

**Paper Reference(s) 1PH0/2H**

**Pearson Edexcel Level 1/Level 2 GCSE (9–1)**

**Physics**

**Paper 2**

**Higher Tier**

**Total Marks**

**Friday 12 June 2020 – Morning**

**Time: 1 hour 45 minutes plus your additional time allowance**

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

<b>Surname</b>					
<b>Other names</b>					
<b>Centre Number</b>					
<b>Candidate Number</b>					

**YOU MUST HAVE**

**Calculator, ruler, protractor**

**YOU WILL BE GIVEN**

**Equations Booklet, Diagram Booklet**

**INSTRUCTIONS**

**Answer ALL questions.**

**Answer the questions in the spaces provided – 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.**

**An Equations Booklet is provided.**

## **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 (a) Look at Figure 1 for Question 1(a) in the Diagram Booklet. It shows some forces acting on a seesaw.**

**The forces shown have the same magnitude but act in different directions.**

**In which of these could the forces acting on a seesaw be in equilibrium? (1 mark)**

☐ **A**

☐ **B**

☐ **C**

☐ **D**

**(continued on the next page)**

**1 continued.**

**(b) Look at Figure 2 for Question 1(b) in the Diagram Booklet. It shows an open door.**

**Explain why it is easier to close the door by pushing at point **P** rather than pushing at point **Q**.  
(2 marks)**

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**(continued on the next page)**

**1 continued.**

- (c) Look at Figure 3 for Question 1(c) in the Diagram Booklet. It is a diagram of the forces acting on a swing.**

**The swing is not moving.**

**The seat of the swing, AB, is 0.80 m long.**

**A person of weight 450 N sits on the seat.**

**The person's weight acts at a distance of 0.50 m from A as shown in Figure 3.**

**Ignore the weight of the seat.**

**The upward forces exerted by the ropes on the seat are  $F_1$  and  $F_2$ .**

**Calculate the force  $F_2$  by taking moments about A.  
(3 marks)**

**Answer space continues on the next page.**

1 continued.

force  $F_2 =$  \_\_\_\_\_ N

(TOTAL FOR QUESTION 1 = 6 MARKS)

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- 2 (a) Look at Figure 4 for Question 2(a) in the Diagram Booklet. It shows a small piece of copper about 3 cm high.**

**A student wants to determine the density of copper.**

**The student uses a balance to measure the mass of the piece of copper.**

- (i) Explain how the student could measure the volume of the piece of copper. (3 marks)**

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**(continued on the next page)**



**2 continued.**

**(ii) The mass of the piece of copper is 0.058 kg.**

**The volume of the piece of copper  
is  $6.5 \times 10^{-6} \text{ m}^3$ .**

**Calculate the density of copper. (2 marks)**

**density of copper = \_\_\_\_\_  $\text{kg/m}^3$**

**(continued on the next page)**

**2 continued.**

**(b) Look at Figures 5 and 6 for Question 2(b) in the Diagram Booklet.**

**A student wants to determine the specific heat capacity of copper.**

**Figure 5 shows a piece of copper, with a thread tied around it, in a glass beaker of boiling water.**

**The student leaves the piece of copper in the boiling water so that the copper reaches a temperature of  $100^{\circ}\text{C}$ .**

**The student uses the thread to take the piece of copper out of the boiling water.**

**The student puts the hot piece of copper into a different beaker of cold water at  $20^{\circ}\text{C}$ .**

**The apparatus is shown in Figure 6.**

**The student assumes that the thermal energy gained by the water equals the thermal energy lost by the piece of copper.**

**The water and copper both reach a temperature of  $22^{\circ}\text{C}$ .**

**The cold water gains  $1050\text{ J}$  of energy.**

**The mass of the piece of copper is  $0.058\text{ kg}$ .**

**2 continued.**

- (i) Calculate a value for the specific heat capacity of copper, using these results. (2 marks)**

**Use the equation**

**change in thermal energy = mass × specific heat capacity × change in temperature**

$$\Delta Q = m \times c \times \Delta \theta$$

**specific heat capacity of  
copper from these results = \_\_\_\_\_ J/kg °C**

**(continued on the next page)**

**2 continued.**

- (ii) The value for the specific heat capacity of copper obtained from the student's results is lower than the correct value.**

**State TWO ways that the experiment could be improved to give a value that is closer to the correct value. (2 marks)**

**1** \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**2** \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**(TOTAL FOR QUESTION 2 = 9 MARKS)**

\_\_\_\_\_

- 3 (a) Look at Figures 7 and 8 for Question 3 in the Diagram Booklet.**

**Figure 7 shows a drone.**

**The drone has four spinning blades.**

**The upward force produced enables the drone to rise in the air.**

**The speed at which the blades spin is measured in turns per minute.**

**Figure 8 shows how the upward force produced by the four blades depends on the speed at which the blades spin.**

**Describe the relationship between upward force and speed shown by this graph. (2 marks)**

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**3 continued.**

**(b) A different drone has a mass of 4.5 kg.**

**This drone rises from the ground to a height of 20 m.**

**(i) Calculate the change in gravitational potential energy when the drone rises through a height of 20 m. (2 marks)**

**The gravitational field strength  $g = 10 \text{ N/kg}$ .**

**change in gravitational potential energy = \_\_\_\_\_ J**

**(continued on the next page)**

**3 continued.**

- (ii) State the amount of useful work done by the blades as the drone rises through 20 m. (1 mark)**

**useful work done = \_\_\_\_\_ J**

- (iii) It takes 4 s for the drone to rise through 20 m.**

**Calculate the useful power developed by the blades in this time of 4 s. (2 marks)**

**useful power developed = \_\_\_\_\_ W**

**(TOTAL FOR QUESTION 3 = 7 MARKS)**

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**4 This question is about static electricity.**

- (a) A student has a rubber balloon tied to a long piece of cotton thread.**

**The student gives the balloon an overall electrostatic charge.**

- (i) Describe ONE way that the student could give the balloon an overall electrostatic charge.  
(2 marks)**

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**(continued on the next page)**



**4 continued.**

- (ii) The student gives the balloon an overall negative charge.**

**Which of these sentences explains why the overall charge on the balloon is negative?  
(1 mark)**

- ☐ **A Negative charge has been removed from the balloon.**
- ☐ **B Negative charge has been added to the balloon.**
- ☐ **C Positive charge has been removed from the balloon.**
- ☐ **D Positive charge has been added to the balloon.**

**(continued on the next page)**

**4 continued.**

**(iii) The student charges another balloon on a long thread.**

**Explain how the student can show that the two balloons have the same type of charge.  
(3 marks)**

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**(continued on the next page)**

**4 continued.**

**(b) Look at Figure 9 for Question 4(b) in the Diagram Booklet. It shows a plastic block and a metal disc with an insulating handle.**

**The top surface of the plastic block has a negative charge.**

**The metal disc has no overall electric charge.**

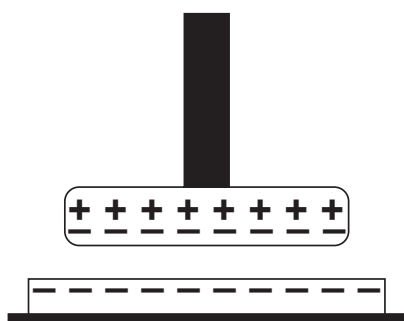
**A student uses the insulating handle to hold the metal disc above the plastic block.**

**(continued on the next page)**

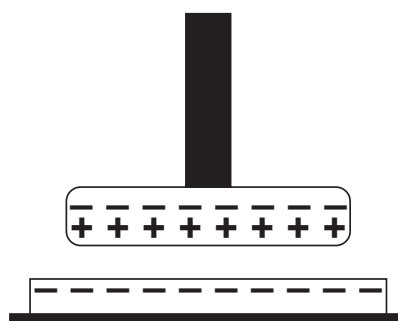
4 continued.

- (i) Which of these diagrams shows how the charge is distributed on the metal disc?  
(1 mark)

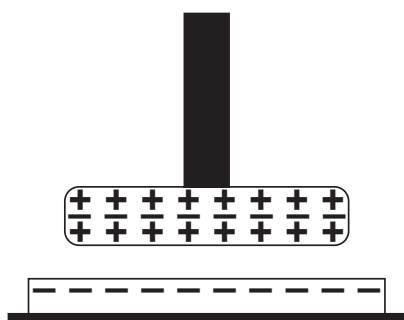
☐ A



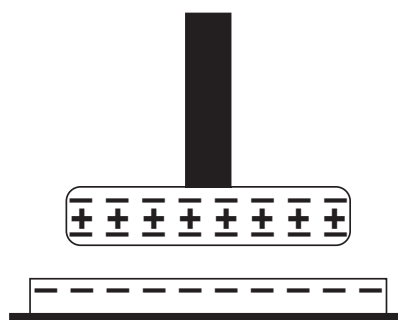
☐ B



☐ C



☐ D



(continued on the next page)

**4 continued.**

- (ii) The student keeps holding the metal disc above the charged plastic block and taps the metal disc with a finger.**

**This earths the metal disc for a short time.**

**Explain why the disc now has an overall positive charge. (2 marks)**

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**(continued on the next page)**

**4 continued.**

**(iii) Look at Figure 10 for Question 4(b)(iii) in the Diagram Booklet. It shows the charges on part of the metal disc and the plastic block.**

**On Figure 10, draw lines to show the shape and direction of the electric field between the metal disc and the plastic block. (2 marks)**

**(TOTAL FOR QUESTION 4 = 11 MARKS)**

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- 5 Look at Figure 11 for Question 5(a) in the Diagram Booklet. It shows the magnetic field of a magnet.**

**(a) At which point is the magnetic field strongest?  
(1 mark)**

☐ **A**

☐ **B**

☐ **C**

☐ **D**

- (b) Look at Figure 12 for Question 5(b) in the Diagram Booklet. It shows a wire carrying a current.**

**Draw, on the card in Figure 12, the magnetic field that is produced by the current. (2 marks)**

- (c) Look at Figure 13 for Question 5(c) in the Diagram Booklet. It shows two metal rods carrying a current.**

**A metal roller touches both rods and completes the circuit.**

**The roller is in the magnetic field produced by a magnet.**

**(continued on the next page)**

**5 continued.**

- (i) The magnetic flux density of the magnetic field at the roller is 1·2 T.**

**The current in the roller is 2·5 A.**

**The length of the roller carrying the current is 0·060 m.**

**Calculate the force on the roller. (2 marks)**

**Use the equation**

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

**force on the roller = \_\_\_\_\_ N**

**(continued on the next page)**



**5 continued.**

- (ii) Describe how Fleming's left-hand rule can be used to determine the direction of the force acting on the roller.**

**You may draw a diagram to help your answer.  
(3 marks)**

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**5 continued.**

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- (iii) Draw an arrow on Figure 13 to show the direction of the force acting on the roller.  
(1 mark)**

**(TOTAL FOR QUESTION 5 = 9 MARKS)**

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- 6 Look at Figure 14 for Question 6(a) in the Diagram Booklet. It shows a spring standing on a table.**

**Weights are added to the spring as shown in Figures 14b and 14c.**

- (a) (i) Estimate the original length of the spring as shown in Figure 14a. (1 mark)**

**original length = \_\_\_\_\_ mm**

- (ii) Describe how the reduction in the length of the spring when weights are added can be determined. (2 marks)**

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**(continued on the next page)**

**Turn over**

**6 continued.**

**(iii) State TWO ways that the experimental procedure could be improved. (2 marks)**

**1** \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**2** \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**(iv) Give ONE reason why the reduction in length eventually reaches a limit as more weights are added. (1 mark)**

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**(continued on the next page)**

**6 continued.**

**(b) A different spring is extended.**

**A force of 0.50 N gives an extension of 13 mm.**

**Calculate the spring constant  $k$  in N/m. (3 marks)**

**spring constant  $k$  = \_\_\_\_\_ N/m**

**(continued on the next page)**

**6 continued.**

**(c) Another spring is extended.**

**The work done to extend the spring is 0.14 J.**

**The spring constant of the spring is 175 N/m.**

**Calculate the extension of the spring.**

**Use an equation selected from the Equations Booklet provided. (3 marks)**

**extension of spring = \_\_\_\_\_ m**

**(TOTAL FOR QUESTION 6 = 12 MARKS)**













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- 7 (a) Look at Figure 15 for Question 7(a) in the Diagram Booklet. It shows three stages of a magnet moving into and then out of a coil of wire.

The coil is connected to a milliammeter.

- (i) Which row of the table shows the deflection on the milliammeter for the three stages in Figure 15? (1 mark)

Figure 16













	magnet moving into coil	magnet stationary inside coil	magnet moving out of coil
<input type="checkbox"/> A			
<input type="checkbox"/> B			
<input type="checkbox"/> C			
<input type="checkbox"/> D			

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7 continued.

Figure 16 (Spare copy)

	magnet moving into coil	magnet stationary inside coil	magnet moving out of coil
<input type="checkbox"/> A			
<input type="checkbox"/> B			
<input type="checkbox"/> C			
<input type="checkbox"/> D			

(continued on the next page)



**7 continued.**

- (ii) Give TWO ways of increasing the deflections on the milliammeter shown in Figure 16. (2 marks)**

**1** \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**2** \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**(continued on the next page)**

**7 continued.**

- (b) Look at Figure 17 for Question 7(b) in the Diagram Booklet. It is a diagram representing a loudspeaker.**

**Explain how sound is produced when an alternating current is supplied to the coil of the loudspeaker. (4 marks)**

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**Turn over**

**7 continued.**

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**(c) Look at Figure 18 for Question 7(c) in the Diagram Booklet. It shows a transformer.**

**(i) State the purpose of the transformer shown in Figure 18. (1 mark)**

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**(continued on the next page)**

**7 continued.**

- (ii) Calculate the output voltage of the secondary coil.**

**Use an equation selected from the Equations Booklet provided. (3 marks)**

**output voltage = \_\_\_\_\_ V**

**(TOTAL FOR QUESTION 7 = 11 MARKS)**

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- 8 (a) Look at Figure 19 for Question 8(a) in the Diagram Booklet.**

**A student investigates resistors connected in parallel using a number of resistors. Each resistor has the same resistance.**

**Figure 19 shows a circuit diagram with one resistor, R.**

- (i) Add to Figure 19:**

- a voltmeter to find the potential difference across resistor R**
- another resistor in parallel with resistor R.**

**(2 marks)**

**(continued on the next page)**

**8 continued.**

- (ii) State the measurements that the student must take to find the overall resistance of the resistors in parallel. (2 marks)**

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**(continued on the next page)**

**8 continued.**

**(iii) Look at Figure 20 for Question 8(a)(iii) in the Diagram Booklet.**

**The student investigates how the overall resistance of the circuit changes when additional resistors are added in parallel to R.**

**Each resistor has the same resistance.**

**Figure 20 shows the results of the student's investigation.**

**State the resistance of a single resistor.  
(1 mark)**

**resistance = \_\_\_\_\_  $\Omega$**

**(continued on the next page)**

**8 continued.**

- (iv) Comment on the relationship between the overall resistance of the circuit and the number of resistors in parallel.**

**Use information from Figure 20 to support your answer. (3 marks)**

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**Turn over**



**8 continued.**

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**(b) Look at Figure 21 for Question 8(b) in the Diagram Booklet.**

**A different circuit is then set up with two resistors as shown in Figure 21.**

- (i) Calculate the potential difference across the  $15\Omega$  resistor. (2 marks)**

**potential difference = \_\_\_\_\_ V**

**(continued on the next page)**

8 continued.

- (ii) Calculate the total power dissipated when there is a current of 0.20 A in the two resistors. (2 marks)

Use the equation

$$P = I^2 \times R$$

power produced \_\_\_\_\_ W

(TOTAL FOR QUESTION 8 = 12 MARKS)

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- 9 (a) Look at Figure 22 for Question 9(a) in the Diagram Booklet.**

**The magnitude and direction of a force can be represented by a vector. Figure 22 shows the forces acting on four identical trolleys. The arrows show the magnitude and direction of the forces.**

**Which diagram shows a pair of forces that will produce zero acceleration? (1 mark)**

- (b) Look at Figure 23 for Question 9(b) in the Diagram Booklet. It shows two small boats pulling a much larger ship.**

**The ship is connected to the boats with ropes.**

**The tension,  $T$ , in each of the ropes has a magnitude of 20 kN.**

**The ropes are at right angles to each other.**

**Draw a vector diagram on page 44 and use it to determine the resultant force that the boats exert on the ship. (4 marks)**

**(continued on the next page)**

**9 continued.**

**magnitude of  
resultant force on the ship = \_\_\_\_\_ kN**

**(continued on the next page)**

**9 continued.**

**\*(c) Look at Figure 24 for Question 9(c) in the Diagram Booklet. It shows a wooden block connected to a weight by a string. The string goes over a pulley.**

**The surfaces of the table and the wooden block are both rough.**

**The wooden block moves across the table at a constant horizontal velocity.**

**Several vertical and horizontal forces act on the wooden block as it moves.**

**Explain how the forces keep the wooden block moving across the table at a constant horizontal velocity.**

**Your answer should refer to all forces acting on the wooden block.**

**You may add to the diagram to help with your answer. (6 marks)**

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**(continued on the next page)**

**Turn over**

**9 continued.**

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**(TOTAL FOR QUESTION 9 = 11 MARKS)**

**Turn over**

- 10 (a) Look at Figure 25 for Question 10(a) in the Diagram Booklet. It shows four identical metal cans, each filled with water to the same level.**

**Each can has three tubes.**

**Water comes out of each tube.**

**Which of these shows the correct pattern of water coming out of the tubes? (1 mark)**

- (b) Look at Figures 26 and 27 for Question 10(b) in the Diagram Booklet. It shows a glass U-tube containing water of density  $1000 \text{ kg/m}^3$ .**

**The water levels are the same on both sides of the U-tube.**

**Both ends of the U-tube are open to the atmosphere.**

**Atmospheric pressure is  $101\,000 \text{ N/m}^2$ .**

**Figure 27 shows the U-tube with one side connected to a gas supply.**

**The difference in the levels of water,  $h$ , is  $0.200 \text{ m}$ .**

**(continued on the next page)**

**10 continued.**

- (i) Calculate the gas supply pressure.  
Use an equation selected from the Equations  
Booklet provided. (3 marks)**

**pressure of gas supply = \_\_\_\_\_  $\text{N/m}^2$**

**(continued on the next page)**



**10 continued.**

- (ii) The measurement is repeated using a U-tube of larger cross-sectional area.**

**Explain why the value of  $h$  does not change.  
(2 marks)**

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**(continued on the next page)**

**10 continued.**

- \*(c) Look at Figure 28 for Question 10(c) in the Diagram Booklet. It shows a cross-section of a boat floating in water and the same boat with a load inside.**

**The boat floats lower in the water when there is a load inside the boat.**

**Explain why the boat floats in water and why the boat floats lower in the water when there is a load inside the boat.**

**You may add to the diagram to help with your answer. (6 marks)**

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**10 continued.**

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**(TOTAL FOR QUESTION 10 = 12 MARKS)**

**TOTAL FOR PAPER = 100 MARKS**

**END**