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Examiners' Report
June 2025

GCSE Combined Science 1SC0 2PH

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June 2025

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Introduction

Questions were set to test candidates' knowledge, application and understanding from these topics in the specification:

Topic 1 – Key concepts of physics

Topic 8 – Energy – forces doing work

Topic 9 – Forces and their effects

Topic 10 – Electricity and circuits

Topic 12 – Magnetism and the motor effect

Topic 13 – Electromagnetic Induction

Topic 14 – Particle model

Topic 15 – Forces and Matter

It was intended that the examination paper would allow every candidate to show what they knew, understood and were able to do. Within the question paper, a variety of question types were included, such as objective questions, short answer questions worth one or two marks each, and longer questions worth three or four marks each. The inclusion of questions designed at targeting candidates' knowledge and understanding of practical work continued. This included assessing their fundamental knowledge of practicals specified in the specification, together with further application, especially where they were asked to propose improvements to a procedure.

The six-mark question, Q06(c), tested their ability to devise a procedure for taking measurements in electrical circuits and suggest what the outcomes might be.

Candidates coped well with most questions and did particularly well in the questions asking for calculations using equations.

Successful candidates were:

- well-acquainted with the content of the specification
- had been engaged with practical work during their course
- competent in quantitative work, especially in using equations
- willing to apply physics principles to the novel situations presented to them
- able to recognise key command words such as "describe" and "explain" and constructed their responses accordingly
- willing to apply physics principles to the novel situations presented to them.

Question 1(a)iii

This question was about how to reduce the energy dissipated as the trolley rolled down the runway.

(iii) The light gate, shown in Figure 1, is used to determine the actual velocity of the trolley at the end of the runway.

The actual velocity at the end of the runway is less than the expected velocity as calculated in (ii).

Suggest **one** way to reduce the difference between the actual velocity and the expected velocity.

(1)

Lubricate the wheels, so that less energy is wasted through friction in the bearings

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Examiner Comments

This was an acceptable suggestion. One mark scored.

Question 1(a)i-ii

In a question about a trolley rolling down a runway, candidates were asked:

(i) to show that the mass of the trolley was about 1.6 kg, given an equation involving change in gravitational potential energy, Δ *GPE*

(ii) to calculate a value for velocity at the end of the runway, given an equation for v^2.

1 (a) A student places a trolley at the top of a runway, as shown in Figure 1.

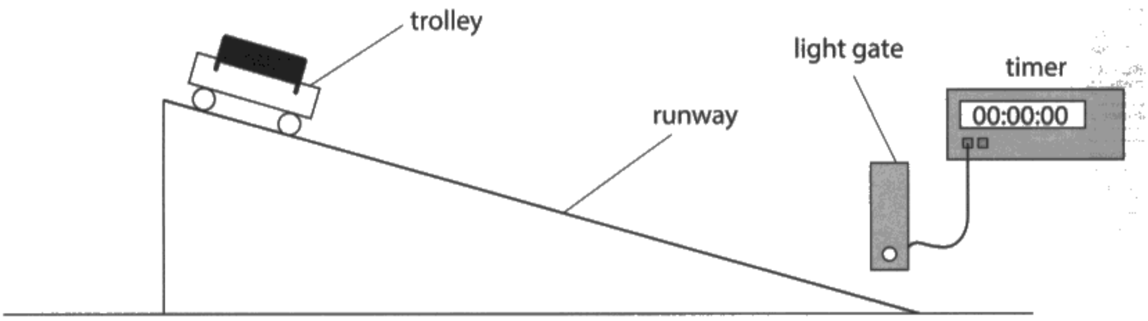

Figure 1

The student had to lift the trolley through a height of 26 cm to put it at the top of the runway.

The gravitational potential energy, Δ*GPE*, of the trolley increases by 4.1 J when lifted to the top of the runway.

The gravitational field strength, *g*, = 10 N/kg.

(i) Show that the mass of the trolley is about 1.6 kg.

Use the equation

$$m = \frac{\Delta GPE}{g \times \Delta h}$$

(2)

$\cancel{1.6 = \frac{4.1}{10 \times 26}}$

$26\text{cm} \xrightarrow{\div 100} 0.26\text{m}$

$\frac{4.1}{10 \times 0.26} = \frac{4.1}{2.6} = 1.5769\ldots$

1.6

(ii) The student releases the trolley and the trolley moves down the runway.

The student assumes that all the extra gravitational potential energy, ΔGPE, stored at the top of the runway is transferred to kinetic energy at the end of the runway.

Calculate the expected value of the velocity of the trolley at the end of the runway.

Use the equation

$$v^2 = \frac{2 \times \Delta GPE}{m}$$

$$= \frac{2 \times 4.1}{1.6}$$

$$v^2 = 5.125$$

$$v = \sqrt{5.125}$$

$$= 2.26\ldots$$

$$\downarrow$$

$$2.26$$

(3)

expected velocity = 2.26 m/s

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Examiner Comments

In this response, the working is clearly shown in both parts. The height of the runway is converted to m in Q01(a)(i): two marks scored. And in Q01(a)(ii) the square root is calculated at the end: three marks scored.

Question 1(b)

This was a deceptively complex calculation of the power generated by a student running up some stairs.

Some data was given, as was the equation.

The **mass** of the student was given but the equation involved the **weight** of the student.

There was a further complication in that the answer was required to 2 significant figures.

(b) A different student finds out how much power can be generated by running up some stairs in a measured amount of time.

The following quantities are measured:

mass of student = 48 kg

total height of stairs = 2.9 m

time to run up stairs = 3.4 s

Calculate the power the student generated.

Give the answer to 2 significant figures (2 s.f.).

Use the equation

$$\text{power} = \frac{\text{weight of student} \times \text{height of stairs}}{\text{time to run up stairs}}$$

(3)

weight = mass x gravitational field strength
weight = 48 x 10
weight = 480

$$\text{power} = \frac{480 \times 2.9}{3.4}$$

Power = 409.411
Power = 410W

power = 410 W

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Examiner Comments

In this response, the working is clearly and logically shown. The weight is calculated then the power is calculated. The answer is then given to 2 significant figures. Three marks scored.

Question 2(a)

Question 2(b)

This was a straightforward calculation of the power input to a television, given the necessary data and the equation.

(b) The mains supply to the television is 230V.

The current supplied to the television is 0.53 A.

Calculate the power input to the television.

Use the equation

$$P = I \times V$$

(2)

electrical Power

I × V

P = 0.53 × 230 = 121.9

power = 121.9 W

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Examiner Comments

Even though this is a straightforward calculation, it is a good idea to show the working. The number of significant figures is not specified here so this answer gains full marks. Two marks scored.

Question 2(c)ii

Here, candidates had to explain the action of a fuse.

An acceptable answer would involve the fuse melting and therefore switching off the current.

(ii) A 3 A fuse is used in the plug.

Explain what happens if a fault causes the current to rise to more than 3 A.

(2)

The thin, metal wire in the fuse will melt, causing the circuit to break.

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Examiner Comments

This is an acceptable response for both marks. Two marks scored.

Question 2(c)iii

Candidates had to state one safety device, other than a fuse, that can be used in domestic electrical wiring.

Two examples are included below.

(iii) A fuse is a safety device.

State **one** other safety device that can be used in domestic electrical wiring.

(1)

Earth wire

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An acceptable safety device. One mark scored.

(iii) A fuse is a safety device.

State **one** other safety device that can be used in domestic electrical wiring.

(1)

~~Earth wire~~ Circuit breaker

ResultsPlus
Examiner Comments

An acceptable safety device. One mark scored.

Question 2(d)

In this question about the suitability of cables supplying current in two different situations, acceptable explanations would link thicker wires to suitability to safely carry higher current.

(d) Figure 2 shows two pieces of electrical cable side by side.

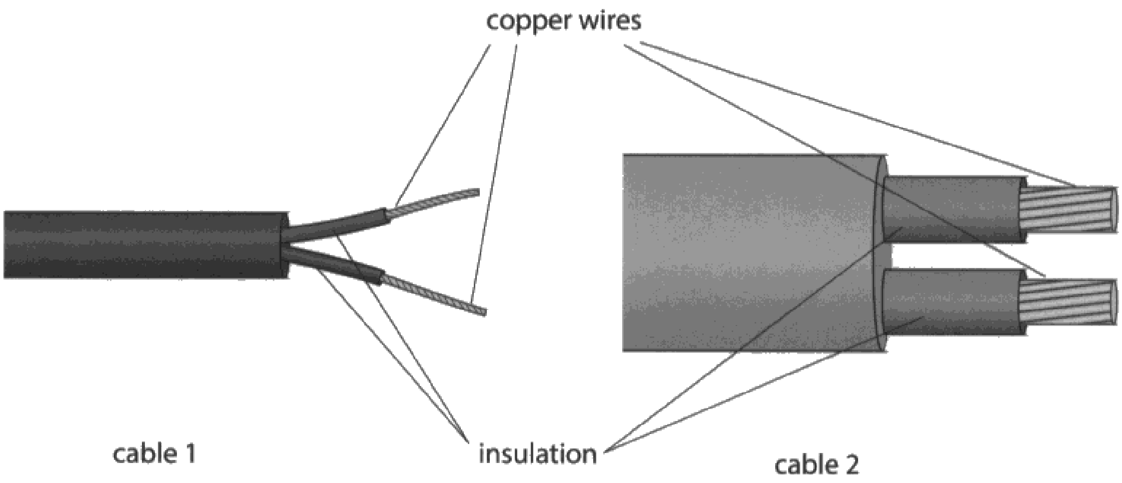

Figure 2

Cable 1 is used to supply electric current to the television.

Cable 2 is used to supply electric current to the house.

Explain why cable 2 is more suitable than cable 1 for supplying electric current to the house.

(2)

- thicker wires so more current can be transported
- More insulation so less heat energy loss and higher safety.

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Examiner Comments

This response achieves this in the first two lines. Reference to the insulation is not relevant here. Two marks scored.

Question 3(b)

This required a basic kinetic theory description of the changes in the motion of particles in a substance as the substance changes from liquid to solid.

(b) Describe the change in the motion of the wax particles as the wax changes from liquid to solid.

(2)

As the wax changes from liquid to solid the particles will move slower as they are losing energy so they will be vibrating and become in more fixed arrangement ~~up~~ .

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Examiner Comments

This description covers the main points to the appropriate depth. Two marks scored.

Question 3(c)i

Candidates had to select relevant data from a table and use it to calculate the volume of liquid wax. The equation was given in the question but it required rearranging.

motion to more motion.

(c) Figure 4 shows the values of some properties of the wax.

property	value
density when solid	930 kg / m^3
density when liquid	830 kg / m^3
specific latent heat	190 kJ / kg
specific heat capacity of solid wax	2.1 kJ / kg °C

Figure 4

(i) The wax has a mass of 3.9 kg.

Using information from Figure 4, calculate the volume of the wax when it is all liquid.

Use the equation

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

$$\frac{M}{\rho \mid V}$$

$$V = \frac{M}{\rho} = \frac{3.9}{830} = 0.0046\,98\ldots$$

(2)

$$= 0.0047 \text{ (2 SF) } m^3$$

M = 3.9 kg

ρ = 830

volume = 0.0047 m^3

ResultsPlus
Examiner Comments

The working shows the correct data has been selected, the equation rearranged and the correct value calculated.

Question 3(c)ii

Question 3(c)iii

Candidates had to apply their knowledge and understanding, using data from a table and a cooling curve, to suggest an explanation for quite a demanding concept.

They could score all three marks if their explanation linked three of the following points.

- specific heat capacity is (much) less than specific latent heat
- specific heat capacity is 2.1(kJ/kg °C) and specific latent heat is 190 (kJ/kg)
- less (thermal) energy is transferred (to surroundings during R to S)
- (thermal) energy transferred (to surroundings) at similar / constant rate.

(iii) Explain why, using Figure 4, the time from R to S is much shorter than the time from Q to R on the graph in Figure 3.

(3)

Q-R was liquid wax, and R-S was solid wax. The SLH is 190kJ/kg, so it takes a lot of energy for the wax to change state. so Q-R took a long time because it was changing into solid. The SHC for solid wax is a lot less (2.1kJ/kg°C), so not a lot of energy is needed for temp. change, so R-S is fast.

(Total for Question 3 = 9 marks)

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Examiner Comments

Lines 2 and 5 in the response cover the first two marking points and the third marking point is covered by 'less energy needed', avoiding the direction of energy transfer. Three marks scored.

Question 4(a)i

Question 4(b)i

Question 4(b)ii-iii

Candidates had to use data from a table to complete a bar chart and then describe the relationship between the variables shown on the bar chart.

Full marks could be scored in the description for saying that as the number of plastic strips increased, the mean number of nails picked up would decrease and that this relationship was not linear.

(ii) Use the data in Figure 7 to complete the bar chart in Figure 8.

(1)

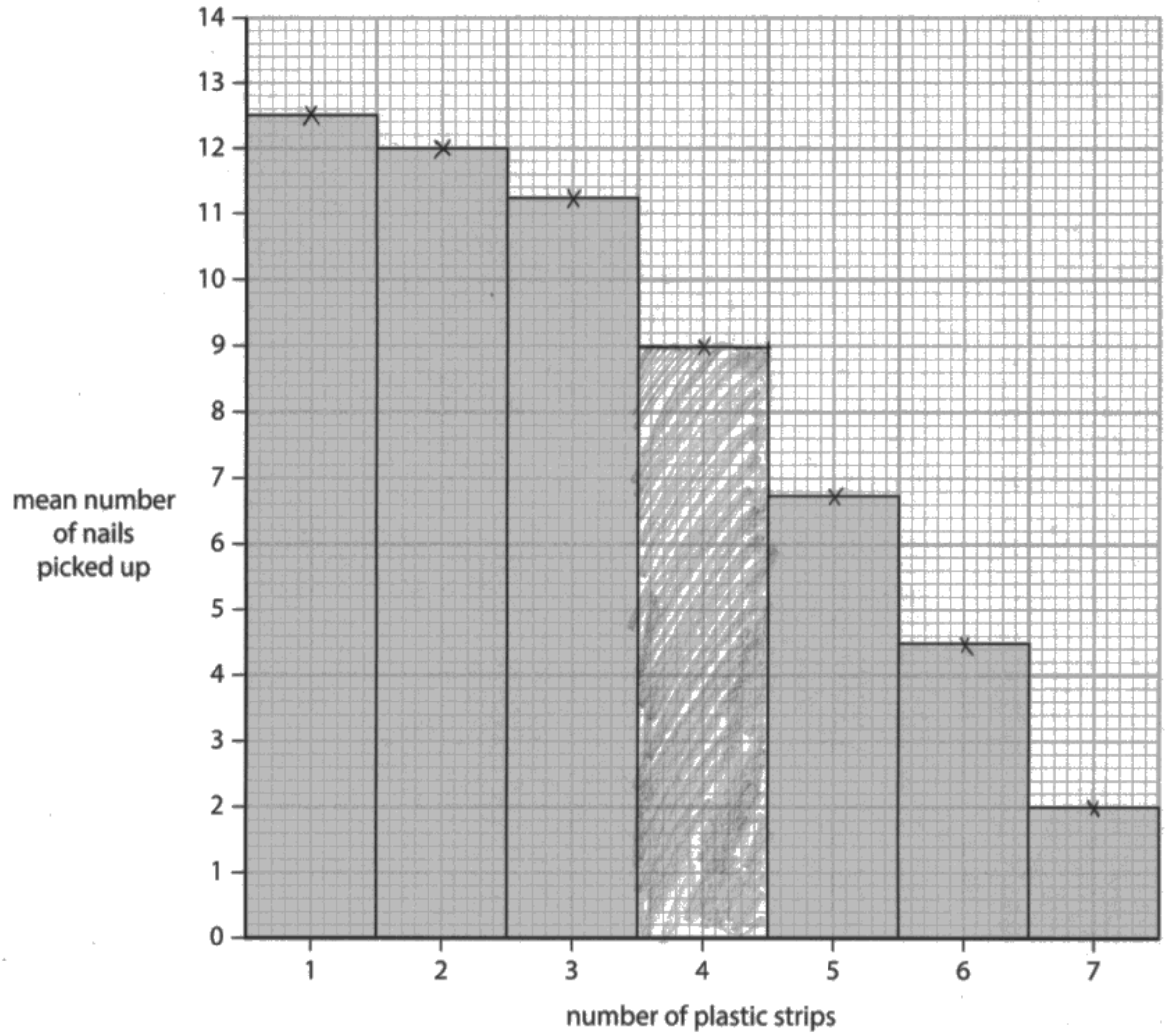

Figure 8

(iii) Use Figure 8 to describe the relationship between the number of plastic strips and the mean number of nails picked up.

(2)

As the number of plastic strips increases the mean number of nails picked up decreases. The gradient of the graph isn't constant so the relationship ~~graph~~ isn't linear and not directly proportional

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Examiner Comments

This scores both marks for the description and even explains what they mean by ‘isn’t linear’. One mark scored for the bar chart. Two marks scored for the description.

Question 4(b)iv

Candidates had to suggest a test for the hypothesis that the nails used in an investigation had not become permanently magnetised.

Both the available marks could be scored for outlining a suitable test and its expected results.

(iv) A student thinks that none of the nails used in the investigation become permanently magnetised.

Suggest how the student could test this hypothesis.

(2)

remove the nail from the magnet and and hold it to another nail. If the nail picks up the nail then it has become a permant magnet, if not, then it has not became a permanant magnet.

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Examiner Comments

This is an example of a response that scores both marks. Two marks scored.

Question 4(c)

Here candidates were given an unfamiliar equation involving magnetic flux density *B*.

$B \times d^2 = K$

where *K* was a constant.

They were given a pair of values for *B* and *d*, then asked to calculate a value for *B* for a different value of *d*.

(c) The magnetic flux density, *B*, is a measure of the strength of the magnetic field of a magnet.

B varies with the distance, *d*, from a magnetic pole of a magnet as given by the equation

$$B \times d^2 = K$$

where *K* is a constant for the magnet.

At a distance of 3 mm from the pole of a magnet, $B = 650\,\mu T$.

Calculate the value of *B* at a distance of 6 mm from the pole of the magnet.

(3)

$650 \times 3^2 = 5850$

$K = 5850$

$B = \frac{5850}{6^2} = 162.5$

$= 163$

B at 6 mm = 163 μT

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Examiner Comments

The working here is clear and logical. A value is calculated for K using the original data. This value and the new value for d are substituted into the equation to find the new value for B . Three marks scored.

Question 5(a)i

The same spring was shown in a horizontal position and in a vertical position. Candidates were asked to give a reason why the spring was longer when vertical.

5 (a) A student measures the length of a spring when it is horizontal and when it is vertical, as shown in Figures 9a and 9b.

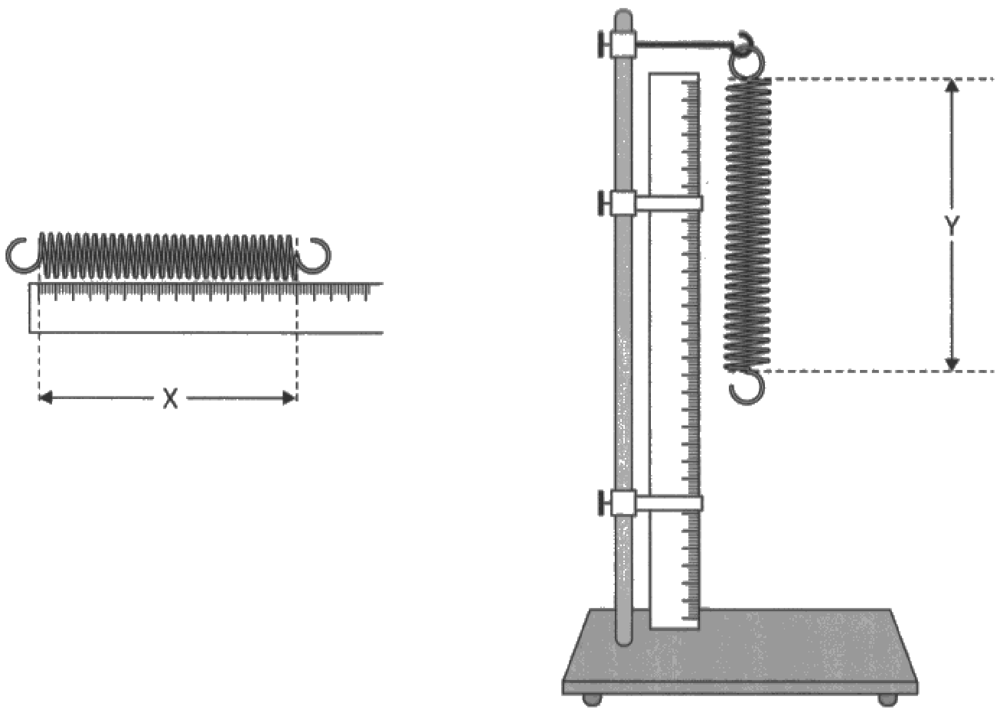

Figure 9a **Figure 9b**

The length, Y, of the vertical spring in Figure 9b is greater than the length, X, of the horizontal spring in Figure 9a.

(i) Give a reason why the length of the spring in Figure 9b is greater than the length of the the spring in Figure 9a.

(1)

gravity pulls the spring downwards when verticle, causing spring to stretch.

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Examiner Comments

This is a perfectly acceptable reason. One mark scored.

Question 5(b)i

Candidates had to find the energy stored in a spring by calculating the area under a graph for a specified extension of the spring.

The extension on the graph was given in cm but the energy was required in J. This meant a conversion from cm to m.

(b) The extension of the spring in Figure 10b is now determined for different weights added to the spring up to a maximum of 6 N.

Figure 11 shows a graph of the results.

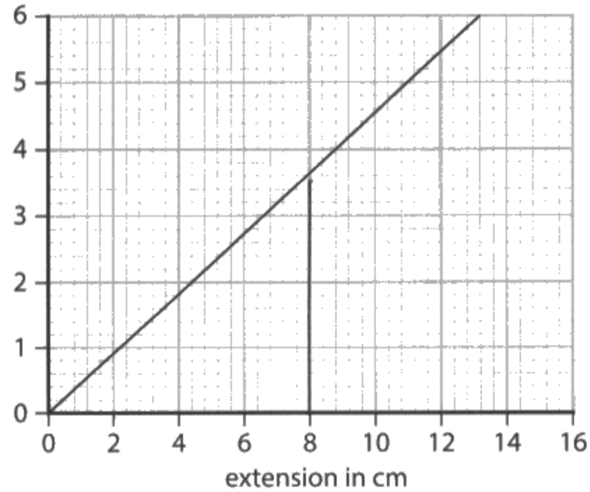

Figure 11

(i) The increase in potential energy stored in the spring is equal to the area under the graph in Figure 11.

Calculate the increase in potential energy stored in the spring when the spring is extended from 0 cm to 8 cm.

$8 \div 100 = 0.08$

Give your answer in joules (J).

(3)

$\frac{0.08 \times 3.6}{2} =$

energy = 0.144 J

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This response shows the unit conversion (8 ÷ 100) and the correct method for calculating the area of a triangle. Three marks scored.

Question 5(b)ii

In calculating the spring constant using data from the graph, candidates were required to state the unit with their answer. An extension in cm or m was acceptable, provided the unit was consistent with their answer.

(ii) Calculate the spring constant of the spring using data from the graph in Figure 11.

State the unit.

$F = ke$ $\qquad$ $\frac{\Delta y}{\Delta x}$ $\qquad$ $\frac{3.6}{0.08}$ **(2)**

$k = \frac{F}{e}$

spring constant = 45 unit N/m

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This response has an extension of 0.08 m, giving the correct answer of 45 N/m. 0.45 N/cm would also gain full marks. Two marks scored.

Question 5(b)iii

Candidates had to draw 2 vectors to complete a free body force diagram.

Examiners were looking for 2 vertical arrows, one pointing up the other pointing down.

The arrows should be acting through a point in the centre of the box.

The arrows should be the same length (or each labelled 5 N).

(iii) The box in Figure 12 represents a weight added to the end of the spring.

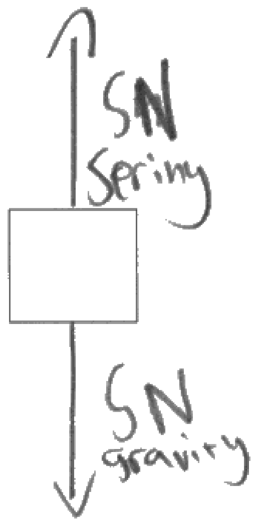

Figure 12

Draw **two** vectors on Figure 12 to complete a free body force diagram of a 5 N weight in equilibrium.

(2)

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In this context, this diagram scored full marks. Two marks scored.

Question 5(c)

Candidates had to complete a vector diagram to show the size and direction of a resultant force.

(c) Figure 13 shows two forces, P and Q, acting at point X.

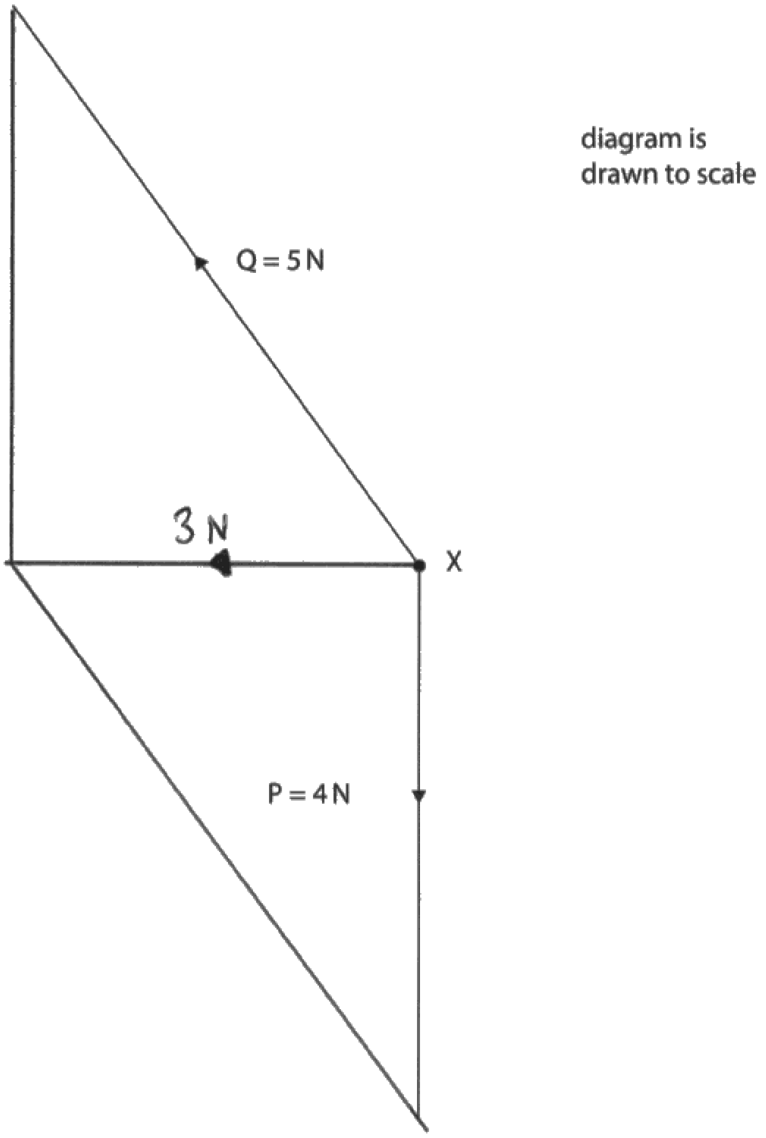

Figure 13

Complete the diagram in Figure 13 to show the size and direction of the resultant force, R, on point X.

(2)

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This response uses the parallelogram of forces to arrive at the correct answer. Two marks scored.

(c) Figure 13 shows two forces, P and Q, acting at point X.

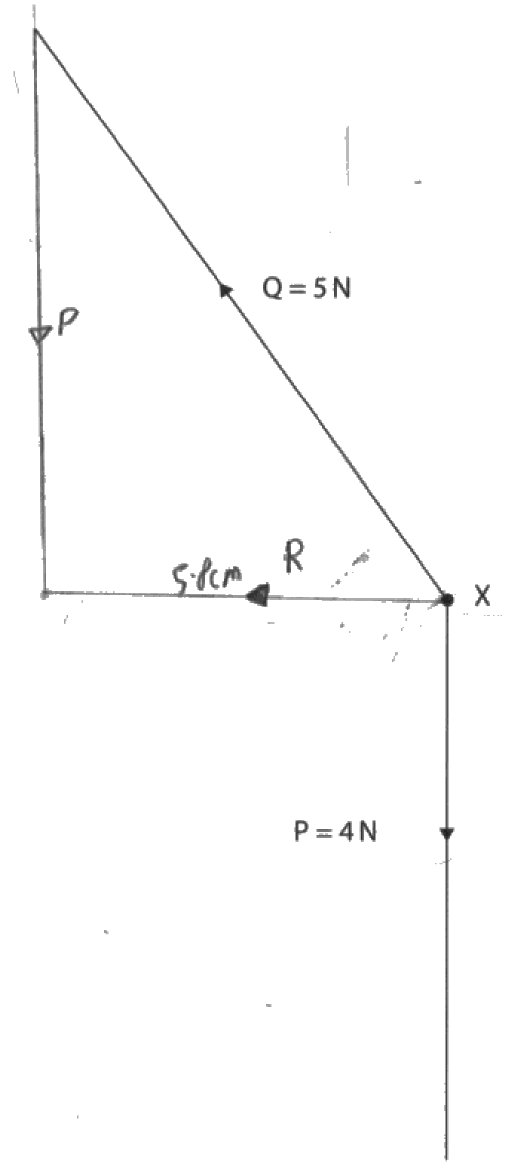

Figure 13

Complete the diagram in Figure 13 to show the size and direction of the resultant force, R, on point X.

Q+P

(2)

Q+P=R

√4 5.8÷2 = 2.9

6.4×2=12.8

(Total for Question 5 = 11 marks)

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This response uses the triangle of forces, measures the length of the resultant and converts it to a force in the allowed range (2.5 to 3.5 N) in the writing under the diagram. Two marks scored.

Question 6(a)i

Candidates had to calculate the resistance of a resistor, given the current and the potential difference. They had to select and rearrange the equation and be aware that the current was given in mA and not in A.

6 (a) A student connects a resistor across the terminals of a 9V battery.

There is a current of 6 mA in the resistor. $\rightarrow 6 \times 10^{-3}$ amp

(i) Calculate the resistance of the resistor.

(2)

$V = I \times R$

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

$\cancel{6 \times 10^{-3}}$

$1500 = \frac{9}{6 \times 10^{-3}}$

resistance = 1500 Ω

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Examiner Comments

In this response, the correct equation is rearranged, the current is converted to A and the correct value for the resistance is calculated. Two marks scored.

Question 6(a)ii

In Q06(a)(i), there was a resistor connected across the terminals of a battery. Here, candidates were asked to describe how an additional component could be used to vary the current in the resistor. Ideally, examiners were looking for a variable resistor connected in series with the original resistor.

(ii) Describe how an additional component could be used to vary the current in the resistor.

(2)

Add a ~~variational~~ variable resistor in series with it

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This is a perfectly acceptable response. Two marks scored.

Question 6(c)

In this extended open response question, candidates were given some information about series and parallel circuits. They were asked to describe, with the aid of circuit diagrams, how a student could use ammeters and voltmeters to investigate the information and compare the expected results.

A level 3 response would include diagrams of a series circuit and a parallel circuit, showing correctly connected ammeters and voltmeters and a comparison between the expected results for currents in the two circuits and a comparison between the expected results for potential differences in the two circuits.

*(c) The table in Figure 14 gives some information about **series** and **parallel** circuits.

series and **parallel** circuits
A battery can be connected to two equal value resistors in **series**. The same battery can be connected to the same two equal value resistors in **parallel**.
The current from the battery when the resistors are in **series** is different from the current from the battery when the resistors are in **parallel**.
The potential difference across each resistor when the resistors are in **series** will be different from the potential difference across each resistor when the resistors are in **parallel**.

Figure 14

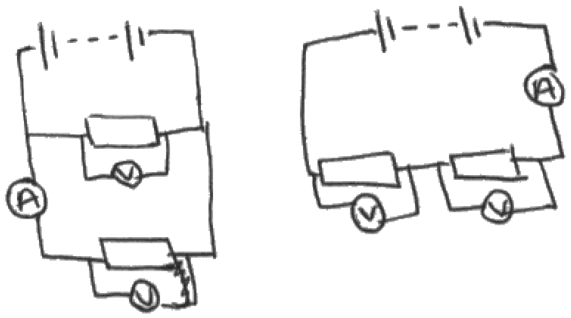
Describe how a student can use ammeters and voltmeters to investigate the information given in Figure 14.

Your answer should include

- circuit diagrams showing how the currents and voltages can be measured
- a comparison of the results that would be expected

(6)

Space for circuit diagrams



when resistors are in parallel, there is less resistance than when resistors are in series because the current has more routes to flow in a parallel circuit meaning more is flowing and there is less slowing down. Use ammeters to measure this.

In a series circuit, the PD is shared across components and depending on which resistor has the most ohms of resistance determines which one gets the biggest share of volts. In a parallel circuit, all resistors will get the same share of potential difference, equal to the number in the battery. Use a voltmeter across each resistor to measure this.

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This response shows clearly drawn series and parallel circuits with ammeters and voltmeters correctly connected. There follows a concise comparison between the current in the two circuits and a concise comparison between the potential difference in the two circuits. Level 3, six marks.

Paper Summary

Based on their performance on this paper, candidates are offered the following advice:

- Make sure that they have a sound knowledge of the fundamental ideas in all the topics.
- Get used to the idea of applying their knowledge to new situations by attempting questions in previous examination papers.
- When describing a practical procedure, draw a labelled diagram to help their answer.
- When suggesting improvements or extensions to a practical procedure, make sure they are relevant to the context of the question.
- Where a question involves a calculation, make sure they write down the equation they are using (if not given in the question) and show each step in their working.
- Make sure that they recognise SI prefixes such as m and k and n and how to handle these in calculations.
- Use the marks at the side of a question as a guide to the form and content of their answer.

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