Paper Reference(s) 1SC0/2PF
Pearson Edexcel Level 1/Level 2 GCSE (9–1)

Total Marks

Combined Science
PAPER 6
Foundation Tier

Friday 16 June 2023 – Morning

Time: 1 hour 10 minutes

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

Surname						
Other names						
Centre Number						
Candidate Number						

V72564A

Pearson

YOU MUST HAVE

Calculator, ruler, Equation Booklet (enclosed)

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 60.

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 booklet.

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 (a) Look at Figure 1 for Question 1(a) in the Diagram Booklet. It shows the parts in an electrical circuit.

Draw the circuit diagram of this electrical circuit in the space provided in the Diagram Booklet.

The battery symbol and some of the connecting wires have been drawn for you.
(4 marks)

(continued on the next page)

1 continued.

(b) Look at Figure 2 for Question 1(b) in the Diagram Booklet. It shows the current flowing into and out of point P in part of a circuit.

Which of these is the value of current I?
(1 mark)

☐ A 2A

☐ B 5A

☐ C 7A

☐ D 9A

(continued on the next page)

1 continued.

(c) (i) There is a current of 0·46 A in a lamp.

Calculate the total charge that flows through the lamp in 30 seconds.

Use the equation

charge = current × time in seconds

(2 marks)

charge = _____ C

(continued on the next page)

1(c) continued.

(ii) The voltage across the lamp is 6·0 V.

The current in the lamp is 0·46 A.

Calculate the energy transferred to the lamp in one minute.
(2 marks)

(continued on the next page)

1(c)(ii) continued.

Use the equation

energy transferred =
current × voltage × time in seconds

energy transferred =

_____ J

(Total for Question 1 = 9 marks)

2 This question is about magnets and magnetism.

(a) Look at Figure 3 for Question 2(a) in the Diagram Booklet. It shows a magnet that has picked up three paper clips.

(i) The poles of the lowest paper clip are labelled.

Label the poles of the other two paper clips in Figure 3.
(2 marks)

(continued on the next page)

2(a) continued.

(ii) Complete the sentence, by choosing a word from the list, to describe the type of magnetism that these paper clips have.
(1 mark)

alternated

earthed

induced

transformed

These paper clips have

_____ magnetism.

(continued on the next page)

2(a) continued.

(iii) Suggest a material that these paper clips in Figure 3 could be made from.
(1 mark)

(iv) When the paper clips were pulled off the magnet they fell separately to the table.

Describe how you could test whether any of the paper clips had kept any magnetism.
(2 marks)

Answer space continues on the next page.

2(a)(iv) continued.

(b) Look at Figure 4 for Question 2(b) in the Diagram Booklet. It shows the magnetic field around a wire carrying a current.

(i) State how you can tell from Figure 4 that the strength of the field is greater at P than at Q.

(1 mark)

(continued on the next page)

2(b) continued.

(ii) The magnetic field strength is measured at P for different values of current in the wire.

Look at Figure 5 for Question 2(b)(ii) in the Diagram Booklet. It shows the results of this investigation.

Describe the relationship between magnetic field strength and current.
(2 marks)

Answer space continues on the next page.

2(b)(ii) continued.

(Total for Question 2 = 9 marks)

3 Look at Figure 6 for Question 3 in the Diagram Booklet. It shows part of the UK National Grid system for the supply of electricity to homes.

(a) Electricity supplied to homes has a frequency of
(1 mark)

☐ A 0·02 Hz

☐ B 20 Hz

☐ C 50 Hz

☐ D 500 Hz

(continued on the next page)

3 continued.

(b) Explain why the National Grid uses high voltages with small currents to transfer electricity from power stations.
(2 marks)

(continued on the next page)

3 continued.

(c) Look at Figure 7 for Question 3(c) in the Diagram Booklet. It shows details of a transformer.

(i) Calculate the power in the primary coil.

Use the equation

$$P = V \times I$$

(2 marks)

power in the primary coil =

_____ W

3(c) continued.

(ii) Calculate the following for the transformer in Figure 7.

$$\frac{\text{number of turns in secondary coil}}{\text{number of turns in primary coil}}$$

(2 marks)

(continued on the next page)

3(c) continued.

(iii) For the transformer in Figure 7, evaluate, in its simplest form, the ratio

secondary voltage : primary voltage

(2 marks)

(Total for Question 3 = 9 marks)

4 This question is about energy transfers.

Look at Figure 8 for Question 4 in the Diagram Booklet. It shows the apparatus used for investigating the transfer between gravitational potential energy and kinetic energy.

A metal ball is attached to a thread.

The ball is released from a starting position and swings on the thread.

The ball cuts a light beam at the bottom of its swing.

When the ball cuts the light beam, the speed of the ball is recorded by the data logger.

The ball was released 3 times from the same height and the speed measured each time.

(continued on the next page)

4 continued.

The measurements of speed are given in Figure 9.

FIGURE 9

speed in m/s	1·31	1·27	1·16

(a) Calculate the mean speed.
(2 marks)

mean speed = _____ m/s

(continued on the next page)

4 continued.

(b) Suggest one reason why the measurements of speed were repeated.
(1 mark)

(continued on the next page)

4 continued.

(c) The mass of the ball is 0·052 kg.

The ball falls through a vertical height (Δh) of 5·0 cm as it swings.

The gravitational field strength, g, is 10 N / kg.

Calculate the change in the gravitational potential energy of the ball.

(continued on the next page)

4(c) continued.

Use the equation

$$\Delta GPE = m \times g \times \Delta h$$

(3 marks)

change in gravitational potential energy = _____ J

(continued on the next page)

4 continued.

(d) Look at Figure 10 for Question 4(d) in the Diagram Booklet. It shows an end–on view of the ball's swing from its starting position.

(i) To measure the change in vertical height, Δh, through which the ball moves, a ruler could be used.

Draw a ruler on Figure 10, placed in a position to measure the change in vertical height Δh.
(1 mark)

(continued on the next page)

4(d) continued.

(ii) Look at Figure 11 for Question 4(d)(ii) in the Diagram Booklet. It shows a set square.

Describe how the measurement of the change in vertical height, Δh, could be improved using the set square.

You may add to Figure 10 or Figure 11 to help your description.
(2 marks)

Answer space continues on the next page.

4(d)(ii) continued.

(Total for Question 4 = 9 marks)

5 (a) The voltage (potential difference) across a length of wire is 1·5 V.

A charge of 0·042 C flows through the wire.

Calculate the energy transferred.

Use the equation

$$E = Q \times V$$

(2 marks)

E = _____ J

(continued on the next page)

5 continued.

(b) Look at Figure 12 for Question 5(b) in the Diagram Booklet. It shows some of the apparatus that students use to determine the resistance of a piece of iron wire.

Add connecting wires, a voltmeter and an ammeter to complete the circuit in Figure 12 so that the students can determine the resistance of the piece of iron wire. (2 marks)

(continued on the next page)

5 continued.

(c) The students extend the investigation to determine how the resistance of the iron wire changes with its length.

(i) Give the name of ONE additional piece of apparatus the students would need.
(1 mark)

(ii) Look at Figure 13 for Question 5(c)(ii) in the Diagram Booklet. It shows a graph of the results.

Draw a straight line of best fit on Figure 13.
(1 mark)

(continued on the next page)

5(c) continued.

(iii) Use Figure 13 to estimate the resistance of a 100 cm length of the iron wire.
(1 mark)

resistance = _____ Ω

(continued on the next page)

5(c) continued.

(iv) The variable resistor shown in Figure 12 is used to prevent the iron wire from becoming too hot.

Explain how the variable resistor is used to prevent the iron wire from becoming too hot.
(2 marks)

(continued on the next page)

5 continued.

(d) The potential difference (voltage) across another piece of wire is 1·56 V.

The current in the wire is 0·45 A.

Calculate the resistance of this piece of wire.

Use the equation

$V = I \times R$

(2 marks)

resistance = _____ Ω

(Total for Question 5 = 11 marks)

6 (a) Which of these means changing state from solid directly to gas? (1 mark)

☐ A condensing

☐ B freezing

☐ C melting

☐ D sublimating

(b) An object has a mass of $7{\cdot}22 \times 10^{-2}$ kg and a volume of $2{\cdot}69 \times 10^{-5}\,m^3$.

Calculate the density, ρ, of the object.

(continued on the next page)

6(b) continued.

Use the equation

$$\rho = \frac{m}{V}$$

(3 marks)

State the unit.

density = _____

unit _____

6 continued.

(c) Aluminium has a melting point of 660 °C.

The absolute zero of temperature is –273 °C.

(i) Calculate the melting point of aluminium in kelvin.
(1 mark)

melting point of aluminium =

_____ K

(continued on the next page)

6(c) continued.

(ii) Describe the motion of particles in liquid aluminium (above 660 °C).
(2 marks)

(continued on the next page)

6 continued.

*(d) Look at the Table for Question 6(d) in the Diagram Booklet. It shows some properties of two materials used as thermal insulation.

The higher the R-value, the better the thermal insulating properties of the material.

Assess which of these materials may be the more suitable to use as thermal insulation in a building.

Your answer should compare the properties of fibreglass and polystyrene given in the table.

(6 marks)

Answer space continues on the next 2 pages.

6(d) continued.

Turn over

6(d) continued.

(Total for Question 6 = 13 marks)

TOTAL FOR PAPER = 60 MARKS

END OF PAPER