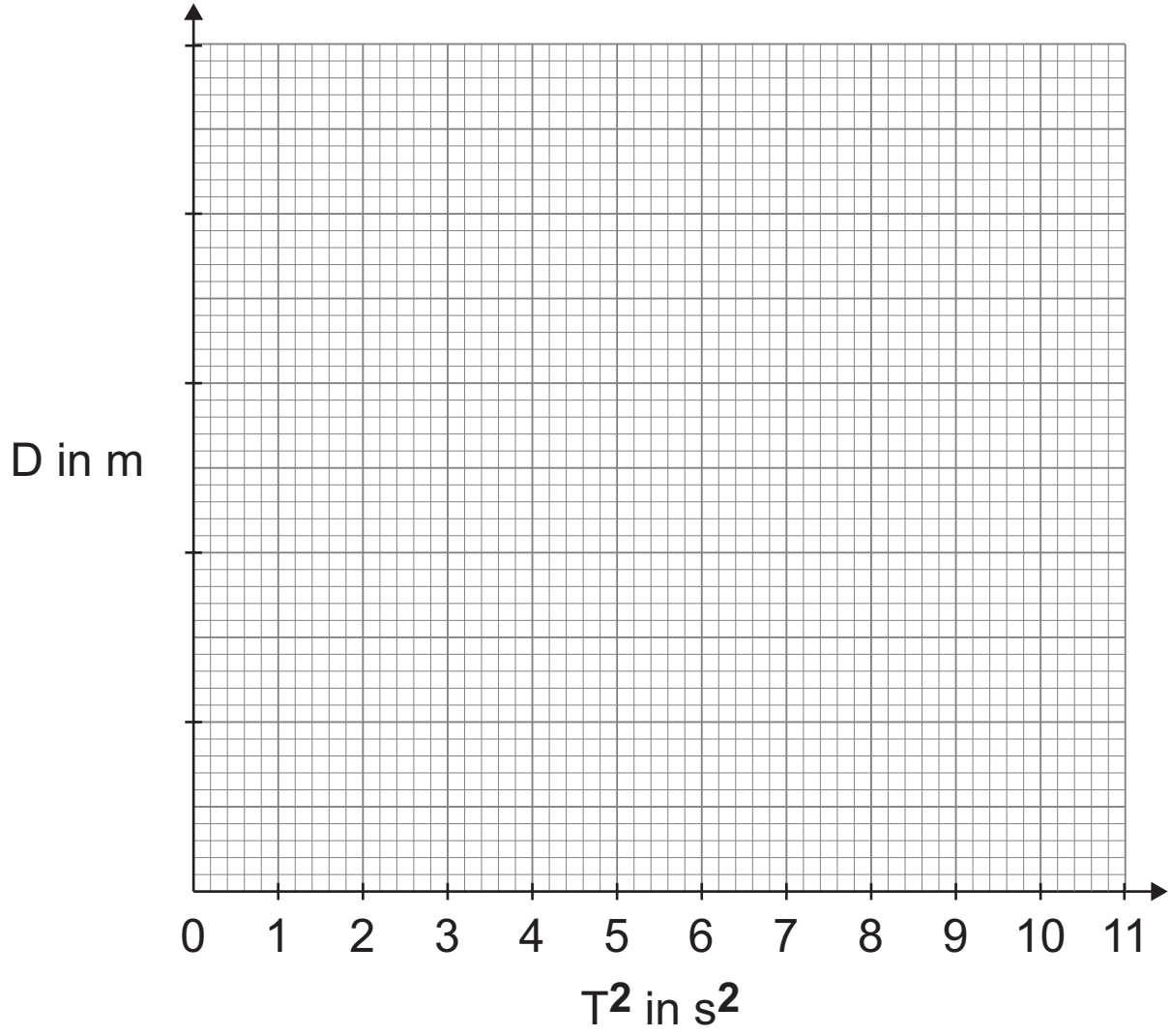
$$D = kT^2$$

where k is a constant.

**(i)** Complete the table by entering the missing values of $T^2$ to 1 decimal place. [2]

**(ii)** Choose a suitable scale and plot a graph of D on the vertical axis versus $T^2$ on the horizontal axis. [3]

**(iii)** Draw a straight line of best fit. [1]




**(iv)** Use your graph to determine the constant k.

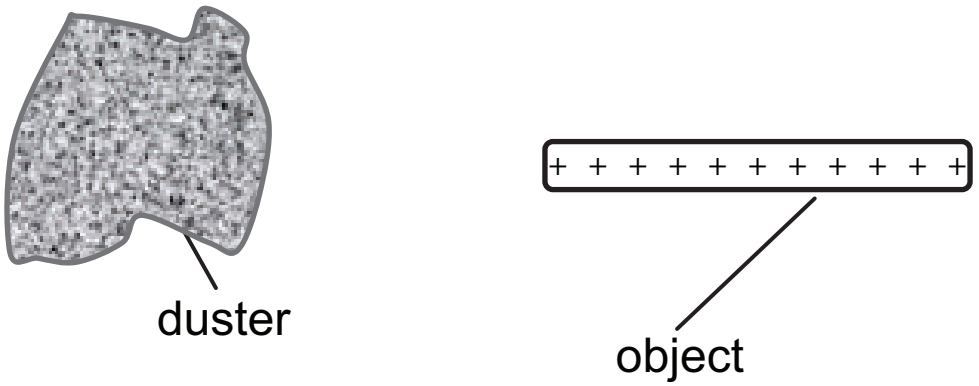
Remember to include the units for k. [4]

**You are advised to show your working out.**

k = _____

Units = _____

**5** **(a)** Julie wants to charge an object by rubbing it with a duster.




**(i)** Before she starts rubbing it, the object is uncharged. Explain why it is uncharged. [1]

_____

_____

The object becomes positively charged when Julie rubs it with a duster.

**(ii)** Complete the sentence below. [2]

The object becomes positively charged because

_____ have moved from the

_____.

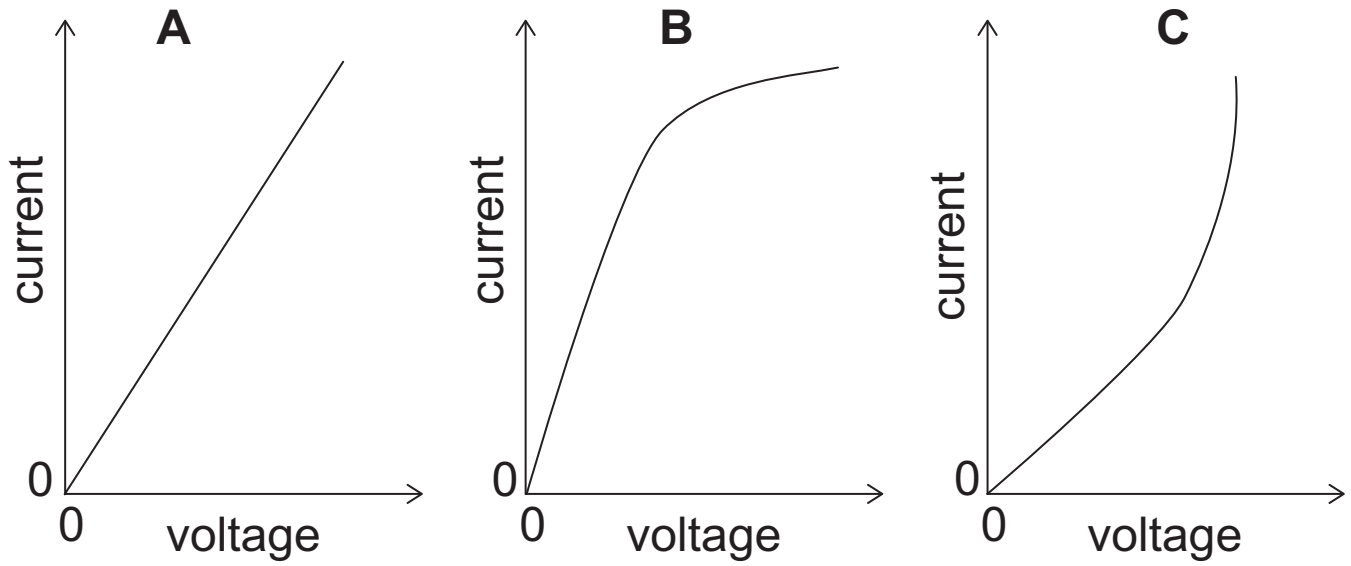
Julie wants to investigate how the current through a filament lamp depends on the voltage across the lamp.

**(b) (i)** In the space below draw the circuit diagram of the apparatus she would use. [5]

**(ii)** Describe how Julie would carry out the experiment. [3]

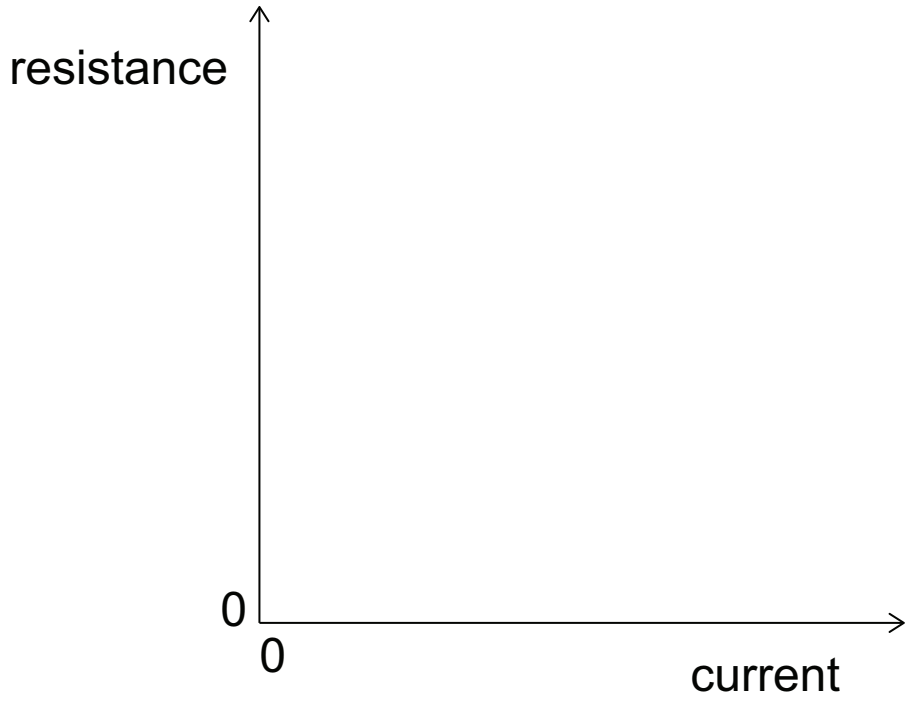
Julie plots a graph of current against voltage for the filament lamp.

**(iii)** Which of the following graphs will she obtain? [1]




Graph: _____

**(iv)** Julie plots a second graph of resistance against current. Sketch the shape of graph that you would expect her to obtain. [2]



**6** **(a)** **(i)** State Ohm's Law in words. [2]

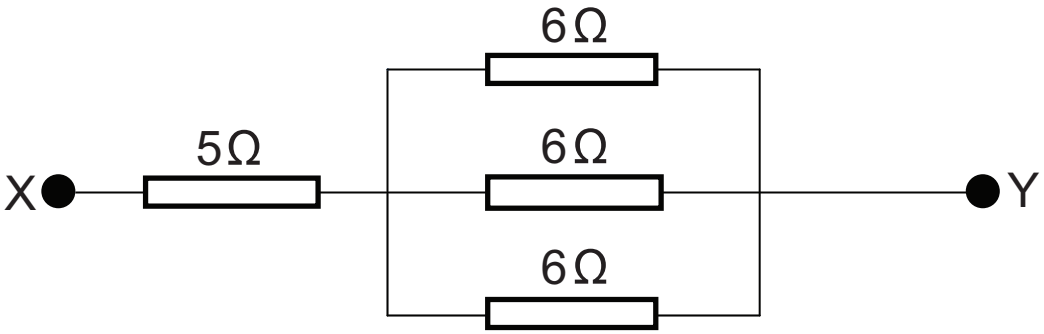
_____

_____

_____

**(ii)** Find the resistance between the points X and Y. [4]

**You are advised to show your working out.**




Resistance = _____ Ω

**(b)** An electric kettle has a power rating of 2800 W.

**(i)** What current flows through this kettle when it is plugged into the 250 V mains? [3]

**You are advised to show your working out.**

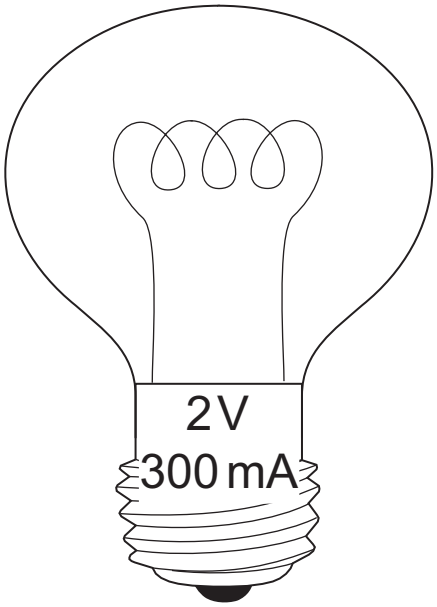
Current = _____ A

The following fuses are available: 1 A, 3 A, 5 A and 13 A.

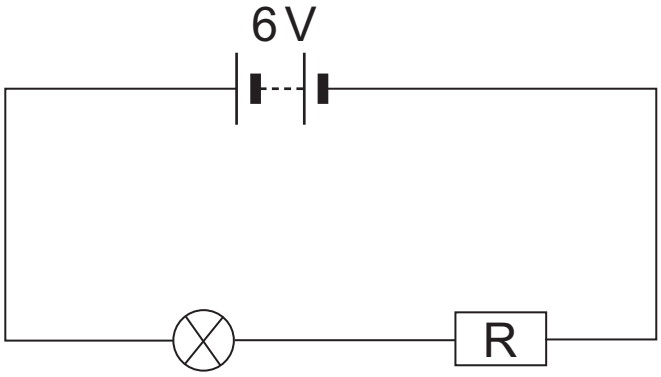
**(ii)** Which fuse should be used for this kettle? [1]

Fuse _____ A

**(c)** A lamp is rated as 2 V, 300 mA. This means that when a voltage of 2 V is applied then a current of 300 mA flows through the lamp and it glows with normal brightness.




This lamp is connected in the circuit below and it glows with normal brightness.

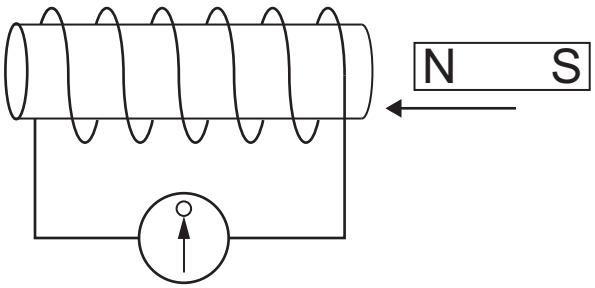


Calculate the resistance of the resistor R. [4]

**You are advised to show your working out.**

Resistance = _____ Ω

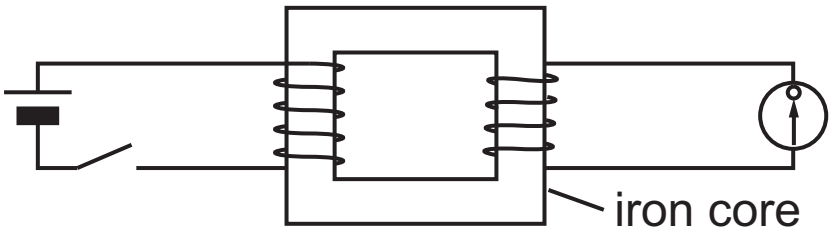
**7** The diagram below shows a wire coil, a sensitive centre-zero ammeter and a bar magnet.




**(a) (i)** Describe fully what is seen on the centre-zero ammeter when the magnet is moved into the coil, brought to rest and then pulled back out again. [3]

**(ii)** What name do we give to this process? [1]

The diagram below shows two coils wound on an iron core. A battery and switch are connected to one coil and a centre-zero ammeter is connected to the other coil.




**(b) (i)** The iron core is a conductor. Explain why the current does not flow from the left hand coil to the right hand coil. [1]

_____

**(ii)** Describe fully what, if anything, is observed on the ammeter when the switch is closed. [2]

_____

_____

_____

**(iii)** Describe fully what, if anything, is observed on the ammeter when the switch is opened. [2]

_____

_____

_____

**(c)** Two types of transformer are used in the transmission of electrical power. Describe and explain the role of the transformer at the generating end of an electricity transmission system. [3]

A transformer steps the voltage up from 25 kV to 132 kV. The primary coil has 2000 turns.

**(d)** Calculate the number of turns in the secondary coil. [3]

**You are advised to show your working out.**

Number of turns = _____

**8** The Earth's crust consists of different layers. The first layer is called the crust and the second is called the mantle.

**(a)** What does the word "lithosphere" apply to? [2]

**(b)** Describe how a volcano is caused. [4]

**THIS IS THE END OF THE QUESTION PAPER**

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