

Paper Reference(s) 4PH1/2P

Pearson Edexcel International GCSE (9–1)

Physics

Unit: 4PH1

Paper 2P

Total Marks

Thursday 16 January 2020 – Afternoon

Time: 1 hour 15 minutes plus your additional time allowance

INSTRUCTIONS TO CANDIDATES

Write your centre number, candidate number, surname and other names in the boxes below. Check that you have the correct question paper.

Centre No.					
Candidate No.					
Surname					
Other names					
Paper Reference	4	P	H	1	/ 2 P



- Use **BLACK** ink or ball-point pen.
- Answer **ALL** questions.
- Answer the questions in the spaces provided – there may be more space than you need.
- Show all the steps in any calculations and state the units.
- Some questions must be answered with a cross in a box ☐. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☐.

MATERIALS REQUIRED FOR EXAMINATION

Calculator, ruler

ITEMS INCLUDED WITH QUESTION PAPERS

Formulae booklet

Separate sheet for use with questions 5(b)(iii) and (iv)

INFORMATION FOR CANDIDATES

- The total mark for this paper is 70.
- The marks for **EACH** question are shown in brackets – use this as a guide as to how much time to spend on each question.

ADVICE TO CANDIDATES

- Read each question carefully before you start to answer it.
- Write your answers neatly and in good English.
- Try to answer every question.
- Check your answers if you have time at the end.

(Turn over)

Answer ALL questions.

1 This question is about energy resources.

(a) The table lists some methods of generating electricity using energy resources.

**Place ticks (✓) in the table to show if each method uses a renewable energy resource.
One has been done for you. (3 marks)**

METHOD OF GENERATING ELECTRICITY	USES A RENEWABLE ENERGY RESOURCE
coal power station	
diesel generator	
geothermal power station	
hydroelectric power station	
natural gas turbine	
nuclear power station	
solar cell	✓
wind turbine	

(Question continues on next page)

(Turn over)

(b) Solar cells can be used to generate electricity.

(i) How is energy transferred from the Sun to a solar cell? (1 mark)

- ☐ **A by heating**
- ☐ **B by radiation**
- ☐ **C electrically**
- ☐ **D mechanically**

(ii) State ONE disadvantage of using solar cells to generate electricity. (1 mark)

(TOTAL FOR QUESTION 1 = 5 MARKS)

(Questions continue on next page)

(Turn over)

2 The photograph shows a brass mass.



(a) State the formula linking density, mass and volume. (1 mark)

(Question continues on next page)

(Turn over)

(b) The brass mass has a mass of 454 g.

The density of brass is 8.46 g/cm^3 .

Calculate the volume of the brass mass.

Give the unit. (3 marks)

volume = _____ unit _____

(TOTAL FOR QUESTION 2 = 4 MARKS)

(Questions continue on next page)

3 Curling is a sport played on ice.

A player slides stone A across the ice towards a scoring zone.

The ice reduces friction so that there is negligible friction when the stone is sliding.



- (a) Stone A leaves the player's hand with a velocity of 2.90 m/s .**

The mass of stone A is 17 kg .

- (i) State the formula linking momentum, mass and velocity. (1 mark)**

(Question continues on next page)

(Turn over)

- (ii) Show that the momentum of stone A is approximately 50 kg m/s . (2 marks)

- (b) Stone A slides towards the scoring zone.

In the scoring zone, stone A collides with a stationary stone, B.



(Question continues on next page)

(Turn over)

- (i) After the collision, both stones move in the same direction as the initial direction of stone A.

The velocity of stone A after the collision is 0.40 m/s .

Calculate the velocity of stone B after the collision. (4 marks)

[mass of stone B = 19 kg]

velocity of stone B = _____ m/s

(Question continues on next page)

(Turn over)

- (ii) When the stones collided, they were in contact for a time of 25 ms.

Calculate the magnitude of the force stone A exerted on stone B in this collision. (3 marks)

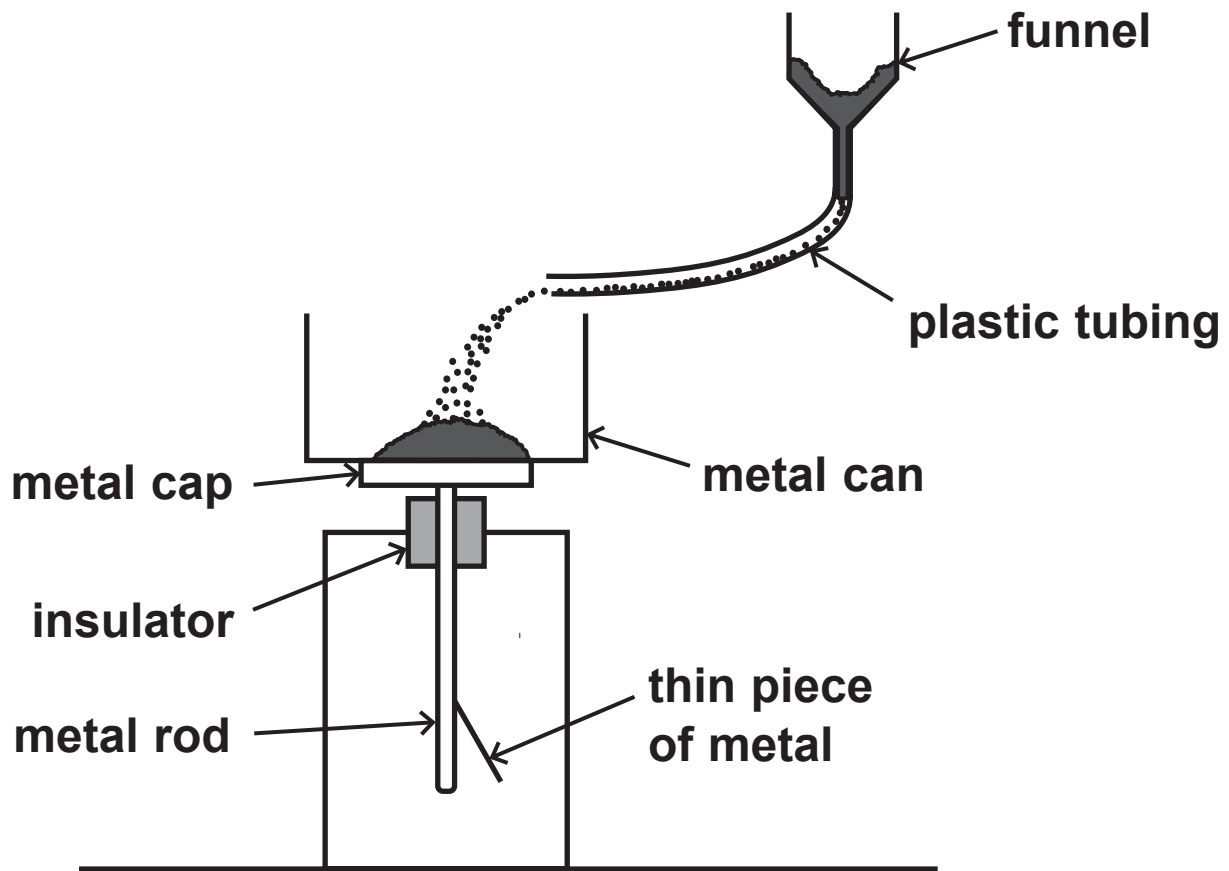
force = _____ N

(TOTAL FOR QUESTION 3 = 10 MARKS)

(Questions continue on next page)

(Turn over)

- 4 A student uses this apparatus to demonstrate the effect of electric charge.



He pours some fine powder into a funnel.

The fine powder moves through a length of plastic tubing and falls into a metal can.

The metal can rests on a metal cap.

The metal cap is connected to a thin piece of metal via a metal rod.

When the powder lands in the can, the thin piece of metal moves away from the metal rod.

(Question continues on next page)

(Turn over)

(a) Explain why the thin piece of metal moves away from the metal rod. (4 marks)

This image shows a blank sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

(Question continues on next page)

(Turn over)

(b) A coulombmeter measures electric charge.

The student connects a coulombmeter to the metal can.

When all the powder has landed in the can, the coulombmeter shows a reading of -9.4×10^{-9} C.

**(i) Which statement is true for the metal can?
(1 mark)**

- ☐ **A it gains negatively charged electrons**
- ☐ **B it loses negatively charged electrons**
- ☐ **C it gains positively charged electrons**
- ☐ **D it loses positively charged electrons**

(ii) State the formula linking charge, current and time. (1 mark)

(Question continues on next page)

(Turn over)

- (iii) It takes a time of 12 s from when the powder starts landing in the metal can until all the powder has landed in the can.

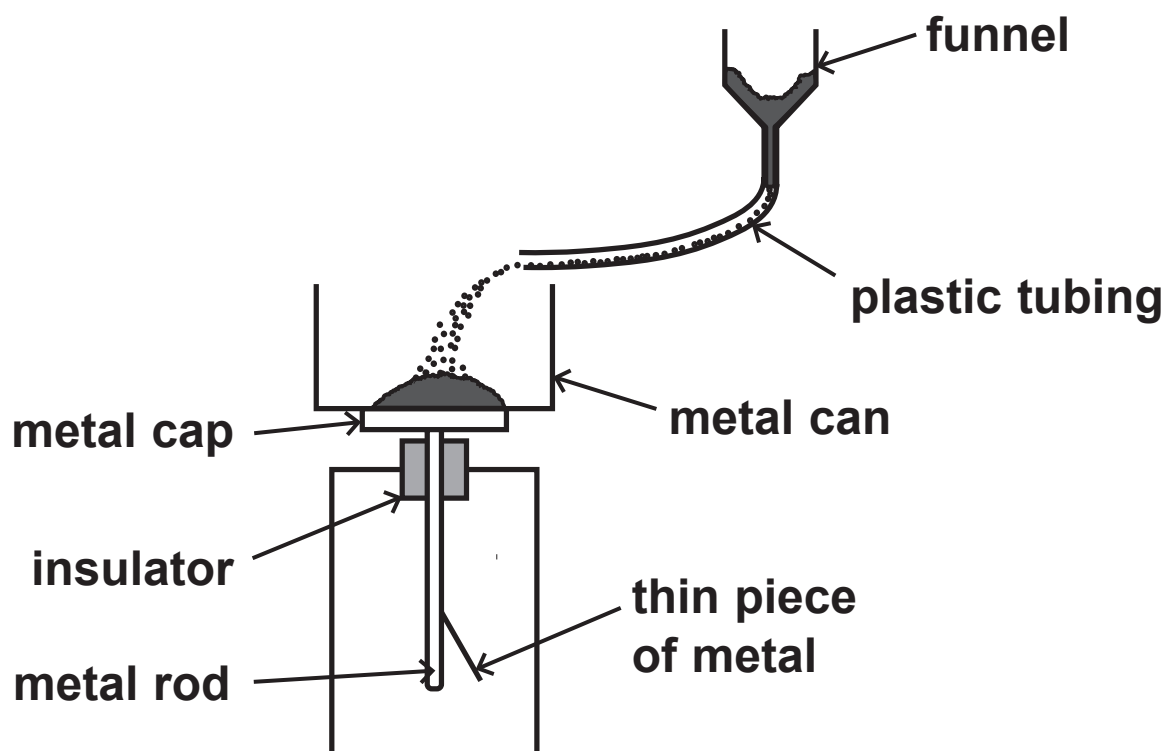
Calculate the mean charging current.
(3 marks)

current = _____ A

(Question continues on next page)

- (c) The student suggests that this demonstration is similar to refuelling an aircraft.

The powder represents the fuel and the metal can represents the fuel tank in the aircraft.



Explain how the student should modify this apparatus to demonstrate how to minimise the dangers when refuelling an aircraft.

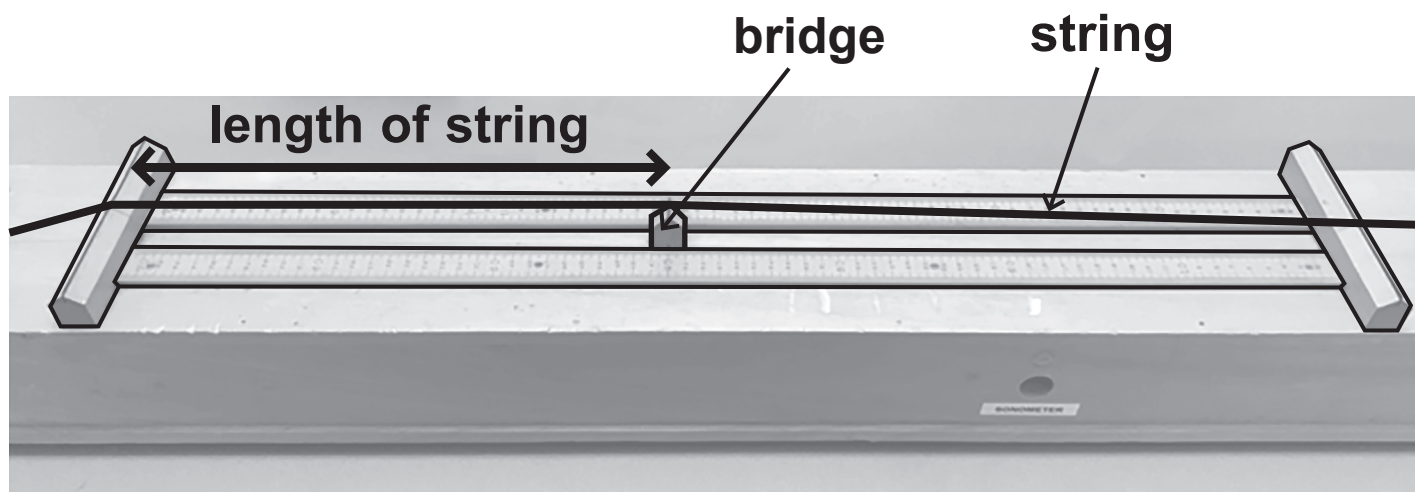
You may add to the diagram to help your answer.
(3 marks)

(Continue your answer on next page)

(Turn over)

- 5 A sonometer is a piece of equipment used to investigate the frequency of waves on a string.

The photograph shows a sonometer.



The string is under tension. When the string is plucked it vibrates to produce a sound wave.

- (a) Describe how an oscilloscope should be used to measure the frequency of the sound wave from the sonometer. (4 marks)

(Continue your answer on next page)

(Turn over)

(Turn over)

- (b) A student investigates how the frequency of sound from the sonometer varies with the length of the string.**

This is the student's method.

- **apply a constant tension force to the string**
- **pluck the string and measure the frequency of the sound wave produced**
- **move the bridge to change the length of the string**
- **pluck the string and measure the new frequency of the sound wave produced**

Repeat the method for different lengths of string.

- (i) Give a control variable for the student's investigation. (1 mark)**

(Question continues on next page)

(ii) The table shows the student's results.

String length in cm	Frequency in Hz			
	Test 1	Test 2	Test 3	Mean
20	105	104	108	106
40	53	54	52	53
60	36	32	35	
80	25	28	26	26
100	22	20	21	21
120	20	17	18	18
140	15	15	14	15

Calculate the mean frequency for a string length of 60 cm. (2 marks)

mean frequency = _____ Hz

(iii) Plot a graph of the mean frequency and string length data on the grid on the separate sheet provided. (3 marks)

(Question continues on next page)

(Turn over)

- (iv) Draw the curve of best fit on the separate sheet provided. (1 mark)
- (v) Determine the string length needed to produce a sound wave of frequency 75Hz. (1 mark)

string length = _____ cm

- (vi) The student cannot hear the sound from the sonometer for some of the string lengths tested.

Explain which of the string lengths produce sounds that humans cannot hear. (2 marks)

(TOTAL FOR QUESTION 5 = 14 MARKS)

(Questions continue on next page)

(Turn over)

6 This question is about stars.

(a) Astronomers measure the absolute magnitude of stars.

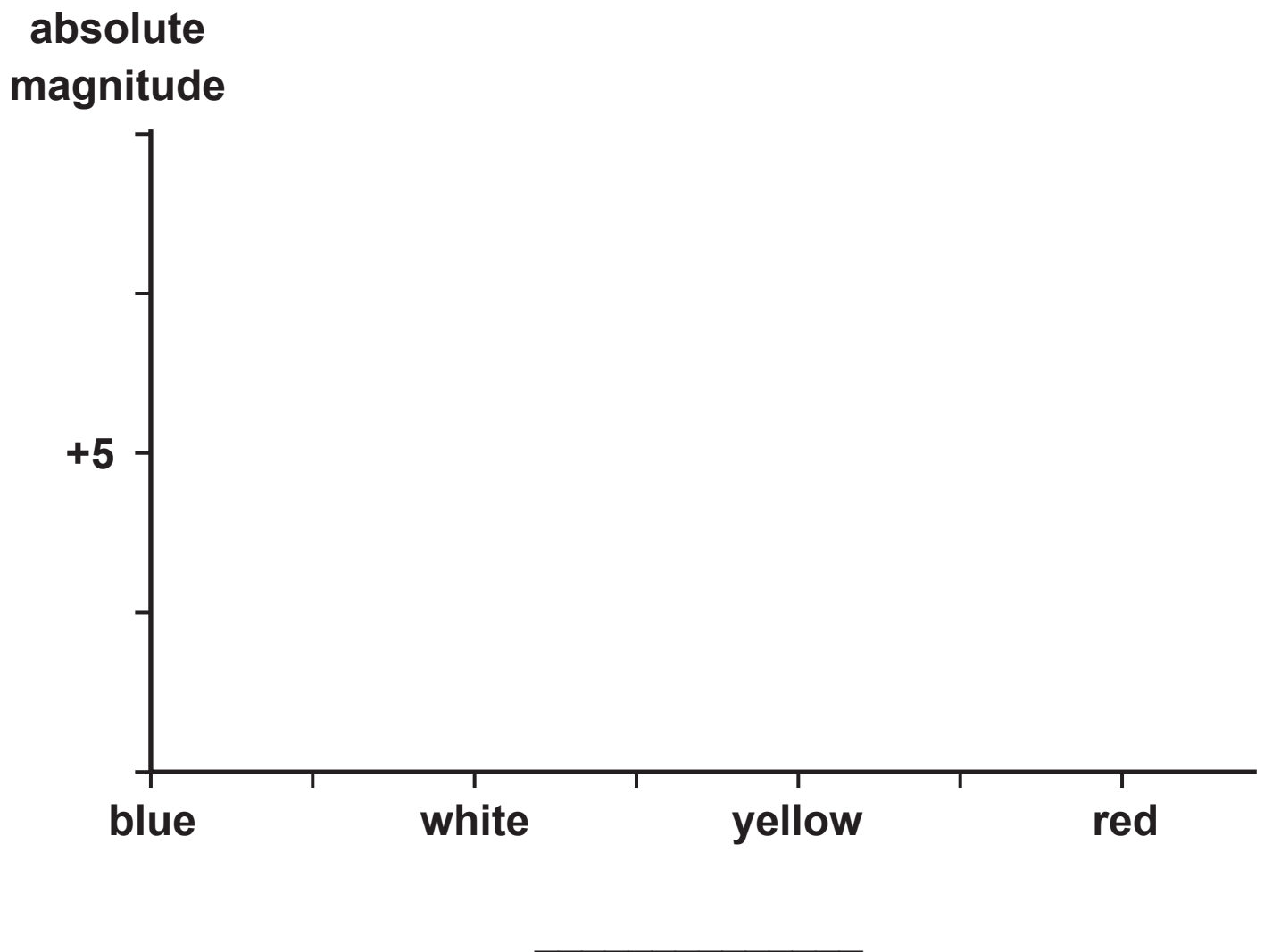
**State what is meant by the term
ABSOLUTE MAGNITUDE. (2 marks)**

(Question continues on next page)

(b) The evolution of stars can be shown on a Hertzsprung-Russell diagram (HR diagram).

Complete the HR diagram by

- labelling the x-axis
- completing the absolute magnitude scale
- drawing the main sequence, red giant and white dwarf regions (5 marks)



(TOTAL FOR QUESTION 6 = 7 MARKS)

(Questions continue on next page)

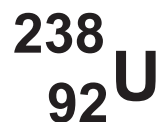
(Turn over)

- 7 The photograph shows a glass plate made from uranium glass.



Uranium oxide is used to give the glass a green colour.

- (a) Uranium-238 is the most common isotope of uranium and can be represented using this symbol.



(Question continues on next page)

- (i) State what information the numbers 92 and 238 give about the nucleus of this isotope of uranium. (2 marks)

92 _____

238 _____

- (ii) Uranium-238 decays by alpha emission.

Describe how the nucleus of a uranium-238 atom changes as a result of alpha emission. (2 marks)

- (b) The table gives some information about the uranium glass plate.

mass of plate	1.1 kg
percentage (%) of plate made of uranium-238 (by mass)	4.5%
mass of uranium-238 atom	4.0×10^{-27} kg

- (i) Calculate the number of uranium-238 atoms in the plate. (2 marks)

number of atoms = _____

(Question continues on next page)

(Turn over)

- (ii) Uranium-238 is an alpha emitter and has a half-life of 4.5 billion years.

Explain why it is safe to eat food from the uranium glass plate. (3 marks)

(TOTAL FOR QUESTION 7 = 9 MARKS)

(Questions continue on next page)

8 This question is about magnetic fields.

- (a) Diagram 1 shows a positively charged proton moving downwards in a uniform magnetic field.

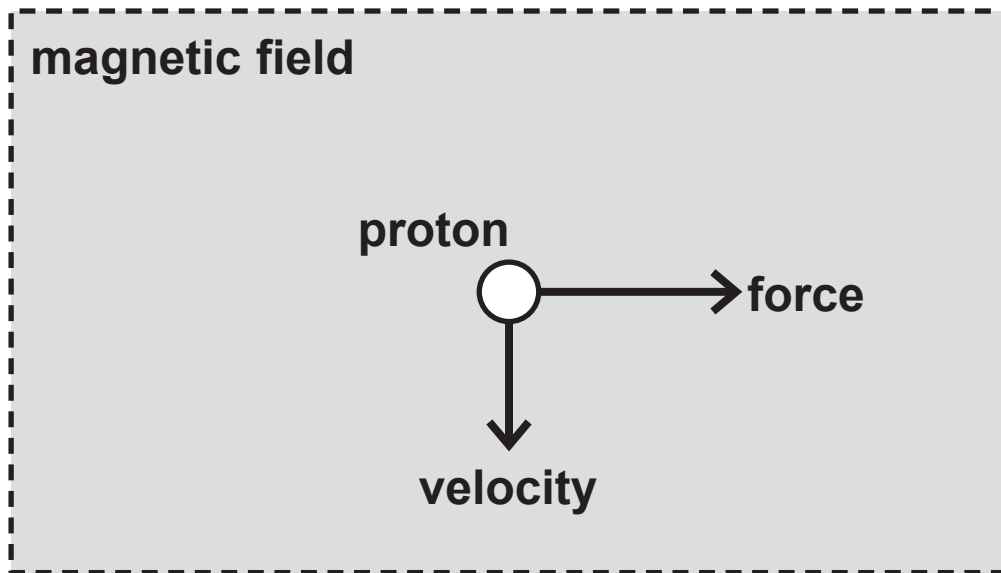


Diagram 1

The proton experiences a force to the right.

What is the direction of the magnetic field?
(1 mark)

- ☐ A into the page
- ☐ B left
- ☐ C out of the page
- ☐ D upward

(Question continues on next page)

(Turn over)

- (b) When a current passes through a flat circular coil, a magnetic field is produced.

Complete diagram 2 by drawing the magnetic field of the flat circular coil. (3 marks)

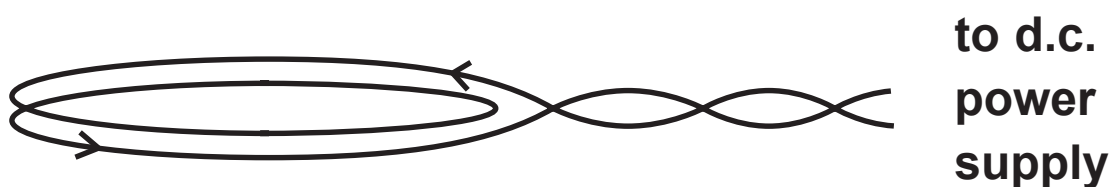
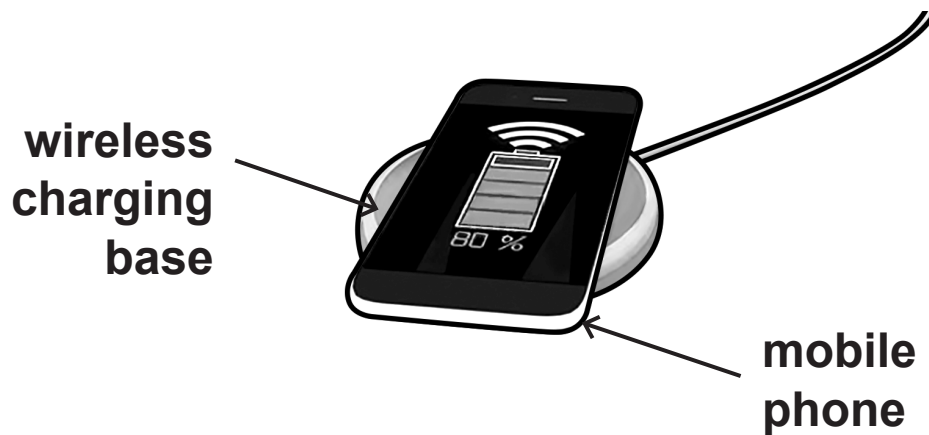


Diagram 2

(Question continues on next page)

(Turn over)

- (c) A wireless charging base uses a magnetic field to charge the battery of a mobile phone.



There is an alternating current in a coil of wire in the charging base.

There is another coil of wire connected to the battery in the mobile phone.

(Question continues on next page)

- (i) Explain how the wireless charging base charges the battery of the mobile phone.
(3 marks)

(Question continues on next page)

- (ii) Discuss the advantages and disadvantages of using a high current in the wireless charging base. (2 marks)

(TOTAL FOR QUESTION 8 = 9 MARKS)

TOTAL FOR PAPER = 70 MARKS
END