Paper Reference(s) 4PH1/2P
Pearson Edexcel International GCSE (9–1)

Total Marks

Physics
UNIT: 4PH1
PAPER: 2P

Time: 1 hour 15 minutes

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

Surname						
Other names						
Centre Number						
Candidate Number						

V70953A

Pearson

YOU MUST HAVE

Ruler, calculator, Equation Booklet

YOU WILL BE GIVEN

Diagram Booklet, Formulae Booklet

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.

Show all the steps in any calculations and state the units.

INFORMATION

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.

There may be spare copies of some diagrams.

ADVICE

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.

Answer ALL questions.

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 student uses a watt-meter to measure the power of electrically-operated appliances.

(a) State what is meant by the term POWER.
(1 mark)

(continued on the next page)

1 continued.

(b) The student measures the mean power output (in watts) for six different appliances.

Look at the list for Question 1(b) in the Diagram Booklet. It shows their results.

On page 6 draw a results table for the student's results.
(2 marks)

(continued on the next page)

1 continued.

(continued on the next page)

1 continued.

(c) The student measures the power output for a different appliance.

Look at the list for Question 1(c) in the Diagram Booklet. It shows their raw data.

(i) The student identifies an anomalous result in their data.

Draw a circle around the anomalous result.
(1 mark)

(continued on the next page)

1 continued.

(ii) Calculate the mean power output for this appliance.

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

mean power output = _____ W

(Total for Question 1 = 7 marks)

2 This question is about momentum.

(a) Which of these is the correct unit for momentum?
(1 mark)

☐ **A** $kg/m/s$

☐ **B** $kg^2\,m/s$

☐ **C** $kg\,m/s^2$

☐ **D** $kg\,m/s$

(continued on the next page)

2 continued.

(b) Look at the diagram for Question 2(b) in the Diagram Booklet. It shows an object before and after an explosion.

The object breaks into two parts, P and Q.

The parts move away from each other in opposite directions.

(i) State what is meant by the **principle of conservation of momentum**.
(1 mark)

(continued on the next page)

2 continued.

(ii) Calculate the magnitude of the velocity of part P after the explosion.
(3 marks)

velocity = _____ m/s

(continued on the next page)

2 continued.

(c) A child drops an egg from a height of 10 cm and the egg lands on the floor.

Explain why the egg is less likely to break if the floor is covered with a thick carpet than if the floor were covered in hard tiles.
(3 marks)

(continued on the next page)

2 continued.

(Total for Question 2 = 8 marks)

3 Mobile phone charger X contains a transformer and is used to charge the phone's battery.

Look at the list for Question 3(a) in the Diagram Booklet. It shows the information on charger X.

(continued on the next page)

3 continued.

(a) (i) The power of the charger can be calculated using the formula

power = current × voltage

Calculate the output power of charger X.
(2 marks)

output power = _____ W

(continued on the next page)

3 continued.

(ii) Calculate the input current to charger X.

Assume that charger X is 100% efficient.
(3 marks)

input current = _____ A

(continued on the next page)

3 continued.

(b) Charger X transfers a charge of 10 500 C to the mobile phone battery.

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

(continued on the next page)

3 continued.

(ii) Calculate the time in minutes to transfer a charge of 10 500 C to the battery.
(3 marks)

time = _____ minutes

(continued on the next page)

3 continued.

(iii) Charger Y can also be used to charge the mobile phone battery.

Look at the list for Question 3(b)(iii) in the Diagram Booklet. It shows the information label for charger Y.

Explain how the time taken to transfer the same amount of charge to the mobile phone battery will be affected when charger Y is used instead of charger X.
(2 marks)

(continued on the next page)

3 continued.

(continued on the next page)

3 continued.

(c) Both chargers contain step-down transformers.

Explain how a step-down transformer works.

You may include a diagram to support your answer.
(4 marks)

(continue your answer on the next page)

3 continued.

(continued on the next page)

3 continued.

(Total for Question 3 = 15 marks)

4 Sound waves with a frequency above the range of human hearing are known as ultrasound.

(a) State the frequency range for human hearing.
(2 marks)

(b) The frequency of ultrasound waves can be determined using an oscilloscope.

(i) Give the name of the piece of apparatus that could be connected to the oscilloscope to detect the ultrasound waves.
(1 mark)

(continued on the next page)

4 continued.

(ii) The time period of the ultrasound waves must be measured to determine their frequency.

Describe how the oscilloscope is used to measure the time period of the ultrasound waves.

(3 marks)

(continued on the next page)

4 continued.

(c) Look at the diagram for Question 4(c) in the Diagram Booklet. It shows the oscilloscope screen when an ultrasound wave is detected.

The oscilloscope settings are also shown.

(i) Determine the time period of the ultrasound waves.
(2 marks)

time period = _____ s

(continued on the next page)

4 continued.

(ii) Calculate the frequency of the ultrasound waves.
(2 marks)

frequency = _____ Hz

(Total for Question 4 = 10 marks)

5 (a) Look at the table for Question 5(a) in the Diagram Booklet. It gives some statements about different parts of a nuclear reactor.

Place ticks (✓) in the boxes to show which statements are about the moderator and which statements are about a control rod in a nuclear reactor.
(3 marks)

(continued on the next page)

5 continued.

(b) Describe the role of shielding around a nuclear reactor.
(2 marks)

(continued on the next page)

5 continued.

(c) A uranium fuel rod is made from fuel pellets that contain uranium-235 and uranium-238.

Only uranium-235 undergoes nuclear fission in the reactor core.

Energy is released when the uranium-235 nuclei undergo fission.

Look at the list for Question 5(c) in the Diagram Booklet. It gives some data about a typical uranium fuel pellet.

(continued on the next page)

5 continued.

(i) Calculate the number of uranium-235 atoms in the fuel pellet.
(2 marks)

number of uranium-235 atoms = _____

(continued on the next page)

5 continued.

(ii) Calculate the energy released when the nucleus of a single atom of uranium-235 undergoes fission.
(2 marks)

energy released = _____ J

(Total for Question 5 = 9 marks)

6 The universe began with an event known as the Big Bang.

(a) Describe how the size and temperature of the universe have changed since the Big Bang. (2 marks)

(continued on the next page)

6 continued.

(b) Discuss two pieces of evidence that support the Big Bang theory.
(6 marks)

6 continued.

(Total for Question 6 = 8 marks)

7 This question is about specific heat capacity.

(a) State what is meant by the term **specific heat capacity**.
(2 marks)

(continued on the next page)

7 continued.

(b) A student uses this method to measure the specific heat capacity of water.

- place an aluminium block of known mass in an oven at a temperature of 220 °C
- place water of known mass in a container at a temperature of 20 °C
- leave the aluminium block in the oven for 10 minutes
- remove the aluminium block from the oven and place the block in the water
- measure the maximum temperature of the water after it has been heated by the aluminium block

The student uses their data to calculate the specific heat capacity of water.

(continued on the next page)

7 continued.

Give two ways that they could improve their method to increase the accuracy of their value of specific heat capacity. (2 marks)

1

2

(continued on the next page)

7 continued.

(c) Look at the list for Question 7(c) in the Diagram Booklet. It shows the student's data.

(i) When the water reaches its maximum temperature, the water and aluminium block are in thermal equilibrium.

State the temperature of the aluminium block as it reaches thermal equilibrium with the water.
(1 mark)

temperature of aluminium = _____ °C

(continued on the next page)

7 continued.

(ii) Calculate the temperature change of the water when it has been heated to its maximum temperature. (1 mark)

temperature change of water = _____ °C

(continued on the next page)

7 continued.

(iii) The water gains 190 000 J of energy in its thermal store as it is heated to its maximum temperature.

Calculate the specific heat capacity of water.

(3 marks)

specific heat capacity of water = _____ J / kg °C

(continued on the next page)

7 continued.

(d) After finishing the experiment, the student removes the aluminium block and places the container of water into a freezer.

The water loses energy at a constant rate and cools from 38 °C to –20 °C.

The water freezes and turns into ice at 0 °C.

Ice has a lower specific heat capacity than water.

Look at the grid for Question 7(d) in the Diagram Booklet. Use the axes to sketch a temperature-time graph from when the water is placed in the freezer until it reaches its lowest temperature.

No calculations are required.
(4 marks)

(Total for Question 7 = 13 marks)

TOTAL FOR PAPER = 70 MARKS
END OF PAPER