

Paper Reference(s) 1PH0/2H
Pearson Edexcel Level 1/Level 2 GCSE (9–1)

Physics
PAPER 2
Higher Tier

Total Marks

Time: 1 hour 45 minutes

In the boxes below, write your name, centre number and candidate number.

Surname					
Other names					
Centre Number					
Candidate Number					

YOU MUST HAVE

Calculator, ruler, Equation Booklet

YOU WILL BE GIVEN

Diagram Booklet, Additional Equations Insert

INSTRUCTIONS

Answer ALL questions.

Answer the questions in the spaces provided in this Question Paper or in the separate Diagram Booklet – there may be more space than you need.

Calculators may be used.

Any diagrams may NOT be accurately drawn, unless otherwise indicated.

You must show all your working out with your answer clearly identified at the end of your solution.

INFORMATION

The total mark for this paper is 100.

The marks for EACH question are shown in brackets – use this as a guide as to how much time to spend on each question.

In questions marked with an ASTERISK (*), marks will be awarded for your ability to structure your answer logically, showing how the points that you make are related or follow on from each other where appropriate.

A list of equations is included as a separate insert.

There may be spare copies of some diagrams.

ADVICE

Read each question carefully before you start to answer it.

Try to answer every question.

Check your answers if you have time at the end.

Answer ALL questions. Write your answers in the spaces provided.

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 ☐.

1 This question is about static electricity.

**(a) Look at Figure 1 for Question 1(a) in the Diagram Booklet. Draw on Figure 1 the shape and direction of the electric field due to the positive point charge.
(2 marks)**

(b) A student rubs a plastic ruler against a woolly jumper.

The student tests the ruler and finds it has a positive charge.

**Explain how the ruler becomes positively charged.
(2 marks)**

(continued on the next page)

Turn over

1 continued.

- (c) An insecticide sprayer charges droplets of insecticide.**

Look at Figure 2 for Question 1(c) in the Diagram Booklet. It shows the sprayer being used to spray a leaf.

The leaf is connected to the ground (earthed).

Explain how charging the droplets helps to make sure that the leaf gets covered with insecticide.

**You may add to Figure 2, including the sign (+ or –) of any charges, to help your answer.
(3 marks)**

(continued on the next page)

Turn over

1 continued.

(Total for Question 1 = 7 marks)

- 2 (a) Look at Figure 3 for Question 2(a) in the Diagram Booklet. It shows a lamp connected to a d.c. power supply.

The power supply provides a potential difference (voltage) of 4.5 V.

The current in the lamp is 0.30 A.

- (i) Calculate the resistance of the lamp.
(1 mark)

Use the equation

$$R = \frac{V}{I}$$

resistance = _____ Ω

(continued on the next page)

2 continued.

- (ii) Calculate the power supplied to the lamp.
(2 marks)**

power = _____ W

(continued on the next page)

2 continued.

- (b) Look at Figure 4 for Question 2(b) in the Diagram Booklet. Another IDENTICAL lamp is added to the circuit, as shown in Figure 4.**

The power supply provides the same potential difference as it provided in the circuit in Figure 3.

State and explain the difference between the brightness of the lamp in Figure 3 and the brightness of a lamp in Figure 4.

(3 marks)

(continued on the next page)

Turn over

2 continued.

- (c) A student is given a low voltage power supply and 1 m of resistance wire.**

The student uses these and other pieces of equipment to measure the resistance of just 50 cm of the resistance wire.

On page 12 draw a diagram of the circuit that the student should use.

Your circuit diagram should identify the pieces of equipment that the student uses.

(3 marks)

(continued on the next page)

2 continued.

(Total for Question 2 = 9 marks)

- 3 (a) When water boils and turns into steam, there are changes in the arrangement of particles and the density.

Which of these shows the changes?
(1 mark)

	space between particles in steam	density of steam
<input type="checkbox"/> A	bigger than in water	greater than water
<input type="checkbox"/> B	bigger than in water	less than water
<input type="checkbox"/> C	smaller than in water	greater than water
<input type="checkbox"/> D	smaller than in water	less than water

(continued on the next page)

3 continued.

(b) Look at Figure 5 for Question 3(b) in the Diagram Booklet. It shows some water in a measuring cylinder and a lump of iron.

The lump of iron is lowered fully into the water.

The water level in the measuring cylinder rises to 530 cm³.

The density of iron is 7.9 g/cm³.

Calculate the mass of the lump of iron.

Use the equation

$$\text{density} = \frac{\text{mass}}{\text{volume}}$$

**Give your answer to 2 significant figures.
(4 marks)**

3 continued.

mass = _____ g

(continued on the next page)

3 continued.

- (c) A piece of wood has a similar shape and volume to the lump of iron.**

The density of the wood is 0.82 g/cm^3 .

The density of water is 1.00 g/cm^3

**Explain why the method used in part (b) cannot be used to determine the mass of the piece of wood.
(2 marks)**

(continued on the next page)

3 continued.

- (d) Describe what happens when a substance experiences sublimation.
(2 marks)**

(Total for Question 3 = 9 marks)

- 4 (a) A donkey has a weight of 2500 N.

The area of each hoof is 0.022 m^2 .

- (i) Calculate the average pressure that the donkey exerts on the ground.
(2 marks)

Use the equation

$$\text{pressure} = \frac{\text{force}}{\text{area}}$$

average pressure = _____ Pa

(continued on the next page)

4 continued.

- (ii) Look at Figure 7 for Question 4(a)(ii) in the Diagram Booklet. It shows how the shape of a camel's hoof is different from the shape of a donkey's hoof.**

The camel and the donkey have the same mass.

Explain how a camel's hoof is a more suitable shape than a donkey's hoof for walking on soft ground.

(2 marks)

(continued on the next page)

4 continued.

- (b) A student carries out an investigation to show how pressure varies with depth in water.**

A pressure sensor is attached to a rule.

Look at Figure 8 for Question 4(b) in the Diagram Booklet. The rule and pressure sensor are lowered into the water in a tank, as shown in Figure 8.

The depth of the pressure sensor below the surface of the water is read from the scale on the rule.

The pressure is displayed on the student's mobile phone which receives a signal from the pressure sensor.

Figure 9 gives some of the readings.

FIGURE 9

depth in m	pressure in kPa
0.050	99.15
0.100	99.70
0.150	100.15
0.200	100.70
0.250	101.15
0.300	101.70

4 continued.

Look at Figure 10 for Question 4(b) in the Diagram Booklet. It shows a graph with some of the results plotted, but two of the points are missing.

**(i) Plot the two missing points on the graph.
(2 marks)**

**(ii) Draw a line of best fit through the points on the graph.
(1 mark)**

**(iii) Which of the following equations represents the variation of pressure with depth of water below the surface?
(1 mark)**

☐ **A** $y = ax^2 + b$

☐ **B** $y = mx$

☐ **C** $Y = mc - x$

☐ **D** $y = mx + c$

(continued on the next page)

4 continued.

- (iv) Use the graph in Figure 10 to predict the pressure at the surface of the water.
(1 mark)**

pressure at the surface of the water =

_____ kPa

(continued on the next page)

4 continued.

- (c) The student repeats the investigation in part (b) using seawater and draws a graph of the results.**

The seawater is more dense than the water used in part (b).

**Compare the graph for seawater with the graph in Figure 10.
(2 marks)**

(Total for Question 4 = 11 marks)

- 5 (a) Look at Figure 11 for Question 5(a) in the Diagram Booklet. It shows the shape of the magnetic field near a bar magnet.**
- (i) Draw arrows on the field lines in Figure 11 to show the direction of the magnetic field.
(1 mark)**
- (ii) Place a letter X on Figure 11 at a place where the magnetic field is strongest.
(1 mark)**
- (iii) Describe TWO differences between the magnetic field shown in Figure 11 and a uniform magnetic field.
(2 marks)**

(continued on the next page)

Turn over

5 continued.

- (b) State how a uniform magnetic field may be obtained in a school laboratory.
(1 mark)**

(continued on the next page)

5 continued.

(c) Look at Figure 12 for Question 5(c) in the Diagram Booklet. It shows the directions of some plotting compass needles placed at different points near the Earth's surface.

**(i) Sketch, on Figure 12, the Earth's magnetic field outside and inside the Earth.
(2 marks)**

**(ii) State which part of the Earth generates its magnetic field.
(1 mark)**

(continued on the next page)

5 continued.

- (d) A wire is placed at right angles to the Earth's magnetic field.

The wire is 0.600 m long and carries a current of 93.1 mA.

The force on the wire is 1.11×10^{-5} N.

Calculate the magnetic flux density of the Earth's magnetic field.

(2 marks)

Use the equation

$$F = B \times I \times l$$

magnetic flux density = _____ T

(Total for Question 5 = 10 marks)

Turn over

6 (a) Which of these is a vector quantity?
(1 mark)

☐ **A acceleration**

☐ **B speed**

☐ **C time**

☐ **D distance**

(continued on the next page)

6 continued.

- (b) Look at Figure 13 for Question 6(b) in the Diagram Booklet. It shows a toy that a student makes for a nursery school.**

The rod hangs by a string from the ceiling.

- (i) The moment of C about point P is 0.60 N m.**

**Calculate the weight of C.
(2 marks)**

Use the equation

$$\text{moment} = F \times d$$

weight of C _____ N

(continued on the next page)

6 continued.

- (ii) Show that the total moment of S and R about P is 0.70 Nm .
(2 marks)**

(continued on the next page)

6 continued.

- (iii) Using the data in the question and the principle of moments, determine if the toy shown in Figure 13 is in equilibrium.**

**The rod is very light so its weight can be ignored.
(3 marks)**

(continued on the next page)

Turn over

6 continued.

- (c) Look at Figures 14a and 14b for Question 6(c) in the Diagram Booklet. Figure 14a shows a rack and pinion system, used on a mountain railway.**

Figure 14b shows a close up of the rack and pinion.

The teeth on the rack are 8.0 cm apart.

Calculate how far along the rack the train moves when the pinion turns through one complete revolution.

(2 marks)

distance = _____ m

(Total for Question 6 = 10 marks)

- 7 (a) Look at Figure 15 for Question 7(a) in the Diagram Booklet. It shows a 'Mars rover' descending to the surface of the planet Mars.
- (i) Calculate the change in gravitational potential energy of the rover as it descends from position P to position Q.

Mass of rover = 1100 kg

Gravitational field strength on Mars = 3.7 N/kg

Give your answer to 2 significant figures.
(3 marks)

change in
gravitational potential energy = _____ J

(continued on the next page)

7 continued.

- (ii) Use data from Figure 15 to calculate the change in kinetic energy of the rover as it descends from position P to position Q.
(2 marks)**

change in kinetic energy = _____ J

(continued on the next page)

7 continued.

- (iii) The rover is slowed down safely using thrusters and a parachute (not shown in Figure 15).**

The thrusters use jets of gas to control movements and the parachute is designed to be used in the atmosphere of Mars.

Describe the energy changes involved in terms of the work done by various forces as the rover descends.

(3 marks)

(continued on the next page)

Turn over

7 continued.

(b) The rover uses solar panels for its power needs.

The solar panels can provide 1200 W of power.

- (i) Show that the solar panels can provide
2·16 MJ of energy in 30 minutes.
(1 mark)**

(continued on the next page)

7 continued.

- (ii) The solar panels convert 27% of the energy they receive from the Sun into electricity.**

**Calculate the solar energy received by the panels that provides the 2·16 MJ of energy.
(2 marks)**

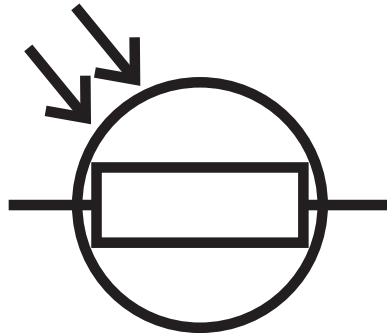
energy received = _____ J

(Total for Question 7 = 11 marks)

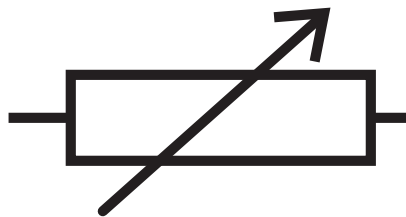
- 8 (a) Which of these shows the correct circuit symbol for a thermistor?
(1 mark)



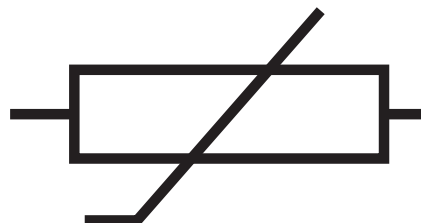
A



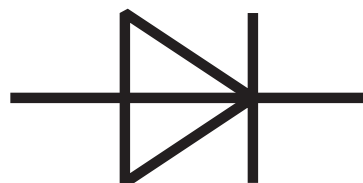
B



C



D



(continued on the next page)

8 continued.

- (b) A student investigates how the resistance of a thermistor varies with temperature.**

Look at Figure 16 for Question 8(b) in the Diagram Booklet. It shows a graph of the results of this investigation.

- (i) Describe how the resistance of this thermistor varies with temperature.
(2 marks)**

(continued on the next page)

8 continued.

- (ii) Draw the tangent to the curve on Figure 16 at a temperature of 30°C , to find the rate of change of resistance with temperature at 30°C .

State the unit.
(3 marks)

rate of change of resistance with temperature

at 30°C = _____ unit _____

(continued on the next page)

8 continued.

(c) Look at Figure 17 for Question 8(c)(i) in the Diagram Booklet. It shows the apparatus used for this investigation.

**(i) Explain ONE improvement in measurement that the student could make in the investigation.
(2 marks)**

(continued on the next page)

8 continued.

In this investigation, the resistance can be measured in two ways.

Method 1 – use an ohmmeter.

Method 2 – use an ammeter and a voltmeter.

Look at Figure 18 for Question 8(c)(ii) in the Diagram Booklet.

- (ii) Explain why method 2 gives more precise results than method 1.
(2 marks)**

(Total for Question 8 = 10 marks)

- 9 (a) Explain the difference between the term 'specific heat capacity' and the term 'specific latent heat' when applied to heating substances.
(2 marks)

(continued on the next page)

9 continued.

- (b) Look at Figure 19 for Question 9(b) in the Diagram Booklet. It shows some apparatus that may be used to determine the specific heat capacity of water.**

A student measures the initial temperature of the water.

The power supply is switched on for 10 minutes and then switched off.

Explain how the student should then obtain an accurate reading for the final temperature of the water, to be used in the calculation of the specific heat capacity.

(3 marks)

(continued on the next page)

Turn over

9 continued.

(continued on the next page)

9 continued.

***(c) A container of gas is at room temperature.**

The gas is then heated.

The volume of the container remains the same.

By considering changes in velocities of the gas particles, explain how the temperature increase affects

- **the average kinetic energy of the particles**
- **the pressure the particles exert on the walls of the container.**

(6 marks)

(continued on the next page)

Turn over

9 continued.

[illegible]

(continued on the next page)

Turn over

9 continued.

(Total for Question 9 = 11 marks)

- 10 (a) Look at Figure 20 for Question 10(a) in the Diagram Booklet. It shows a magnet and a coil.**

The coil is connected to a sensitive centre-zero ammeter.

**Explain what will be observed on the meter when the magnet is pushed in and pulled out of the coil, repeatedly.
(3 marks)**

(continued on the next page)

10 continued.

(b) This question is about a transformer.

Look at Figure 21 for Question 10(b) in the Diagram Booklet. It shows a transformer. It is 100% efficient. Calculate the current in the primary coil.

Use the information given in Figure 21 and equations selected from the list of equations provided in the Additional Equations Insert.

**The transformer is 100% efficient.
(3 marks)**

current in the primary coil = _____ A

(continued on the next page)

Turn over

10 continued.

- *(c) Look at Figure 22 for Question 10(c) in the Diagram Booklet. It shows how electricity is delivered efficiently from a power station (P) to homes (T).**

Using Figure 22, explain the stages in the process of delivering electricity efficiently from P to T.

**Your answer should include details of the effects that Q, R and S have on efficiency.
(6 marks)**

10 continued.

(continued on the next page)

Turn over

10 continued.

[illegible]

(continued on the next page)

Turn over

10 continued.

(Total for Question 10 = 12 marks)

TOTAL FOR PAPER = 100 MARKS

END OF PAPER