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

Total Marks

Combined Science
PAPER 6
Higher Tier

Time: 1 hour 10 minutes

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

Surname					
Other names					
Centre Number					
Candidate Number					

Y69472A

Pearson

YOU MUST HAVE

Calculator, ruler, Equation Booklet

YOU WILL BE GIVEN

Diagram Booklet, Equations 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.

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 and 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 (a) Look at Figure 1 for Question 1(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.

(continued on the next page)

1 continued.

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

Use the equation

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

resistance = _____ Ω

(continued on the next page)

1 continued.

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

power = _____ W

(continued on the next page)

1 continued.

(b) Look at Figure 2 for Question 1(b) in the Diagram Booklet. Another IDENTICAL lamp is added to the circuit, as shown in Figure 2.

The power supply provides the same potential difference as it provided in the circuit in Figure 1.

State and explain the difference between the brightness of the lamp in Figure 1 and the brightness of a lamp in Figure 2.
(3 marks)

(continued on the next page)

1 continued.

(continued on the next page)

1 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 11 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)

1 continued.

(Total for Question 1 = 9 marks)

2 (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
☐ A	bigger than in water	greater than water
☐ B	bigger than in water	less than water
☐ C	smaller than in water	greater than water
☐ D	smaller than in water	less than water

(continued on the next page)

2 continued.

(b) Look at Figure 3 for Question 2(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 cm^3.

The density of iron is 7·9 g/cm^3.

On page 14 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)

(continued on the next page)

2 continued.

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

mass = _____ g

(continued on the next page)

2 continued.

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

The density of the wood is $0{\cdot}82\,g/cm^3$.

The density of water is $1{\cdot}00\,g/cm^3$

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)

2 continued.

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

(Total for Question 2 = 9 marks)

3 (a) Look at Figure 4 for Question 3(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 4 to show the direction of the magnetic field.
(1 mark)

(ii) Place a letter X on Figure 4 at a place where the magnetic field is strongest.
(1 mark)

(continued on the next page)

3 continued.

(iii) Describe TWO differences between the magnetic field shown in Figure 4 and a uniform magnetic field.
(2 marks)

(continued on the next page)

3 continued.

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

(continued on the next page)

3 continued.

(c) Look at Figure 5 for Question 3(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 5, 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)

3 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 $1{\cdot}11 \times 10^{-5}$ N.

On page 22 calculate the magnetic flux density of the Earth's magnetic field.
(2 marks)

(continued on the next page)

3 continued.

Use the equation

$F = B \times I \times l$

magnetic flux density = _____ T

(Total for Question 3 = 10 marks)

4 (a) Look at Figure 6 for Question 4(a) in the Diagram Booklet. It shows a 'Mars rover' descending to the surface of the planet Mars.

(i) On page 24 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)

(continued on the next page)

4 continued.

change in gravitational potential

energy = _____ J

(continued on the next page)

4 continued.

(ii) Use data from Figure 6 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)

4 continued.

(iii) The rover is slowed down safely using thrusters and a parachute (not shown in Figure 6).

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)

4 continued.

(continued on the next page)

4 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)

4 continued.

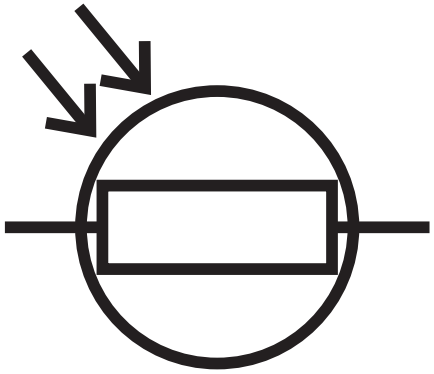
(ii) The solar panels convert 27% of the energy they receive from the Sun into electricity.

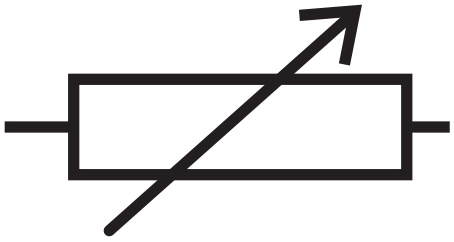
Calculate the solar energy received by the panels that provides the 2·16 MJ of energy.
(2 marks)

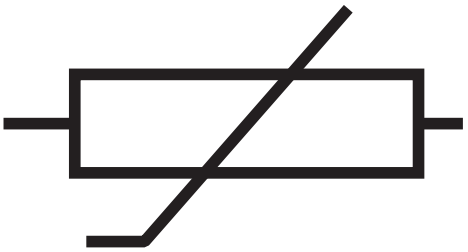
energy received = _____ J

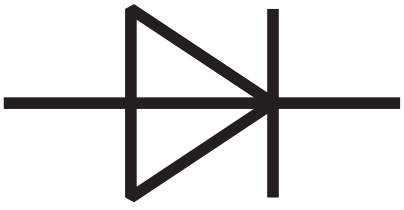
(Total for Question 4 = 11 marks)

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

☐ A 

☐ B 

☐ C 

☐ D 

(continued on the next page)

5 continued.

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

Look at Figure 7 for Question 5(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)

5 continued.

(ii) Look at Figure 7 for Question 5(b) in the Diagram Booklet. Draw the tangent to the curve 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)

5 continued.

(c) Look at Figure 8 for Question 5(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)

5 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 9 for Question 5(c)(ii) in the Diagram Booklet.

(continued on the next page)

5 continued.

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

(Total for Question 5 = 10 marks)

6 (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)

6 continued.

(b) Look at Figure 10 for Question 6(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)

6 continued.

(continued on the next page)

6 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)

6 continued.

(continued on the next page)

6 continued.

(Total for Question 6 = 11 marks)

TOTAL FOR PAPER = 60 MARKS
END OF PAPER