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

Physics

Paper 2
Foundation 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.

Surname					
Other names					
Centre Number					
Candidate Number					

X62076A

Pearson

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)(i) in the Diagram Booklet. It shows an object under the surface of the sea.

(i) Which arrow shows where the pressure on the object is greatest? (1 mark)

☐ **A**

☐ **B**

☐ **C**

☐ **D**

(continued on the next page)

1 continued.

(ii) Look at Figure 2 for Question 1(a)(ii) in the Diagram Booklet. It shows two blocks of stone resting on the bottom of the sea.

Both blocks have the same height.

Area Y is 4 times bigger than area X.

What is the pressure due to the water on the top surface of block Y? (1 mark)

☐ A one quarter of the pressure on X

☐ B the same as the pressure on X

☐ C twice the pressure on X

☐ D four times the pressure on X

(continued on the next page)

1 continued.

(b) Look at Figure 3 for Question 1(b) in the Diagram Booklet.
A diver is swimming underwater in a lake.

The diver wears the meter shown in Figure 3.

(i) The meter shows the depth of the diver below the surface of the water.

State the depth shown on the meter in Figure 3.

State the unit. (2 marks)

depth = _____ unit = _____

(ii) State how the pressure of the water on the diver changes as the diver swims down from the surface of the lake. (1 mark)

_____

_____

_____

(continued on the next page)

1 continued.

(iii) State why the total pressure on the diver is greater than just the pressure due to the water above the diver. (1 mark)

(c) An aeroplane takes off from the ground.

State TWO factors that affect the pressure of the atmosphere on the aeroplane as the aeroplane goes higher in the atmosphere. (2 marks)

1

2

(TOTAL FOR QUESTION 1 = 8 MARKS)

2 (a) Look at Figure 4 and the table for Question 2(a) in the Diagram Booklet. It shows the inside of a mains plug.

The mains plug has three safety features.

One of these safety features has been ticked in the table.

Put TWO more ticks in the table to show the other two safety features. (2 marks)

(b) Look at Figure 5 for Question 2(b) in the Diagram Booklet. It shows a charger for a car battery.

(i) The meter on the battery charger shows the current supplied to a battery.

The meter on the battery charger is (1 mark)

☐ A an ammeter

☐ B an ohmmeter

☐ C a voltmeter

☐ D a wattmeter

(continued on the next page)

2 continued.

(ii) The battery charger supplies a steady current of 2·5A to the battery.

Calculate the charge flowing to the battery in 8 minutes. (2 marks)

Use the equation

charge = current × time

charge = _____ C

(continued on the next page)

2 continued.

(c) The transformer in another battery charger has a primary coil and a secondary coil.

The voltage across the primary coil = 230 V.

The voltage across the secondary coil = 15 V.

The current in the secondary coil is 3·1 A.

Calculate the current in the primary coil. (2 marks)

Use the equation

$$\text{primary current} = \frac{\text{secondary voltage} \times \text{secondary current}}{\text{primary voltage}}$$

current = _____ A

(TOTAL FOR QUESTION 2 = 7 MARKS)

3 (a) (i) Look at Figure 6 for Question 3(a)(i) in the Diagram Booklet. It shows two gears.

Gear R and gear S can rotate.

Gear R has 20 teeth.

Gear S has 60 teeth.

Gear S rotates through 2 complete revolutions.

Calculate how many complete revolutions gear R rotates by. (2 marks)

gear R has rotated through _____ revolutions

(continued on the next page)

3 continued.

(ii) Look at Figure 7 for Question 3(a)(ii) in the Diagram Booklet. It shows two gears, S and T.

Gear S can rotate on a fixed axle.

Gear T can move up and down.

Gear S has 60 teeth.

The distance between each of the teeth on gear S and on gear T is 2 mm.

Gear S moves through one complete revolution in the direction shown.

Which of these describes the motion of gear T? (1 mark)

☐ A 60 mm up

☐ B 60 mm down

☐ C 120 mm up

☐ D 120 mm down

(continued on the next page)

3 continued.

(b) (i) Look at Figure 8 for Question 3(b)(i) in the Diagram Booklet. It shows a force of 70 N turning a lever about point P.

Calculate the moment of the 70 N force about point P.

State the unit. (3 marks)

Use the equation

moment = force × distance normal to the direction of the force

moment = _____ unit _____

(continued on the next page)

3 continued.

(ii) Look at Figure 9 for Question 3(a)(ii) and 3(a)(iii) in the Diagram Booklet. It shows a worker using a wheelbarrow to move some sand.

The load is equal to the total weight of the sand and the wheelbarrow.

The effort is the force that the worker applies to the wheelbarrow handles.

The worker applies just enough effort to lift the load.

Explain why the effort is smaller than the load. (2 marks)

(continued on the next page)

3 continued.

(iii) Some sand falls down and sticks between the wheel and the axle.

State why it might be harder to push the wheelbarrow along when there is some sand between the wheel and the axle. (1 mark)

_____

_____

_____

(TOTAL FOR QUESTION 3 = 9 MARKS)

4 Look at Figure 10 for Question 4 in the Diagram Booklet. It shows a toy used to launch a ball.

One end of the spring is fixed to the handle.

The other end of the spring is fixed to the support.

(a) Look at Figure 11 for Question 4(a) in the Diagram Booklet.
A child pulls the handle, stretching the spring.

Figure 11 shows the toy with the spring stretched.

(i) Which of these shows the forces acting on the handle when the child keeps the spring stretched?

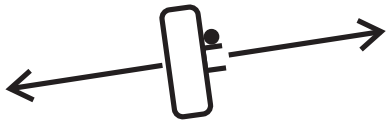
Ignore the force due to gravity. (1 mark)

☐ A

☐ B

☐ C

☐ D



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4 continued.

(ii) In Figure 11, the extension of the spring is 0·070 m.

The spring constant (k) is 20 N / m.

Calculate the force used to extend the spring. (2 marks)

Use the equation

$$\text{force} = k \times \text{extension}$$

force = _____ N

(continued on the next page)

4 continued.

(b) Look at Figure 12 for Question 4(b) in the Diagram Booklet.
The child pulls the handle until the pad is against the support as shown in Figure 12.

(i) The extension of the spring is 0·09 m.

The spring constant (k) is 20 N / m.

Calculate the work done in extending the spring by 0·09 m. (2 marks)

Use the equation

work done = $\frac{1}{2} \times k \times (\text{extension})^2$

work done = _____ J

(continued on the next page)

4 continued.

(ii) The child lets go of the handle.

The ball starts to move.

The spring returns to its original length.

Describe the energy transfer that takes place when the ball starts to move. (2 marks)

(continued on the next page)

4 continued.

(iii) The child can only stretch the spring until the pad is pressing against the support.

Explain how the design of the toy prevents the spring from becoming damaged. (2 marks)

(TOTAL FOR QUESTION 4 = 9 MARKS)

5 (a) Look at Figure 13 for Question 5(a) in the Diagram Booklet. It shows a part of a machine used to separate steel cans from aluminium cans.

The cans are carried along a moving belt.

The belt goes around a roller.

The roller is a magnet.

Each can falls into one of the containers.

Explain how this machine separates the steel cans from the aluminium cans. (2 marks)

(continued on the next page)

5 continued.

(b) Look at Figure 14 for Question 5(b) in the Diagram Booklet.
A student investigates magnetism using two toys as shown in Figure 14.

(i) There is a magnet attached to the top of each toy.

The student moves the toy brick towards the toy car.

The magnet on the toy brick repels the magnet on the toy car.

On Figure 14, label the north pole and the south pole on the magnet attached to the toy brick.
(1 mark)

(continued on the next page)

5 continued.

(ii) Explain why the toy car starts to move only when the toy brick gets near to the toy car. (2 marks)

(continued on the next page)

5 continued.

(iii) The student thinks that two magnets on top of each other will produce a magnetic field that is stronger than the magnetic field from a single magnet.

The student has a metre rule and more magnets available.

Describe how the student could develop this investigation to test this theory. (4 marks)

(continued on the next page)

5 continued.

(TOTAL FOR QUESTION 5 = 9 MARKS)

6 **Look at Figure 15 for Question 6 in the Diagram Booklet.**
A student investigates resistors connected in series in an electrical circuit.

The student has

- **a 3·0 V battery**
- **a 22 Ω resistor**
- **a resistor marked X.**

The student does not know the value of the resistor marked X.

The student decides to measure the potential difference (voltage) across resistor X.

Figure 15 shows the circuit that the student connected.

(a) The circuit is connected incorrectly.

Describe how the student should correct the mistake. (2 marks)

(continued on the next page)

6 continued.

_____

_____

(b) The student corrects the mistake.

The voltage across resistor X is 2·1 V.

The circuit is connected to a 3 V battery.

(i) State the value of the voltage across the 22 Ω resistor. (1 mark)

voltage across 22 Ω resistor = _____ V

(continued on the next page)

6 continued.

(ii) The current in resistor X is 0·041 A.

The voltage across resistor X is 2·1 V.

Show that the resistance of resistor X must be about 50 ohms. (2 marks)

Use the equation

$$V = I \times R$$

(continued on the next page)

6 continued.

(iii) Calculate the power in resistor X when the voltage across X is 2·1 V and the current in resistor X is 0·041 A. (2 marks)

power = _____ W

(iv) Calculate the overall resistance of the 22 ohm resistor and resistor X. (2 marks)

overall resistance = _____ Ω

(continued on the next page)

6 continued.

(v) The current in the circuit is 0·041 A.

The voltage across the battery is 3·0 V.

Calculate the energy transferred in 2 minutes.
(2 marks)

Use the equation

$$E = I \times V \times t$$

energy = _____ J

(TOTAL FOR QUESTION 6 = 11 MARKS)

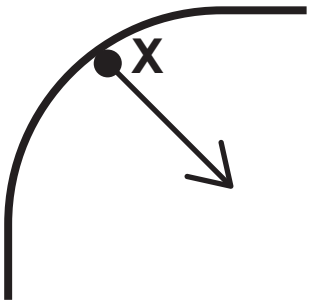
7 Look at Figure 16 for Question 7 in the Diagram Booklet. It shows a metal container with a movable piston.

Point X is on the inner surface of the container.

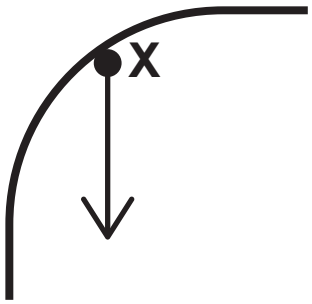
The gas in the container is at a higher pressure than the air outside the container.

(a) Which of these shows the direction of the force, due to the gas, on the container at point X? (1 mark)

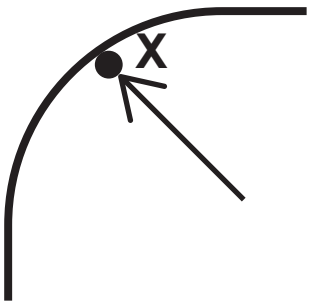
☐ A



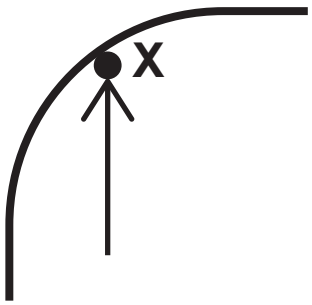
☐ B



☐ C



☐ D



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7 continued.

(b) The pressure of the gas in Figure 16 (P_1) is 120 kPa.

The volume of the gas in Figure 16 (V_1) is 2500 cm^3.

The piston is pushed up slowly so that the temperature of the gas does not change.

The new volume of the gas (V_2) is 1600 cm^3.

Calculate the new pressure of the gas, P_2. (2 marks)

Use the equation

$$P_2 = \frac{P_1 \times V_1}{V_2}$$

new pressure, P_2 = _____ kPa

(continued on the next page)

7 continued.

(c) Look at Figure 17 for Question 7(c) in the Diagram Booklet. It shows a bicycle pump with a closed end.

The area of the piston is 2 cm^2.

A force of 28 N is applied to the piston.

Calculate the pressure, in N/cm^2, of the piston on the air in the bicycle pump. (3 marks)

pressure = _____ N/cm^2

(continued on the next page)

7 continued.

*(d) Look at Figure 18 for Question 7(d) in the Diagram Booklet.
A container is sealed so that the mass of the gas inside cannot change.

The volume of the gas is changed and the pressure is measured at different volumes.

The temperature of the gas does not change.

Figure 18 is a graph of the results.

Explain, in terms of the movement of particles, why there is a pressure on the container and why the pressure changes as shown in Figure 18.
(6 marks)

(continued on the next page)

7 continued.

(TOTAL FOR QUESTION 7 = 12 MARKS)

8 (a) Look at Figure 19 for Question 8(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)

(continued on the next page)

8 continued.

(ii) The mass of the piece of copper is 0·058 kg.

The volume of the piece of copper is $6{\cdot}5 \times 10^{-6}\,m^3$.

Calculate the density of copper. (2 marks)

density of copper = _____ kg/m^3

(continued on the next page)

8 continued.

(b) Look at Figures 20 and 21 for Question 8(b) in the Diagram Booklet.
A student wants to determine the specific heat capacity of copper.

Figure 20 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 °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 °C.

The apparatus is shown in Figure 21.

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 °C.

The cold water gains 1050 J of energy.

The mass of the piece of copper is 0·058 kg.

(continued on the next page)

8 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)

8 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 _____

_____

_____

(continued on the next page)

8 continued.

(c) Look at Figure 22 for Question 8(c) in the Diagram Booklet. It shows a long piece of wire is made into a coil.

The coil is connected to a low voltage power supply.

Describe how this coil could be used instead of the Bunsen burner in Figure 20. (2 marks)

(TOTAL FOR QUESTION 8 = 11 MARKS)

9 (a) Look at Figures 23 and 24 for Question 9(a) in the Diagram Booklet.
Figure 23 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 24 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)

(continued on the next page)

9 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.

The gravitational field strength g = 10 N / kg.
(2 marks)

change in gravitational potential energy = _____ J

(continued on the next page)

9 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

(continued on the next page)

9 continued.

*(c) Look at Figure 25 for Question 9(c) in the Diagram Booklet.
The blades on the drone are turned by electric motors.

The electric motors are powered by a battery.

Figure 25 represents the energy transfers involved when the drone rises from the ground.

Describe the changes in the way energy is stored when the drone rises from the ground.

Your answer should refer to energy transfers.
(6 marks)

(continued on the next page)

9 continued.

(TOTAL FOR QUESTION 9 = 13 MARKS)

10 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)

(continued on the next page)

10 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)

10 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)

(continued on the next page)

10 continued.

(b) Look at Figure 26 for Question 10(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.

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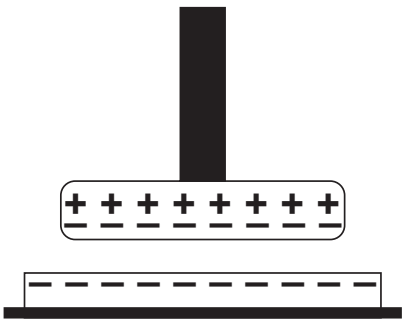
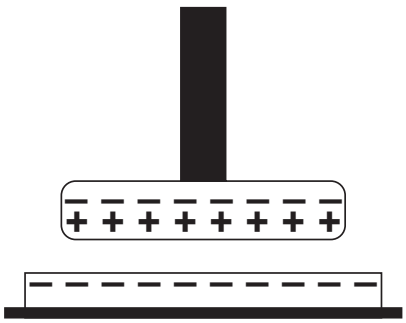
10 continued.

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

☐ A



☐ B



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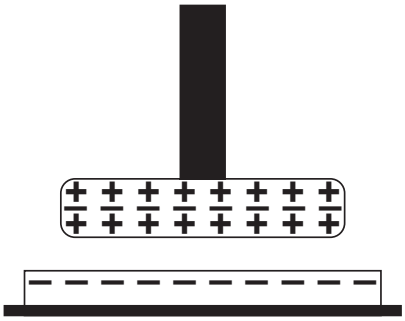
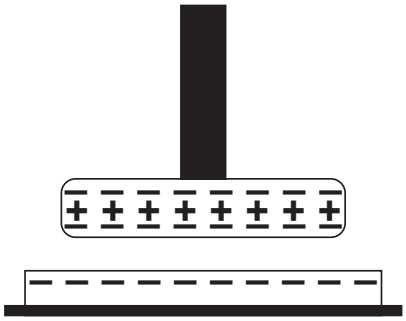


☐ D



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10 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)

(continued on the next page)

10 continued.

(iii) Look at Figure 27 for Question 10(b)(iii) in the Diagram Booklet. It shows the charges on part of the metal disc and the plastic block.

On Figure 27, 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 10 = 11 MARKS)

TOTAL FOR PAPER = 100 MARKS

END