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

Combined Science

Paper 6
Foundation Tier

Total Marks

Friday 12 June 2020 – Morning

Time: 1 hour 10 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					

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 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.

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 ☒.

(continued on the next page)

continued.

1 (a) Look at Figure 1 for Question 1(a) in the Diagram Booklet.

Figure 1 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)

part of plug	safety feature
cable grip	✓
earth wire	
fuse	
live wire	
neutral wire	

(continued on the next page)

1 continued.

(b) Look at Figure 2 for Question 1(b) in the Diagram Booklet.

Figure 2 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)

1 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.

Use the equation

charge = current × time

(2 marks)

charge = _____ C

(continued on the next page)

1 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.

Use the equation

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

(2 marks)

current = _____ A

(TOTAL FOR QUESTION 1 = 7 MARKS)

2 Look at Figure 3 for Question 2 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 4 for Question 2(a) in the Diagram Booklet.
A child pulls the handle, stretching the spring.

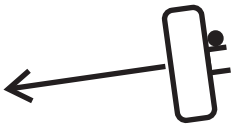
Figure 4 shows the toy with the spring stretched.

(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)

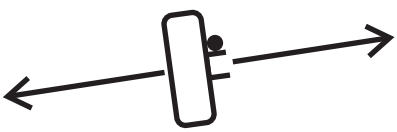
☐ A

☐ B



☐ C

☐ D



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2 continued.

(ii) In Figure 4, 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.

Use the equation

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

(2 marks)

force = _____ N

(continued on the next page)

2 continued.

(b) Look at Figure 5 for Question 2(b) in the Diagram Booklet.

The child pulls the handle until the pad is against the support as shown in Figure 5.

(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.

Use the equation

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

(2 marks)

work done = _____ J

(continued on the next page)

2 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)

2 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 2 = 9 MARKS)

3 (a) Look at Figure 6 for Question 3(a) in the Diagram Booklet.

Figure 6 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)

3 continued.

(b) Look at Figure 7 for Question 3(b) in the Diagram Booklet.

A student investigates magnetism using two toys as shown in Figure 7.

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

(continued on the next page)

3 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)

3 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)

3 continued.

(TOTAL FOR QUESTION 3 = 9 MARKS)

4 **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.

Look at Figure 8 for Question 4 in the Diagram Booklet.

Figure 8 shows the circuit that the student connected.

(continued on the next page)

4 continued.

(a) The circuit is connected incorrectly.

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

(continued on the next page)

4 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)

4 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.

Use the equation

$$V = I \times R$$

(2 marks)

(continued on the next page)

4 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)

4 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.

Use the equation

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

(2 marks)

energy = _____ J

(TOTAL FOR QUESTION 4 = 11 MARKS)

5 (a) Look at Figure 9 for Question 5(a) in the Diagram Booklet.

Figure 9 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)

5 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)

5 continued.

(b) A student wants to determine the specific heat capacity of copper.

Look at Figure 10 for Question 5(b) in the Diagram Booklet.

Figure 10 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.

Look at Figure 11 for Question 5(b) in the Diagram Booklet.

The apparatus is shown in Figure 11.

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

(continued on the next page)

5 continued.

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.

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

Use the equation

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

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

(2 marks)

specific heat capacity of
copper from these results = _____ J/kg °C

(continued on the next page)

5 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)

5 continued.

(c) Look at Figure 12 for Question 5(c) in the Diagram Booklet.

A long piece of wire is made into a coil as shown in Figure 12.

The coil is connected to a low voltage power supply.

Describe how this coil could be used instead of the Bunsen burner in Figure 10. (2 marks)

(TOTAL FOR QUESTION 5 = 11 MARKS)

6 (a) Look at Figure 13 for Question 6(a) in the Diagram Booklet.

Figure 13 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.

Look at Figure 14 for Question 6(a) in the Diagram Booklet.

Figure 14 shows how the upward force produced by the four blades depends on the speed at which the blades spin.

(continued on the next page)

6 continued.

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

(continued on the next page)

6 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)

6 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)

6 continued.

*(c) The blades on the drone are turned by electric motors.

The electric motors are powered by a battery.

Look at Figure 15 for Question 6(c) in the Diagram Booklet.

Figure 15 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)

6 continued.

(TOTAL FOR QUESTION 6 = 13 MARKS)

TOTAL FOR PAPER = 60 MARKS

END