

Combined Science
PAPER 6
Foundation Tier

Total Marks

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										

YOU MUST HAVE

Calculator, ruler

YOU WILL BE GIVEN

Diagram Booklet

Equation 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 Equation 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)

- 1 Look at Figure 1 for Question 1 in the Diagram Booklet. It shows an electrical circuit.**
 - (a) Draw a circuit diagram of the electrical circuit in Figure 1 in the space below.
(4 marks)**

1 continued.

(b) When the current in a lamp is 0.15A, the resistance of the lamp is 40 Ω .

**Calculate the voltage across the lamp.
(2 marks)**

Use the equation

$$V = I \times R$$

voltage = _____ V

(continued on the next page)

1 continued.

- (c) Look at Figure 2 for Question 1(c) in the Diagram Booklet. It shows an ammeter that can read up to 5A.**

State the value of the current shown on the ammeter in Figure 2.

(1 mark)

current = _____ A

(Total for Question 1 = 7 marks)

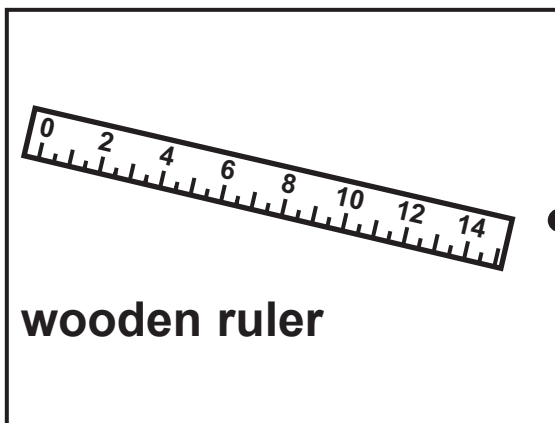
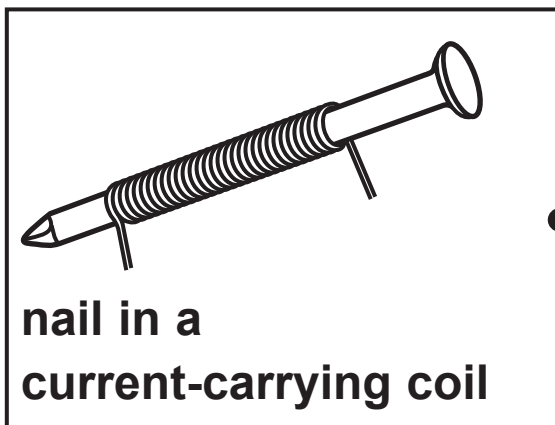
- 2 (a) Figure 3 shows some objects and words describing these objects.

Draw one line from each object to its description.
(2 marks)

Figure 3

OBJECT

DESCRIPTION



(continued on the next page)

Turn over

2 continued.

(b) Look at Figure 4 for Question 2(b) in the Diagram Booklet. It shows a wire passing through a piece of card.

The wire carries an electric current.

(i) Draw ONE magnetic field line on Figure 4, to show the shape of the magnetic field produced by the current.

(1 mark)

(ii) Draw ONE arrow on the field line you have drawn to show the direction of the magnetic field.

(1 mark)

(continued on the next page)

2 continued.

- (c) A student measures the strength of the magnetic field at several distances from the wire in Figure 4.**

Look at Figure 5 for Question 2(c) in the Diagram Booklet. It shows most of the student's results.

**Look at Figure 6 for Question 2(c) in the Diagram Booklet. It shows two extra sets of results.
mT is a unit of strength of a magnetic field.**

- (i) Plot the two extra points on Figure 5.
(2 marks)**
- (ii) Draw a best fit curve on the graph in Figure 5.
(1 mark)**
- (iii) Use the graph in Figure 5 to calculate the change in strength of magnetic field when the distance from the wire changes from 4 cm to 8 cm.
(2 marks)**

change in strength of magnetic field =

_____ mT

(continued on the next page)

Turn over

2 continued.

- (iv) The distance from the wire affects the strength of the magnetic field.**

State ONE other factor that affects the strength of the magnetic field.

(1 mark)

(Total for Question 2 = 10 marks)

3 This question is about using the mains electricity supply.

- (a) (i) An electric kettle is used to boil some water.
The mains supply voltage is 230 V.
The power supplied to the kettle is 1.9 kW.**

**Calculate the current in the kettle.
(2 marks)**

Use the equation

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

current supplied to the kettle =

_____ A

(continued on the next page)

3 continued.

- (ii) A coffee machine takes 120 s to heat some water.**

Mains supply voltage = 230 V

Current in this coffee machine = 7.4 A

Calculate the energy transferred to the coffee machine in 120 s.

Use an equation selected from the Equation Booklet.

(2 marks)

energy transferred to coffee machine =

_____ J

(continued on the next page)

3 continued.

(b) Look at Figure 7 for Question 3(b) in the Diagram Booklet. It shows the inside of a mains plug. The neutral wire is labelled.

- (i) State the name of wire **X** and the name of wire **Y**.
(2 marks)**

wire **X** _____

wire **Y** _____

- (ii) State the name of component **Z**.
(1 mark)**

component **Z** _____

(continued on the next page)

3 continued.

- (c) A transformer is used to connect a laptop computer to the mains electricity supply.
The input voltage to the transformer is 230 V.
The output current from the transformer is 2.37 A.
The transformer has an output voltage of 19.0 V.
The transformer used is 100% efficient.**

**Calculate the input current to the transformer.
(3 marks)**

Use the equation

$$\text{input current} \times \text{input voltage} = \text{output current} \times \text{output voltage}$$

input current _____ A

(Total for Question 3 = 10 marks)

4 This question is about energy changes.

(a) Look at Figure 8 for Question 4(a) in the Diagram Booklet. It shows a water slide.

A person travels from the top to the bottom of the water slide.

(i) The mass of the person, $m = 72 \text{ kg}$.

The change in vertical height, $h = 7.0 \text{ m}$

Gravitational field strength, $g = 10 \text{ N/kg}$

Calculate the change in gravitational potential energy for the person.

(2 marks)

Use the equation

change in gravitational potential energy = $m \times g \times h$

change in gravitational potential energy

_____ J

(continued on the next page)

Turn over

4 continued.

- (ii) The person comes to rest after the end of the water slide.**

Explain what happens to the energy as the person comes to rest after the end of the water slide.

(2 marks)

(continued on the next page)

4 continued.

- (b) Look at Figure 9 for Question 4(b) in the Diagram Booklet. It shows a person pushing a box from the bottom of a slope to the top of the slope.**

Explain which one of the three distances shown in Figure 9 should be used to calculate the work done against the force of friction between the box and the slope.

(2 marks)

(continued on the next page)

4 continued.

(c) Calculate the kinetic energy of a tennis ball travelling at 28 m/s.

The mass of the tennis ball = 58 g.

(3 marks)

Use the equation

$$\text{KE} = \frac{1}{2} \times m \times v^2$$

kinetic energy _____ J

(Total for Question 4 = 9 marks)

- 5 (a) Look at Figure 10 for Question 5(a) in the Diagram Booklet. It shows two different types of the same circuit component.

What is the name of this circuit component?
(1 mark)

- ☐ A diode
- ☐ B light dependent resistor
- ☐ C thermistor
- ☐ D variable resistor

- (b) Which row in the table describes the way that ammeters and voltmeters should be connected with a component in a circuit?
(1 mark)

	ammeter	voltmeter
<input type="checkbox"/> A	in parallel	in parallel
<input type="checkbox"/> B	in parallel	in series
<input type="checkbox"/> C	in series	in parallel
<input type="checkbox"/> D	in series	in series

(continued on the next page)

Turn over

5 continued.

- (c) Look at Figure 11 for Question 5(c) in the Diagram Booklet. It shows the results from an experiment where the potential difference (voltage) across a filament lamp was varied.**

The current and voltage were measured.

- (i) Describe the relationship between the current and the voltage as shown in the graph in Figure 11.
(2 marks)**

(continued on the next page)

5 continued.

- (ii) Use the values of the voltage and current at point P and at point Q on the graph in Figure 11 to complete the table in Figure 12. (2 marks)**

Figure 12

	voltage in V	current in mA
point P		
point Q		

(continued on the next page)

5 continued.

- (iii) Calculate the resistance of the filament lamp when the voltage is 4.5 V and the current is 51 mA.
(2 marks)**

Use the equation

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

resistance = _____ Ω

(continued on the next page)

5 continued.

- (iv) Explain why the resistance of the filament lamp changes as the voltage across it increases.
(3 marks)**

(Total for Question 5 = 11 marks)

- 6 (a) Describe, in terms of particles, TWO differences between a solid and a liquid of the same substance.**
(2 marks)

1 _____

2 _____

(continued on the next page)

6 continued.

(b) Look at Figure 13 for Question 6(b) in the Diagram Booklet. It shows the dimensions of a solid block of concrete.

Density of concrete, ρ , = 2100 kg/m³.

**Calculate the mass of the concrete block.
(3 marks)**

Use the equation

$$m = \rho \times V$$

mass of concrete block = _____ kg

(continued on the next page)

Turn over

6 continued.

- (c) Look at Figure 14 for Question 6(c) in the Diagram Booklet. It shows a shed made mostly of concrete blocks.**

**State TWO practical ways to reduce heat loss from this shed.
(2 marks)**

1 _____

2 _____

(continued on the next page)

6 continued.

***(d) Look at Figure 15 for Question 6(d) in the Diagram Booklet. A student has two metal strips and a ruler, as shown in Figure 15.**

A teacher tells the student that

- **one metal strip is made of aluminium**
- **the other metal strip is made of stainless steel.**

The student looks up data in a reference book, finding some density values:

density of aluminium = 2710 kg/m^3

density of stainless steel = 7850 kg/m^3

The student has access to more of the same metal strips, if needed, and may ask for any extra measuring devices.

(continued on the next page)

6 continued.

**Plan how the student could confirm the teacher's statements, by determining the density of each of the strips as accurately as possible.
(6 marks)**

(continued on the next page)

Turn over

6 continued.

(Total for Question 6 = 13 marks)

TOTAL FOR PAPER = 60 MARKS
END OF PAPER