

Please write clearly in block capitals.

F

Centre number

Candidate
number

Surname

Forename(s)

Candidate signature

I declare this is my own work.

GCSE

COMBINED SCIENCE: TRILOGY

Foundation Tier Physics Paper 1

Practice Paper Series – Set 1

Time allowed: 1 hour 15 minutes

Materials

For this paper you must have:

- a ruler
- a scientific calculator
- the Physics Equations Sheet (printed at the back of this booklet).

Instructions

- Use black ink or black ball-point pen.
- Pencil should only be used for drawing.
- Fill in the boxes at the top of this page.
- Answer **all** questions in the spaces provided.
- Do not write outside the box around each page or on blank pages.
- If you need extra space for your answer(s), use the lined pages at the end of this book. Write the question number against your answer(s).
- Do all rough work in this book. Cross through any work you do not want to be marked.
- In all calculations, show clearly how you work out your answer.

Information

- The marks for questions are shown in brackets.
- The maximum mark for this paper is 70.
- You are expected to use a calculator where appropriate.
- You are reminded of the need for good English and clear presentation in your answers.
- When answering question 09.2 you need to make sure that your answer:
 - is clear, logical, sensibly structured
 - fully developed
 - shows how the points that you make are related or follow on from each other where appropriate.

For Examiner's Use

Question	Mark
1	
2	
3	
4	
5	
6	
7	
8	
9	
TOTAL	

This is an original practice paper written for sciencegcse.co.uk to match the style and demand of AQA GCSE Combined Science: Trilogy (8464) Physics Paper 1 (Foundation Tier). It is not an AQA examination paper and has not been produced or endorsed by AQA. It is not a prediction of a future examination.

sciencegcse.co.uk | Practice Paper Series – Set 1 | SGC/S1/P/1F

0 1 An electric motor is used to lift a load. The motor is powered by a battery.

0 1 . 1 Complete the sentences. [2 marks]

Use words from the box.

chemical	elastic potential	gravitational potential	kinetic
----------	-------------------	-------------------------	---------

The battery is a store of energy.

When the load is lifted, the energy store of the load increases.

0 1 . 2 Which unit is used for energy? [1 mark]

Tick (✓) **one** box.

joule (J)	☐
newton (N)	☐
volt (V)	☐
watt (W)	☐

0 1 . 3 The motor lifts a load of mass 2.0 kg through a height of 1.5 m. [2 marks]

Calculate the increase in the gravitational potential energy of the load.

gravitational field strength = 9.8 N/kg

Increase in gravitational potential energy = ... J

0 1 . 4 The motor transfers 120 J of energy from the battery to lift the load. [2 marks]

The useful energy transferred to the load is 30 J.

Calculate the efficiency of the motor.

Efficiency = ...

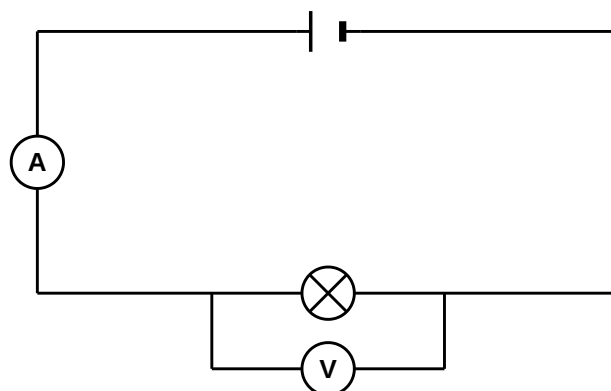
0 1 . 5 Give **one** way in which energy is wasted by the motor. [1 mark]

.....

.....

0 2 Figure 1 shows a circuit.

Figure 1

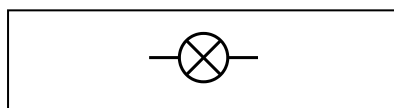


0 2 . 1 Draw **one** line from each circuit symbol to its name.

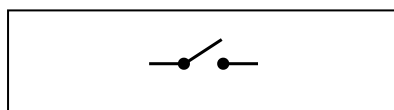
[2 marks]

Circuit symbol

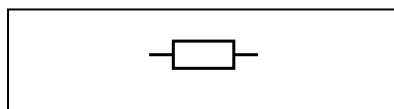
Name



Fuse



Lamp



Resistor

Switch

Do not write outside the box

0 2 . 2 The current in the circuit is 0.20 A.

[2 marks]

Calculate the charge that flows through the lamp in 60 seconds.

Charge = ... C

Question 2 continues on the next page

0 2 . 3

The reading on the voltmeter is 3.0 V.

[2 marks]

Calculate the resistance of the lamp.

Resistance = ... Ω

0 2 . 4

The lamp is replaced with a lamp that has a higher resistance.

[1 mark]

What happens to the current in the circuit?

0 2 . 5

A student wants to measure the potential difference across the cell.

[1 mark]

How should the voltmeter be connected?

Tick (✓) **one** box.

In series with the cell

☐

In parallel with the cell

☐

In series with the lamp

☐

In parallel with the ammeter

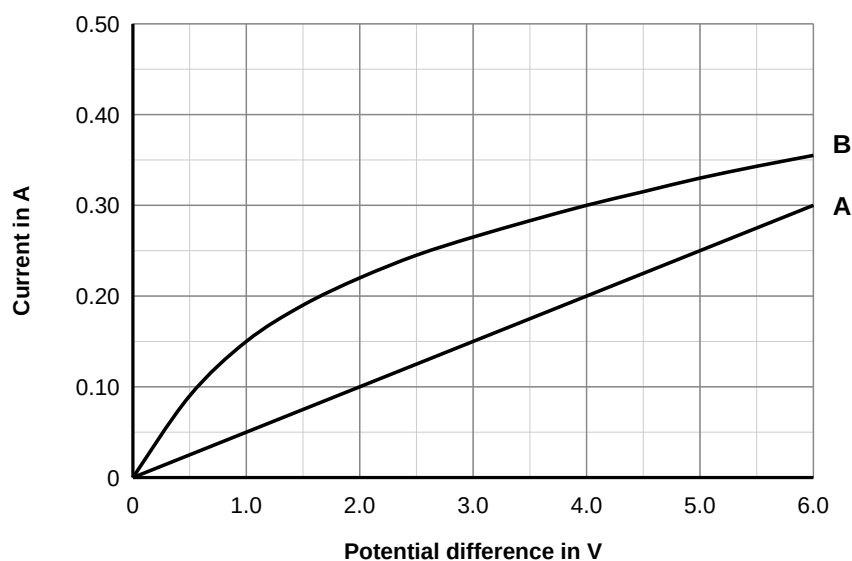
☐

0 3

A student investigated how the current through a component changes as the potential difference across the component is changed.

Figure 2 shows the results for a resistor and for a filament lamp.

Figure 2



03.1 Which line, **A** or **B**, shows the results for the resistor? [1 mark]

Line

03.2 Describe the relationship between the current through the resistor and the potential difference across the resistor. [1 mark]

.....

.....

03.3 Use **Figure 2** to determine the current through the filament lamp when the potential difference across the lamp is 4.0 V. [1 mark]

Current = ... A

03.4 Calculate the resistance of the filament lamp when the potential difference across the lamp is 4.0 V. [2 marks]

Use your answer to **03.3**.

Resistance = ... Ω

03.5 Explain why the resistance of the filament lamp increases as the potential difference increases. [2 marks]

.....

.....

.....

.....

03.6 The student used a variable resistor in the circuit. [1 mark]
What was the variable resistor used for?

.....

.....

Turn over for the next question

0 4 An electric kettle is connected to the mains electricity supply.

The mains supply in the UK has a potential difference of 230 V and is an alternating current (a.c.) supply.

0 4 . 1 What is the frequency of the UK mains supply? [1 mark]

Tick (✓) **one** box.

5 Hz ☐

50 Hz ☐

230 Hz ☐

500 Hz ☐

0 4 . 2 Which statement describes an alternating current? [1 mark]

Tick (✓) **one** box.

The current only flows in one direction ☐

The current is always zero ☐

The current keeps changing direction ☐

The current only flows when the switch is open ☐

0 4 . 3 The current through the kettle is 10 A. [2 marks]

Calculate the power of the kettle.

Power = ... W

0 4 . 4 The kettle is switched on for 180 seconds. [2 marks]

Calculate the energy transferred by the kettle in this time.

Use your answer to **04.3**.

Energy transferred = ... J

Question 4 continues on the next page

0 4 . 5

Electricity is transmitted from power stations to homes through the National Grid.

[2 marks]

Step-up transformers are used to increase the potential difference before the electricity is transmitted through the cables.

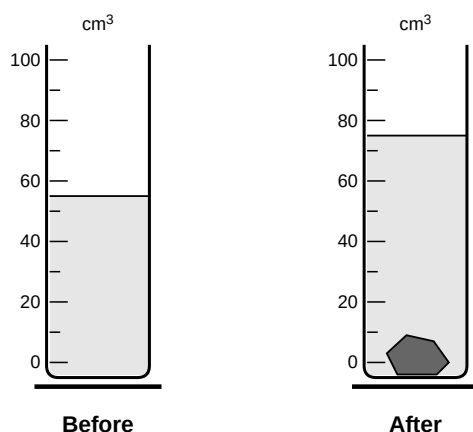
Explain why the potential difference is increased.

0 5

A student used a measuring cylinder to find the volume of a small metal object.

Figure 3 shows the measuring cylinder before and after the object was put into the water.

Figure 3



Do not write outside the box

0 5 . 1

Use **Figure 3** to determine the volume of the metal object.

[1 mark]

Volume = ... cm^3

0 5 . 2

The mass of the metal object is 54 g.

[2 marks]

Calculate the density of the metal.

Density = ... g/cm^3

Table 1 shows the densities of some metals.

Table 1

Metal	Density in g/cm ³
Aluminium	2.7
Iron	7.9
Copper	8.9
Lead	11.3

0 5 . 3 Which metal is the object made from? [1 mark]

Use **Table 1** and your answer to **05.2**.

0 5 . 4 Suggest **one** way the student could make the measurement of the volume more accurate. [1 mark]

0 5 . 5 Describe the arrangement and the movement of the particles in a solid. [2 marks]

Turn over for the next question

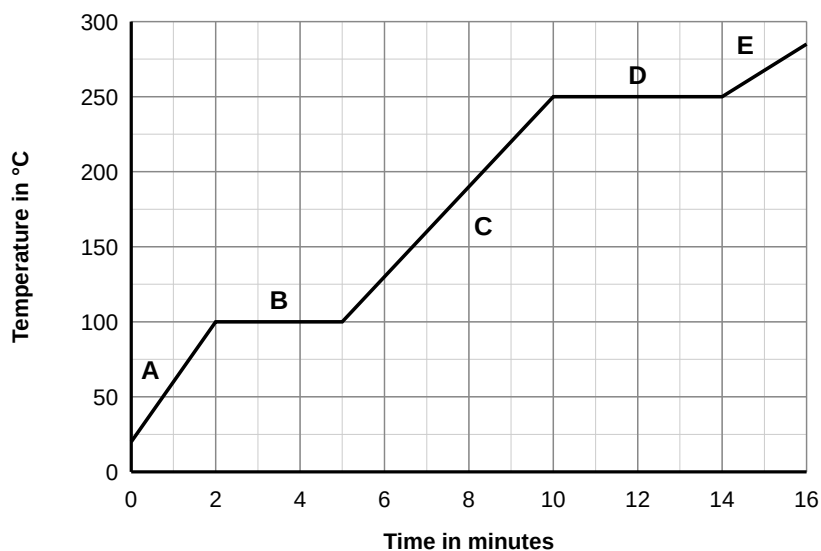
Do not write outside the box

06

A student heated a solid substance until it became a gas.

Figure 4 shows how the temperature of the substance changed with time.

Figure 4



06.1

Which section of the graph, **A**, **B**, **C**, **D** or **E**, shows the substance melting?

[1 mark]

Section

06.2

What is the melting point of the substance?

[1 mark]

Melting point = ... °C

06.3

Explain why the temperature of the substance does not change while it is melting, even though it is still being heated. [2 marks]

.....

.....

.....

.....

Question 6 continues on the next page

Do not write outside the box

- 06.4** The student then heated 0.50 kg of water from 20 °C to 60 °C. [2 marks]
 Calculate the energy needed to heat the water.
 specific heat capacity of water = 4200 J/kg °C

Energy = ... J

- 06.5** Calculate the energy needed to boil 0.50 kg of water at 100 °C to [2 marks]
 make 0.50 kg of steam.
 specific latent heat of vaporisation of water = 2 260 000 J/kg

Energy = ... J

- 07.1** Complete the sentences. [2 marks]
 Use words from the box.

electrons	ions	neutrons	nucleus
-----------	------	----------	---------

An atom has a small central which contains protons and

- 07.2** An atom of sodium has an atomic number of 11 and a mass number of [2 marks]
 23.

Give the number of protons and the number of neutrons in this atom.

Number of protons = ...

Number of neutrons = ...

- 07.3** Sodium has another isotope, sodium-22. [1 mark]
 How is an atom of sodium-22 different from an atom of sodium-23?

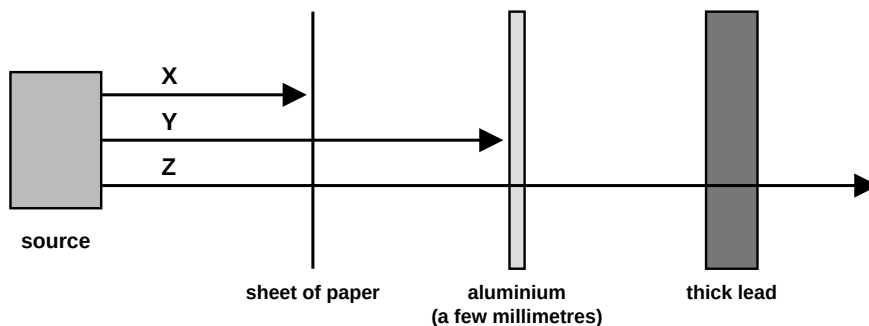
.....

Question 7 continues on the next page

Some atoms have unstable nuclei which give out radiation.

Figure 5 shows how far three types of nuclear radiation, **X**, **Y** and **Z**, can travel through different materials.

Figure 5



07.4

Which type of radiation, **X**, **Y** or **Z**, is alpha radiation?

[2 marks]

Give a reason for your answer.

Radiation

07.5

What is beta radiation?

[1 mark]

Tick (✓) **one** box.

A helium nucleus

☐

An electron from the nucleus

☐

Electromagnetic radiation

☐

A neutron from the nucleus

☐

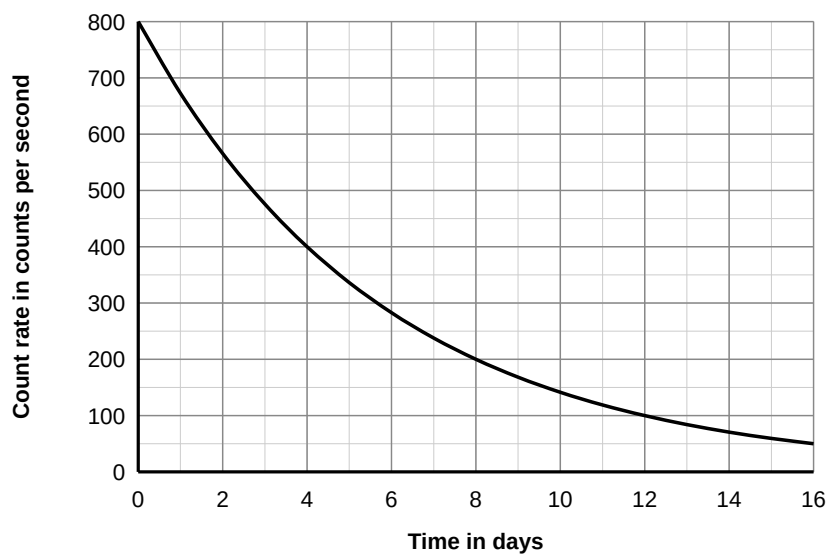
Turn over for the next question

Do not write outside the box

0 8 A radioactive source is used in a hospital.

Figure 6 shows how the count rate from the source changed with time.

Figure 6



0 8 . 1 What is meant by the **half-life** of a radioactive source? [1 mark]

0 8 . 2 Determine the half-life of the source. [2 marks]

Use **Figure 6**.

Show on **Figure 6** how you obtain your answer.

Half-life = ... days

0 8 . 3 What fraction of the radioactive nuclei in the source remains after **two** half-lives? [1 mark]

Tick (✓) **one** box.

$\frac{1}{2}$

☐

$\frac{1}{4}$

☐

$\frac{1}{8}$

☐

$\frac{1}{16}$

☐

Question 8 continues on the next page

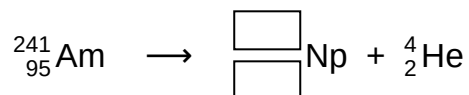
Do not write outside the box

0 8 . 4 A worker who handles the source wears gloves and uses tongs. [2 marks]

Explain how wearing gloves and using tongs reduce the risks to the worker.

0 8 . 5 Americium-241 is a radioactive isotope used in smoke detectors. An americium-241 nucleus decays by emitting an alpha particle to form a neptunium (Np) nucleus. [2 marks]

Complete the nuclear equation for this decay.



0 9 Electricity can be generated using different energy resources.

0 9 . 1 Which of these is a renewable energy resource? [1 mark]

Tick (✓) **one** box.

- | | |
|--------------|--------------------------|
| Coal | ☐ |
| Natural gas | ☐ |
| Nuclear fuel | ☐ |
| Wind | ☐ |

Question 9 continues on the next page

Table 2 gives some information about generating electricity using wind turbines and using a gas-fired power station.

Table 2

	Wind turbines	Gas-fired power station
Fuel	none needed	natural gas has to be bought and burned
Carbon dioxide produced when generating electricity	none	large amounts
Output	depends on the wind speed	can be changed to match demand
Land needed	many turbines spread over a large area	one large building

09.2 Compare the advantages and disadvantages of using wind turbines and using a gas-fired power station to generate electricity. [6 marks]

Use **Table 2** and your own knowledge.

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

END OF QUESTIONS

Additional page, if required.

Write the question numbers in the left-hand margin.

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

Do not write outside the box

Write the question numbers in the left-hand margin.

[illegible]

There are no more questions in this paper. Original practice paper © sciencegcse.co.uk – free to use for non-commercial education. Not an AQA paper.

Physics Equations Sheet

GCSE Combined Science: Trilogy – Practice Paper Series, Set 1

You may use these equations in your answers. HT = Higher Tier only equations. The equations are those listed in the AQA specification; this sheet is provided by sciencegcse.co.uk and is not an AQA document.

	Word equation	Symbol equation
1	kinetic energy = $0.5 \times \text{mass} \times (\text{speed})^2$	$E_k = \frac{1}{2} m v^2$
2	elastic potential energy = $0.5 \times \text{spring constant} \times (\text{extension})^2$	$E_e = \frac{1}{2} k e^2$
3	gravitational potential energy = mass $\times$ gravitational field strength $\times$ height	$E_p = m g h$
4	change in thermal energy = mass $\times$ specific heat capacity $\times$ temperature change	$\Delta E = m c \Delta \theta$
5	power = energy transferred $\div$ time	$P = E / t$
6	power = work done $\div$ time	$P = W / t$
7	efficiency = useful output energy transfer $\div$ total input energy transfer efficiency = useful power output $\div$ total power input	
8	charge flow = current $\times$ time	$Q = I t$
9	potential difference = current $\times$ resistance	$V = I R$
10	power = potential difference $\times$ current	$P = V I$
11	power = (current) $^2 \times$ resistance	$P = I^2 R$
12	energy transferred = power $\times$ time	$E = P t$
13	energy transferred = charge flow $\times$ potential difference	$E = Q V$
14 HT	potential difference across primary coil $\times$ current in primary coil = potential difference across secondary coil $\times$ current in secondary coil	$V_p I_p = V_s I_s$
15	density = mass $\div$ volume	$\rho = m / V$
16	thermal energy for a change of state = mass $\times$ specific latent heat	$E = m L$
17	weight = mass $\times$ gravitational field strength	$W = m g$
18	work done = force $\times$ distance (along the line of action of the force)	$W = F s$
19	force applied to a spring = spring constant $\times$ extension	$F = k e$
20	distance travelled = speed $\times$ time	$s = v t$
21	acceleration = change in velocity $\div$ time taken	$a = \Delta v / t$
22	(final velocity) ^{2} – (initial velocity) ^{2} = $2 \times$ acceleration $\times$ distance	$v^2 - u^2 = 2 a s$
23	resultant force = mass $\times$ acceleration	$F = m a$
24 HT	momentum = mass $\times$ velocity	$p = m v$
25	period = $1 \div$ frequency	$T = 1 / f$
26	wave speed = frequency $\times$ wavelength	$v = f \lambda$
27 HT	force on a conductor (at right angles to a magnetic field) carrying a current = magnetic flux density $\times$ current $\times$ length	$F = B I l$