Examiners' Report
June 2025

GCSE Physics 1PH0 2F

Edexcel and BTEC Qualifications

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June 2025

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Introduction

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

Topic 1 – Key Concepts of Physics

Topic 8 – Energy

Topic 9 – Forces and their effects

Topic 10 – Electricity and circuits

Topic 11 – Static electricity

Topic 12 – Magnetism and the motor effect

Topic 14 – Particle mode

Topic 15 – Forces and Matter

The assessment is through multiple choice questions, short answers, extended writing, calculations and analysis.

The paper also tested the skills acquired by candidates when completing practical work. The specification includes core practicals which should be included in the scheme of work and a number of suggested practicals which exemplify points in the specification to help candidates' understanding.

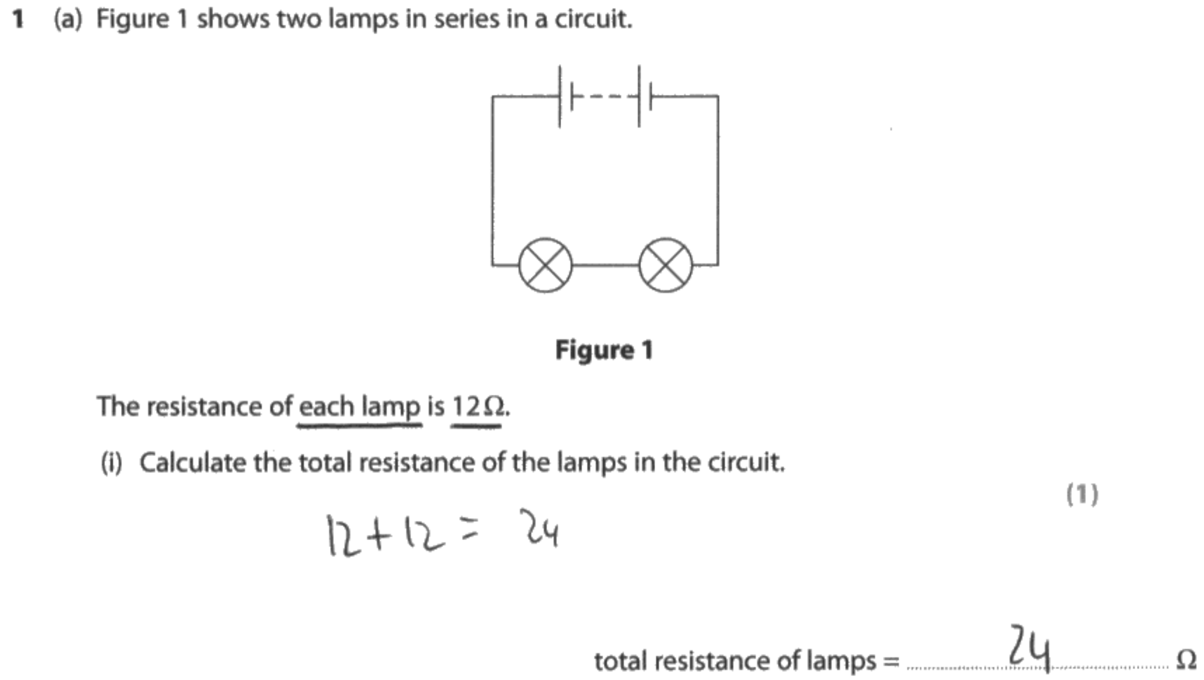
Most candidates managed the calculation questions in this paper where the equation was given. However, many did not show full substitution of numbers, or where working was shown it was unclear. This often led to candidates scoring zero marks on the calculation question where some working may have scored them partial credit. Where an equation is given candidates should be encouraged to write the equation out again with the relevant number for each quantity directly underneath thus clearly showing the correct substitution before starting the calculation.

The questions that tested practical skills were answered with mixed success. Most candidates managed at least partial credit, but often marks were missed due to a lack of clarity in given methods. Candidates should be encouraged to use clear words, such as 'measure' and 'calculate' and should also be encouraged to break longer answers up into separate sentences which each address a specific part of the method, such as each required measurement with its apparatus.

Question 1(a)(i)

Even in one mark calculations, candidates should be encouraged to show their working.

Most scored the mark here, with the most common incorrect answer using 12 x 12.



1 (a) Figure 1 shows two lamps in series in a circuit.

Figure 1

The resistance of each lamp is 12Ω.

(i) Calculate the total resistance of the lamps in the circuit.

(1)

12+12 = 24

total resistance of lamps = 24 Ω

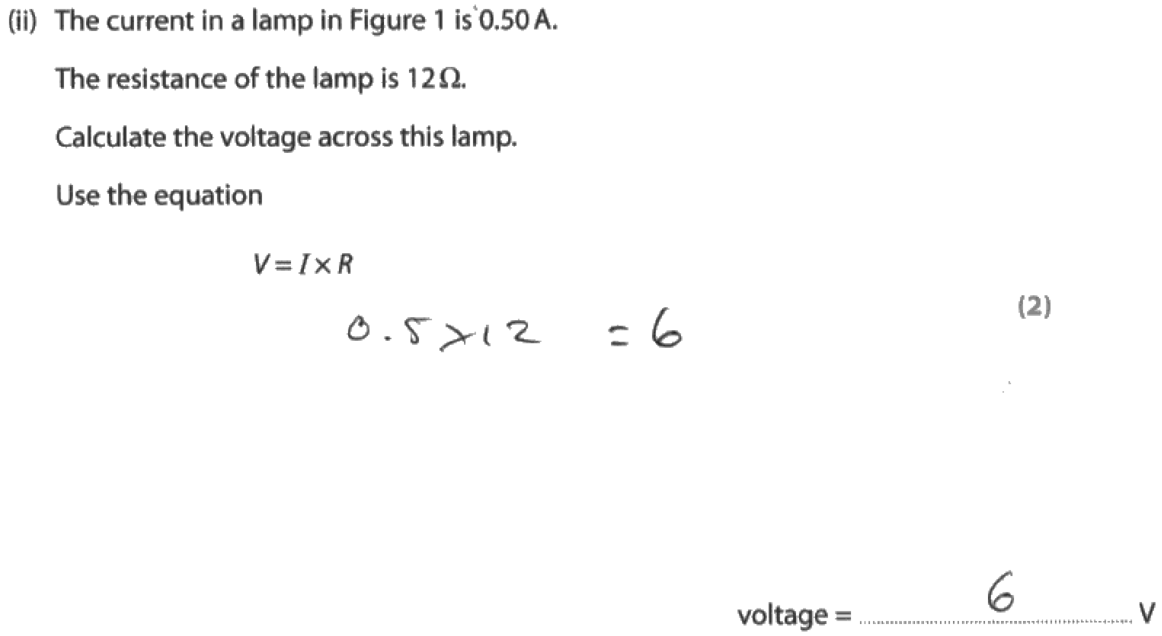
ResultsPlus
Examiner Comments

This response shows clear working leading to the correct answer.

Question 1(a)(ii)

When an equation is given the clearest working shows substitution of numbers in the same order as the given equation as shown in this example.

Even better is if the unknown quantity is left as a letter (V in this case). Candidates who routinely do this will make fewer errors and will find rearrangements easier.



(ii) The current in a lamp in Figure 1 is 0.50 A.

The resistance of the lamp is 12 Ω.

Calculate the voltage across this lamp.

Use the equation

$$V = I \times R$$

(2)

$0.5 \times 12 = 6$

voltage = 6 V

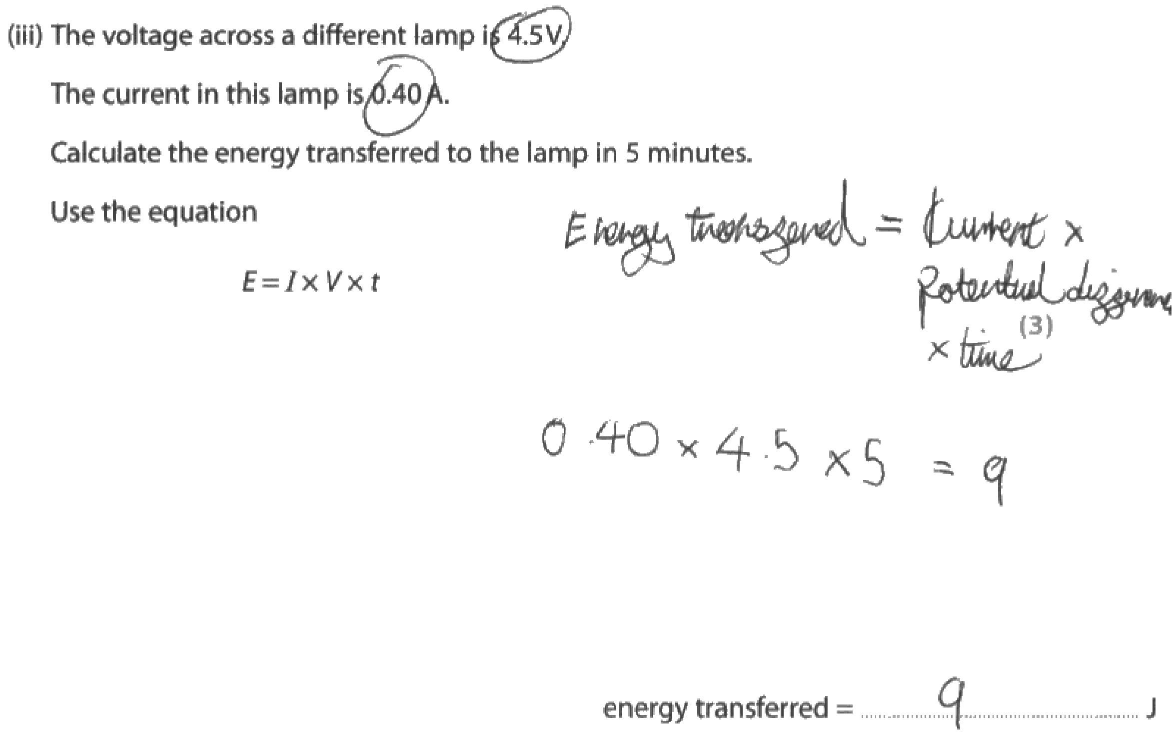
ResultsPlus
Examiner Comments

This response was awarded two marks.

Question 1(a)(iii)

This question required candidates to convert the given time into seconds before substituting into the given equation.

Marks were still awarded for those who completed the calculation correctly without the unit conversion.



(iii) The voltage across a different lamp is 4.5 V.

The current in this lamp is 0.40 A.

Calculate the energy transferred to the lamp in 5 minutes.

Use the equation

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

Energy transfered = Current × Potential difference × time

(3)

0.40 × 4.5 × 5 = 9

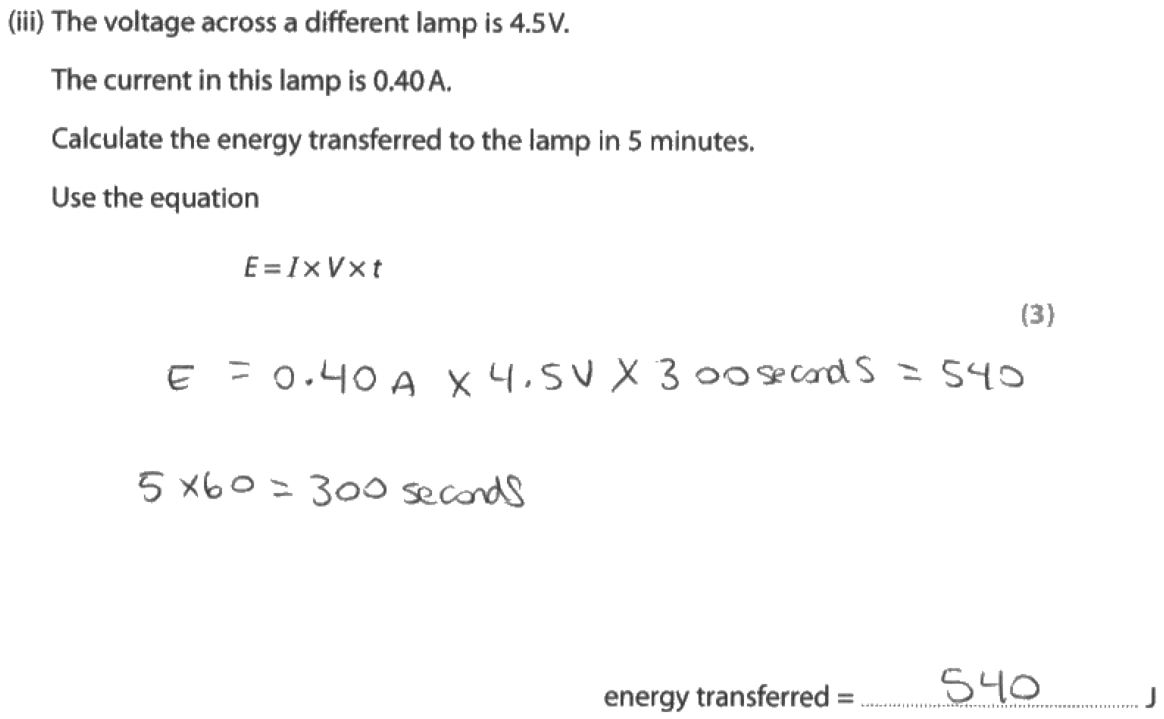
energy transferred = 9 J

ResultsPlus Examiner Comments

This response scores two marks for correct substitution and evaluation using the time in minutes.

ResultsPlus Examiner Tip

Candidates should be encouraged to still attempt the question even if they do not know how to convert the units. It is worth telling candidates that they will still receive credit if they do not convert.



(iii) The voltage across a different lamp is 4.5 V.

The current in this lamp is 0.40 A.

Calculate the energy transferred to the lamp in 5 minutes.

Use the equation

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

(3)

E = 0.40A x 4.5V X 300seconds = 540

5 x60 = 300 seconds

energy transferred = 540 J

ResultsPlus
Examiner Comments

This response scores three marks.

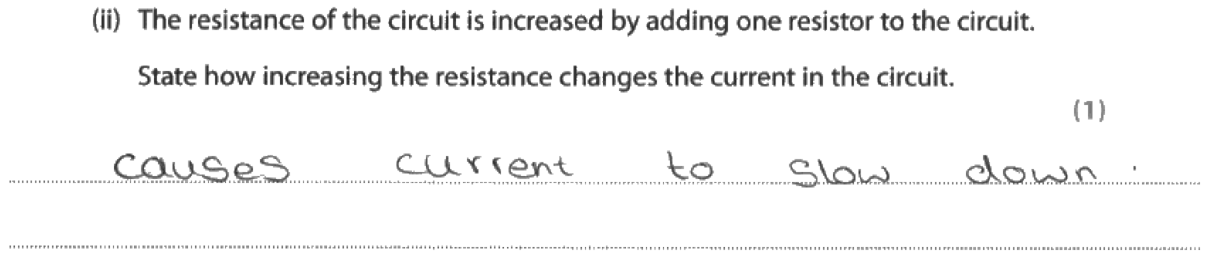
The candidate has clearly shown the conversion of time to seconds and full substitution of numbers into the equation. A very clear, correct response.

Question 1(b)(ii)

Candidates were expected to make the link between increased resistance and decreased current to score the mark here.

Some candidates did not score the mark due to a lack of clarity in their answer. To score they needed to state that the current decreased, some (such as the response shown) referred to the current 'slowing down', this was not awarded credit as it does not show understanding of the effect on the current.

Other words and phrases that clearly meant 'decrease' were accepted though and candidates should be regularly reminded to use words such as 'decrease' when describing how quantities change.



(ii) The resistance of the circuit is increased by adding one resistor to the circuit.

State how increasing the resistance changes the current in the circuit.

(1)

causes current to slow down.

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Examiner Comments

This response did not score any marks.

Question 2(b)(i)

Most candidates scored both marks here, however many did not show any working.

An answer on the answer line of 525 did score two marks but some of those that gave the wrong answer could have scored one mark if the correct working were shown. Evidence of calculator errors were seen and so it is always worth showing working even in simpler calculations.

(b) (i) Figure 3 shows a rock and a long lever.

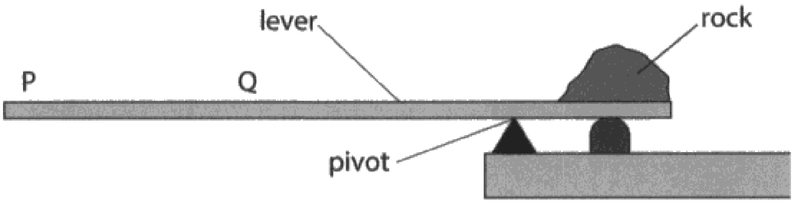


Figure 3

The lever is used to try to move the rock.

The lever is pushed downwards at Q with a force of 375 N.
Q is 1.4 m from the pivot.

Calculate the moment of the force at Q about the pivot.

Use the equation

moment of a force = force × distance from pivot

(2)

N x m = Nm
375 x 1.4 = 525

moment of force = 525 Nm

ResultsPlus
Examiner Comments

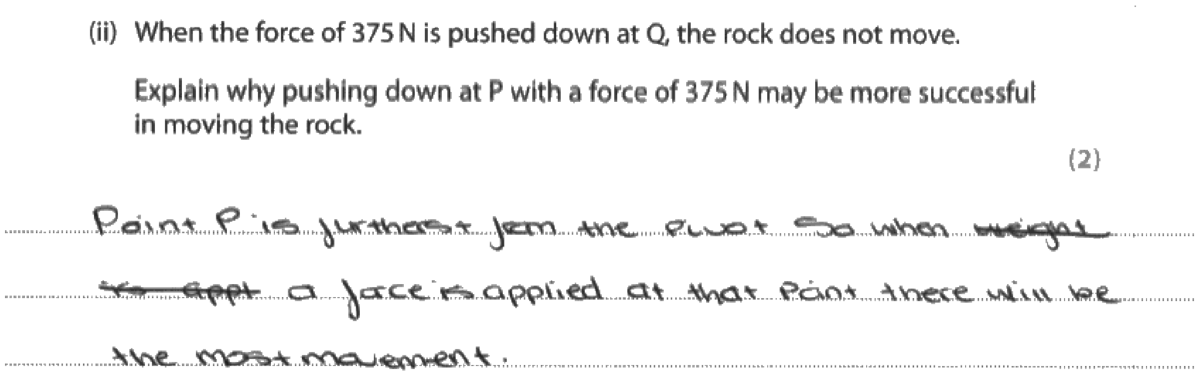
This response scores two marks for the correct answer, but also shows clear working with a check using units to make sure that the correct numbers are being used.

Question 2(b)(ii)

A number of candidates scored the first marking point by stating that P was further from the pivot than Q. However, very few were able to link this to an increased moment.

The majority who achieved the second marking point did so by stating that the rock was easier to lift which was accepted.

A number of candidates referred to the rock sliding, or moving without indication of lifting which did not score. It was common to see candidates repeating the stem of the question without further detail.



(ii) When the force of 375 N is pushed down at Q, the rock does not move.

Explain why pushing down at P with a force of 375 N may be more successful in moving the rock.

(2)

Point P is furthest from the pivot So when ~~weight~~ ~~to appl~~ a force is applied at that point there will be the most movement.

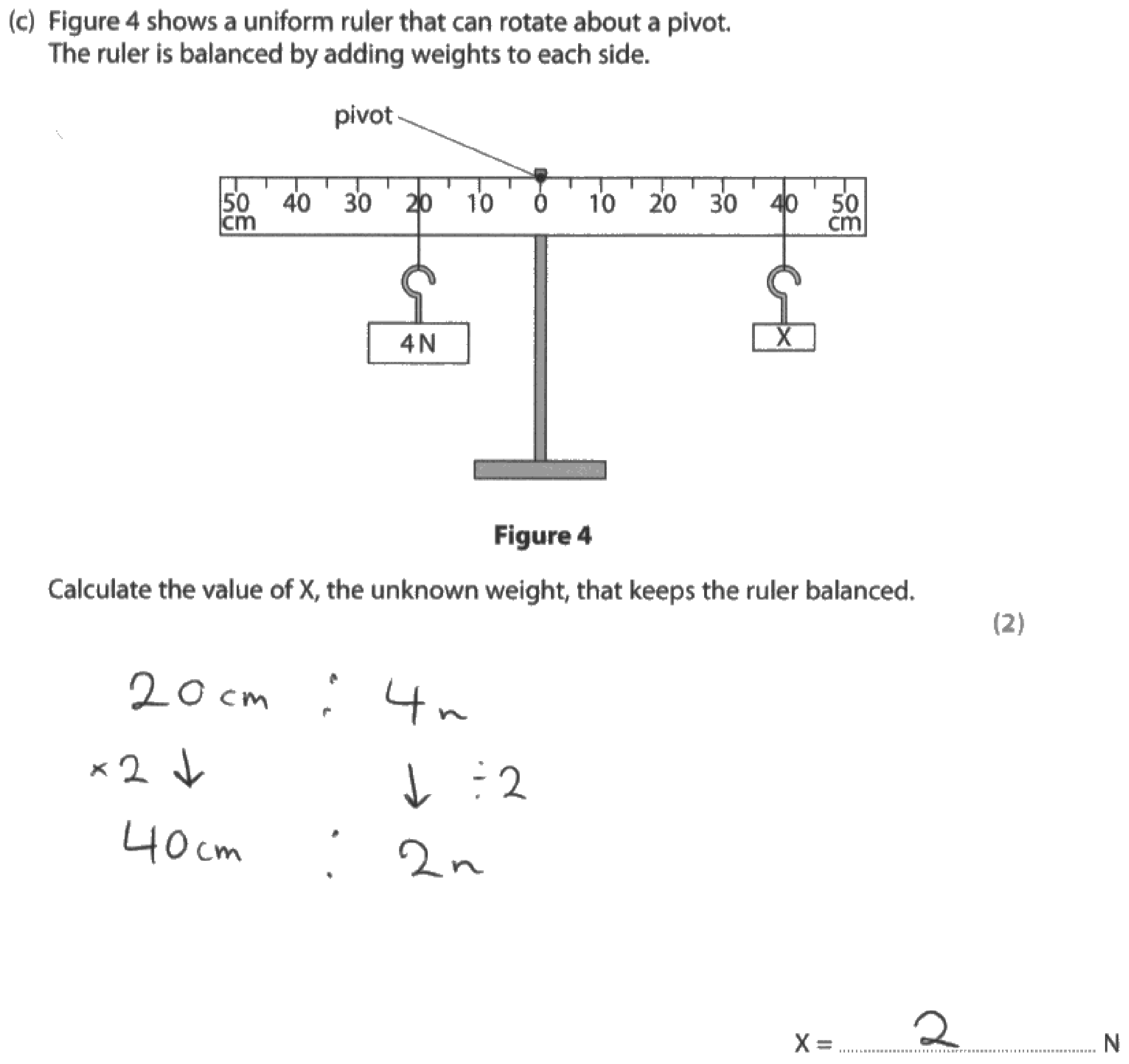
ResultsPlus
Examiner Comments

This response scores one mark for the idea that P is further from the pivot.

The second mark is not scored as the stated effect is not clear enough and is too close to the information given in the question.

Question 2(c)

The working shown for this question were often unclear and difficult to follow. However many did manage to obtain the correct answer of 2.0N.



(c) Figure 4 shows a uniform ruler that can rotate about a pivot.
The ruler is balanced by adding weights to each side.

Figure 4

Calculate the value of X, the unknown weight, that keeps the ruler balanced.

(2)

20cm : 4n

×2 ↓ ↓ ÷2

40cm : 2n

X = 2 N

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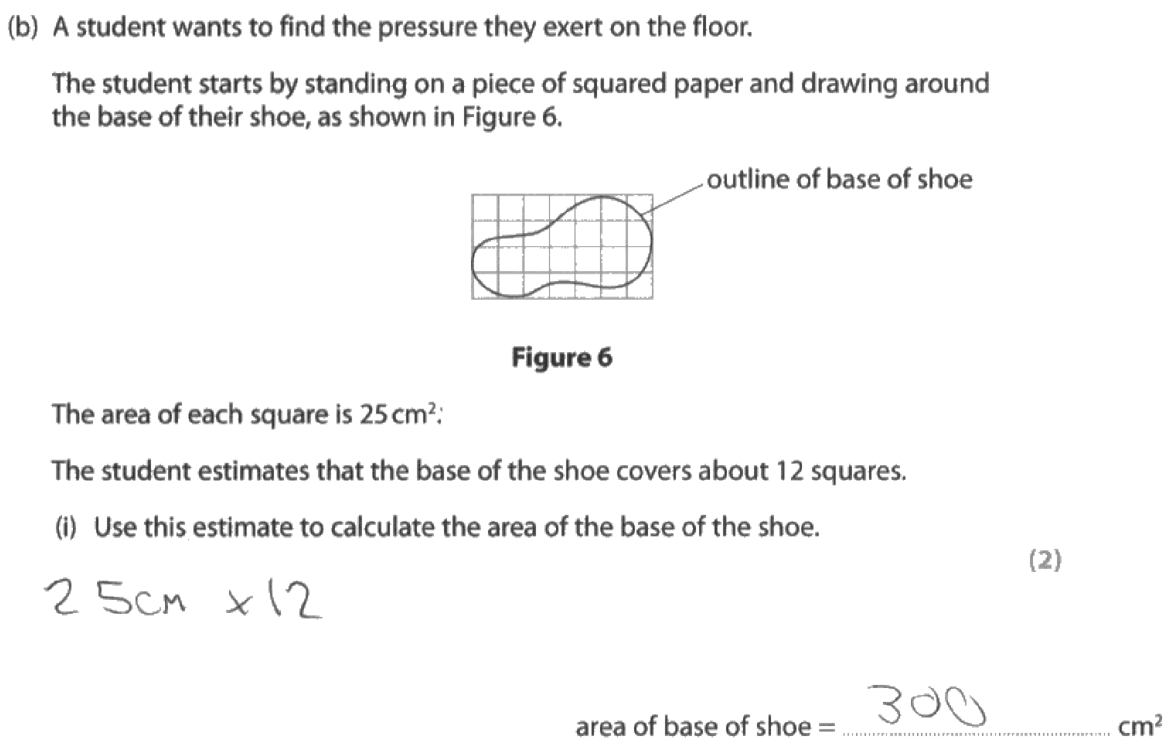
Examiner Comments

This response does show clear working, the idea that if the distance doubles, the weight will halve leading to the correct answer.

Question 3(b)(i)

This question required candidates to calculate the area given the area of each square.

Most scored both marks here with the most common incorrect answer coming from an inclusion of the square from the unit, therefore squaring the 25.



(b) A student wants to find the pressure they exert on the floor.

The student starts by standing on a piece of squared paper and drawing around the base of their shoe, as shown in Figure 6.

outline of base of shoe

Figure 6

The area of each square is 25 cm^2.

The student estimates that the base of the shoe covers about 12 squares.

(i) Use this estimate to calculate the area of the base of the shoe.

(2)

25cm x12

area of base of shoe = 300 cm^2

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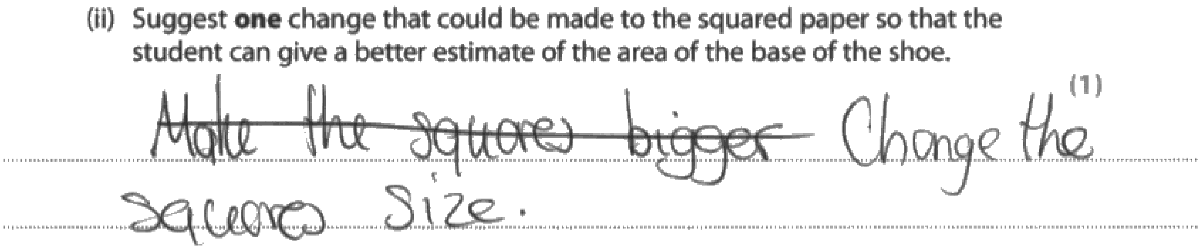
Examiner Comments

This response shows clear working which would score one mark if the candidate had performed a calculator error.

Question 3(b)(ii)

Smaller squares was the expected correct response here although larger paper was accepted since the shoe looks like it only just fits and so would be difficult to position for accurate measurement.



(ii) Suggest **one** change that could be made to the squared paper so that the student can give a better estimate of the area of the base of the shoe.

(1)

~~Make the squares bigger~~ Change the squares size.

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Examiner Comments

This response does not score as the answer is too vague and does not give the direction of the change.

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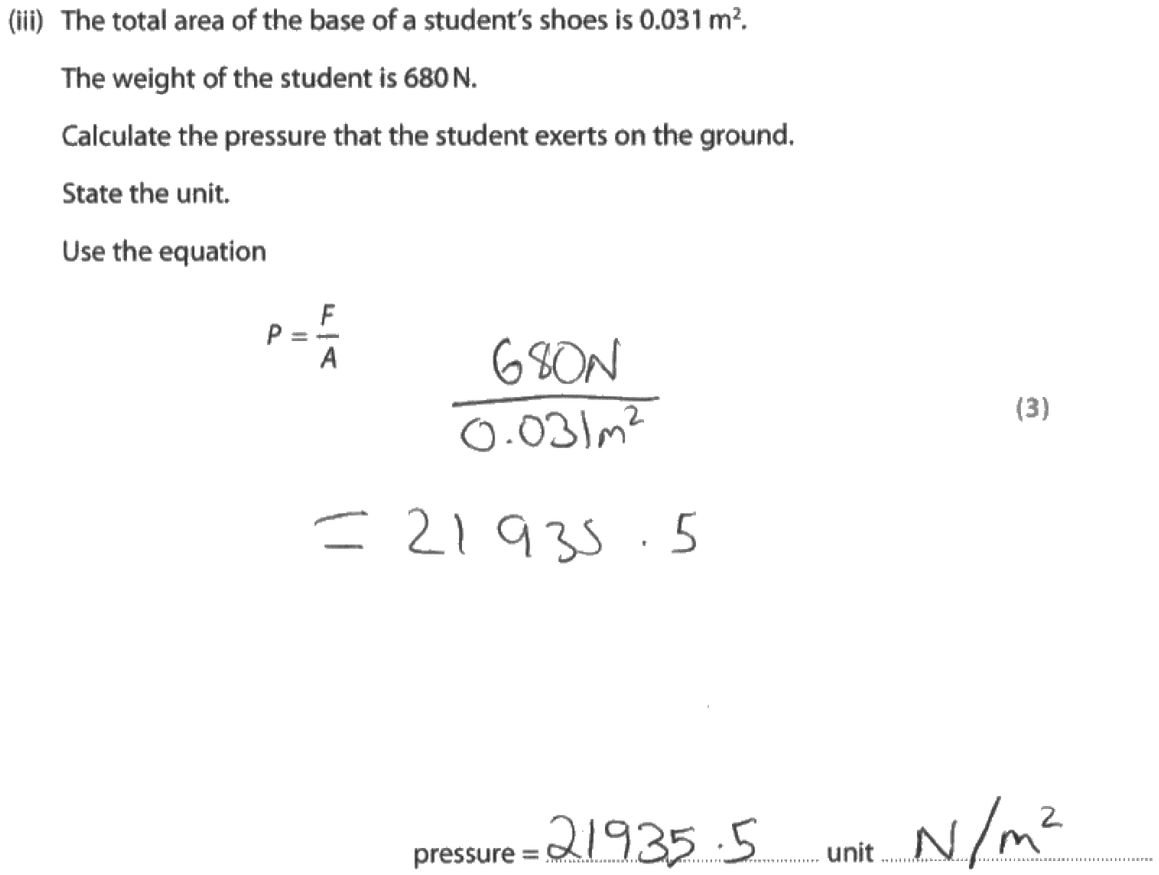
Examiner Tip

Candidates should be regularly reminded to describe changes in as much detail as they can, whether it is increase, decrease or by a certain value. The fact that something changes on its own is rarely enough to score credit.

Question 3(b)(iii)

Candidates had to recognise that the weight of the student was the force with the area given. Most managed to substitute these correctly and obtained the correct answer.

The mark for the unit was less commonly scored with common incorrect units given as Nm^2 or N/m or P.



(iii) The total area of the base of a student's shoes is $0.031\ m^2$.

The weight of the student is 680 N.

Calculate the pressure that the student exerts on the ground.

State the unit.

Use the equation

$$P = \frac{F}{A}$$

$$\frac{680N}{0.031m^2}$$

(3)

$$= 21\,935.5$$

pressure = 21935.5 unit N/m^2

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Examiner Comments

This response scores three marks for correct substitution followed by correct evaluation.

A correct unit is also given for the third mark.

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Examiner Tip

A useful tip for dealing with units is to teach candidates to derive them from the given equation if they cannot remember the unit.

Here a valid unit is N/m^2 which can be seen from the given force in N divided by the given area in m^2.

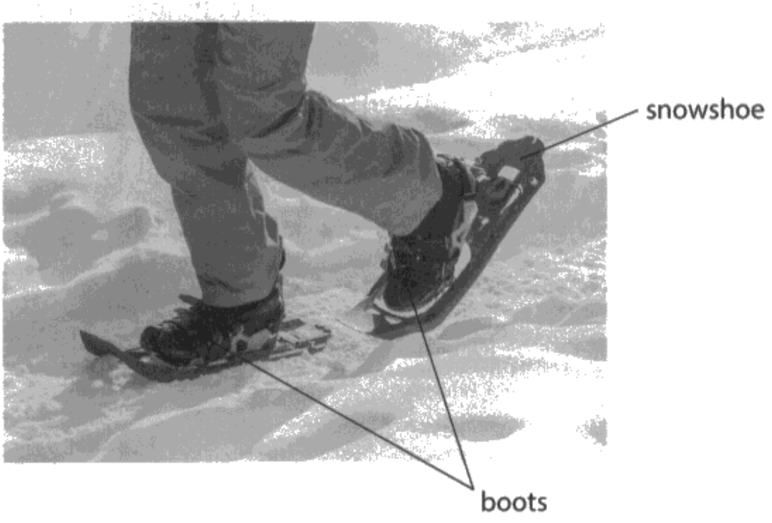
Question 3(c)

Most candidates recognised that the snowshoes had an increased area, but fewer managed to link this to a decrease in pressure.

Candidates needed to be clear that the pressure was reduced (or the idea of this though not sinking into the snow etc) to score the second marking point.

Vague responses referring to the spreading of weight were not credited here.

(c) Figure 7 shows a person wearing snowshoes.



(Source: Pearson Asset Library)

Figure 7

Snow shoes are designed for walking on deep, soft snow.

Explain why they are better suited for this than boots.

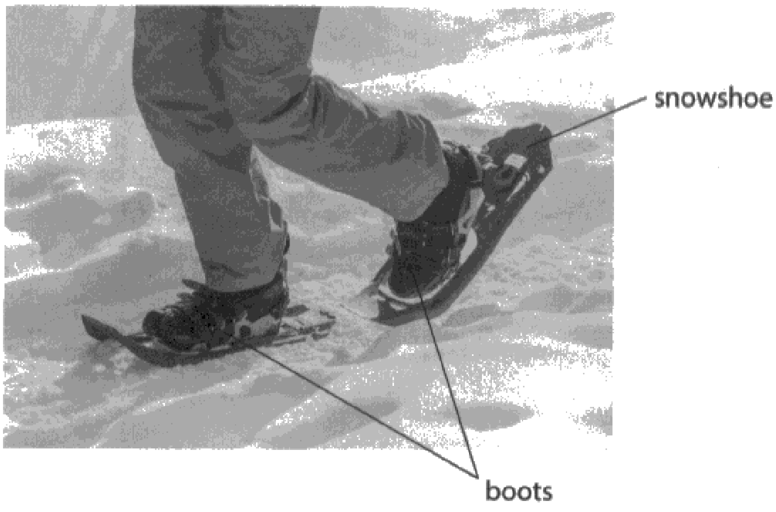
(2)

Snow shoes would work better because they provide ~~a better area~~ more area, so your weight distributes equally over the area

ResultsPlus
Examiner Comments

This response scores the first mark for an increased area, but does not score the second mark as the idea of decreasing the pressure is not there.

(c) Figure 7 shows a person wearing snowshoes.



(Source: Pearson Asset Library)

Figure 7

Snow shoes are designed for walking on deep, soft snow.

Explain why they are better suited for this than boots.

(2)

Because snowshoe reduce the Pressure to the ground allows us to walk easly. it will spread the weight across the snowshoe

ResultsPlus
Examiner Comments

This response scores the second mark for stating that the pressure will decrease, but there is no reference to an increased area for the first marking point.

Question 4(b)

The marks here were for measuring the mass of the key using the balance and then measuring the volume using the measuring cylinder, preferably using water displacement within the cylinder, but a displacement method using the beaker was allowed.

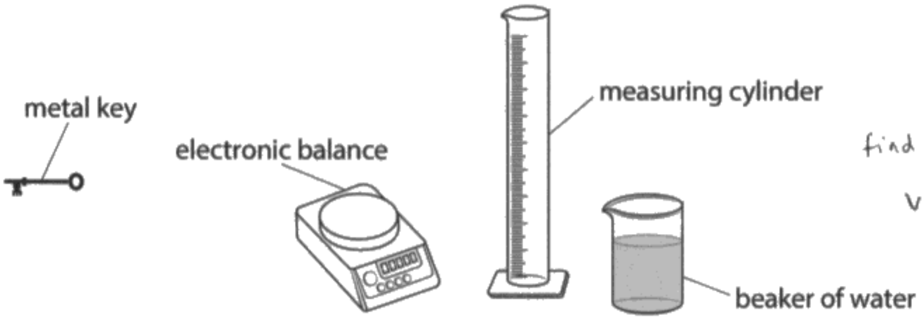
Candidates generally understood the required method, but often did not score all the marks due to vague language around the measurements and methodology. Candidates often did not refer to 'volume', and instead wrote things like 'measure level (of water)', 'measure amount' and even just 'measure it'. Often the idea of measuring the water level was credited, but is not as good as stating the quantity being measured (volume).

Similar problems were seen with the mass measurement. Some candidates stated that weight was being measured when mass is clearly stated in the question.

The word 'measure' is one of the most important words for candidates to use in science exams, experimental questions such as this one are common across the sciences and use of the word 'measure' improves the clarity of answers.

(b) A student is asked to find the density of a metal key.

Figure 8 shows a metal key and some apparatus.



find mass
volume

Figure 8

Using the apparatus shown in Figure 8, describe how the student can find the density of the metal key.

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

(4)

First, the metal key should be placed on the electronic balance to find the mass. The beaker of water should then be poured into the measuring cylinder, followed by putting the key in the measuring cylinder. The volume of water should then be read and the mass of the key divided by the volume of water (with the key in) is the density of the key.

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Examiner Comments

This response scores three marks:

MP1 for measure mass using balance.

MP2 for measuring volume with measuring cylinder (it is clear enough that the cylinder is used for this).

MP3 for placing the key in the cylinder.

MP4 is **not** scored as only one volume measurement is taken.

(b) A student is asked to find the density of a metal key.

Figure 8 shows a metal key and some apparatus.

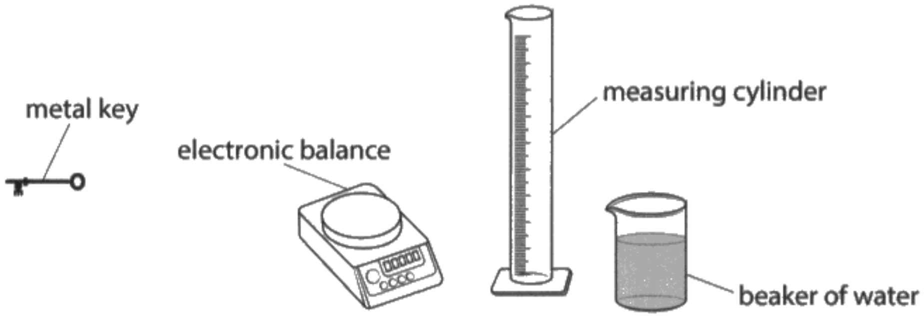

Figure 8

Using the apparatus shown in Figure 8, describe how the student can find the density of the metal key.

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

(4)

Weigh the metal key on the electronic balance to find it's Mass. add ~~10cm~~ ~~100~~ 50 cm³ of water into the measuring cylinder then add the key, workout how much the water moved thats the volume, then ~~a~~ subsitute all the info into the equation and write out the answer. repeat the experiment just in case of anomalys or humen error.

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Examiner Comments

This response scores all four marks. A few things to note:

- 'weigh' is allowed as a verb to mean measuring mass, but measure weight would not be allowed as it is the wrong quantity.
- There is a clear measurement of volume before and after the key is placed here with the idea that the water level will increase and give the key volume.

The word 'measure' is missing here, if it were included it would have made the response clearer and therefore meant that there is less risk of the candidate losing marks through lack of clarity.

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Examiner Tip

The word 'measure' is one of the most important words for candidates to use in science exams, experimental questions such as this one are common across the sciences and the use of the word 'measure' improves the clarity of answers.

Question 4(c)(i)

Majority of candidates were able to complete this calculation with only a few unable to find temperature difference.

(c) (i) A student heats an aluminium block, as shown in Figure 9.

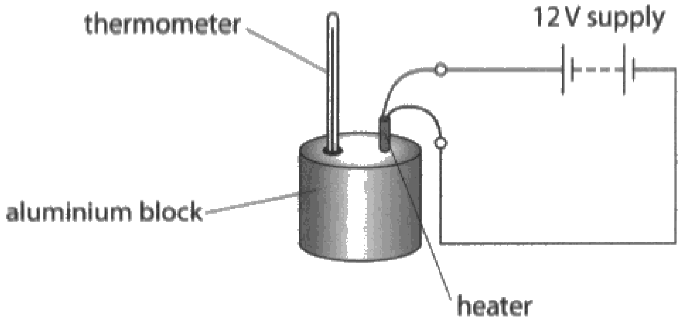


Figure 9

The aluminium block has a mass of 0.96 kg.

The specific heat capacity of aluminium is 920 J/kg °C.

The temperature of the block increases from 18 °C to 35 °C.

Calculate the change in thermal energy of the aluminium block.

Use the equation

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

(2)

35 − 18 = 17

0·96 × 920 × 17 = 15014.4

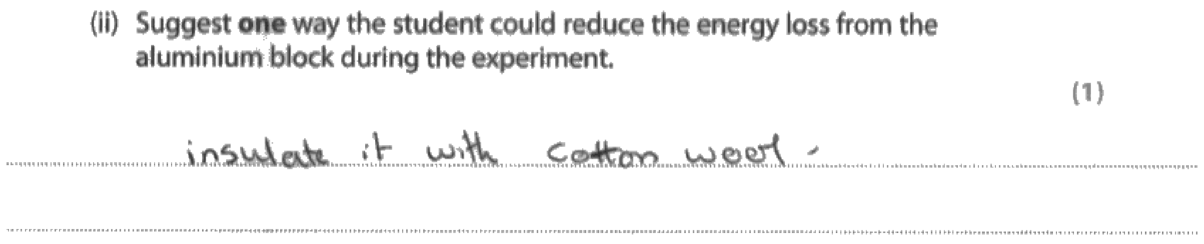
change in thermal energy = 15014.4 J

ResultsPlus
Examiner Comments

This response scores both marks and shows clear working including temperature difference calculation.

Question 4(c)(ii)

Any material used to insulate the block scored the mark here. The majority of candidates scored this mark with only a few incorrectly referring to changes to the heater such as reducing its voltage or current.



(ii) Suggest **one** way the student could reduce the energy loss from the aluminium block during the experiment.

(1)

insulate it with cotton wool .

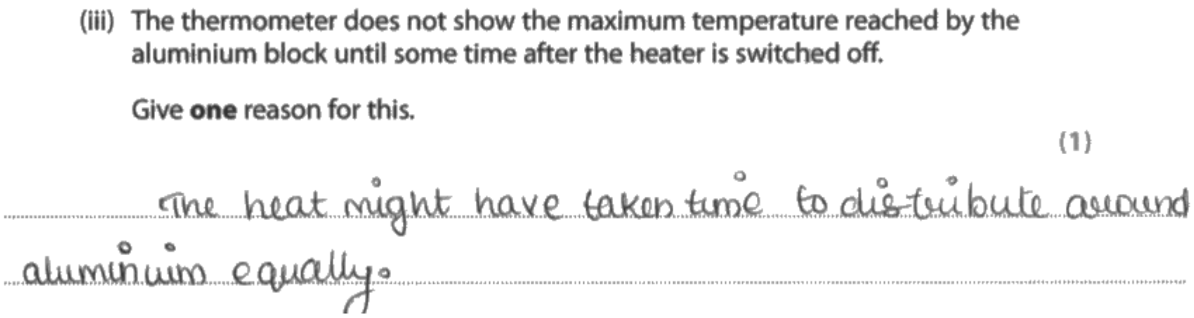
ResultsPlus
Examiner Comments

Many different materials were named. This example scores the mark.

Question 4(c)(iii)

Few candidates scored the mark here. Responses that received credit were those that described the energy needing time to transfer through the metal to the thermometer.

Many candidates described ideas such as the thermometer reaching its limit or energy transferring to surroundings or that the heater was still on and so still transferring energy into the block.



(iii) The thermometer does not show the maximum temperature reached by the aluminium block until some time after the heater is switched off.

Give **one** reason for this.

(1)

The heat might have taken time to distribute around aluminuim equally.

ResultsPlus
Examiner Comments

This is a good response that describes the energy (heat) taking time to spread (distribute) through the metal.

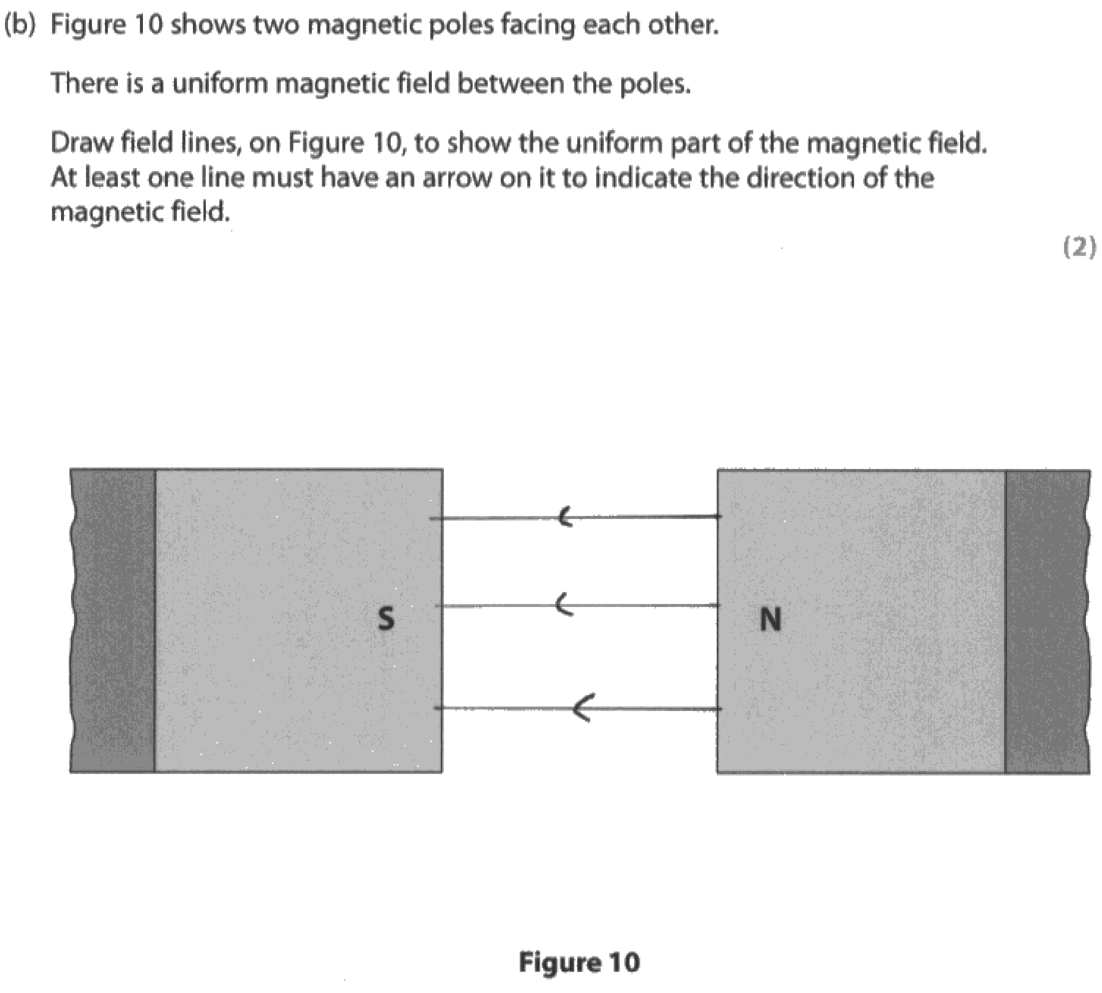
Question 5(b)

This question asks candidates to draw field lines to show a uniform magnetic field between the two magnetic poles.

Candidates often drew multiple field lines, including from the outer ends suggesting a misunderstanding of the question or how to draw a uniform field.

Candidates added many arrows to diagrams, often introducing a contradiction in direction.

Many candidates did not use rulers to draw straight lines, which sometimes lost them the mark.



(b) Figure 10 shows two magnetic poles facing each other.

There is a uniform magnetic field between the poles.

Draw field lines, on Figure 10, to show the uniform part of the magnetic field. At least one line must have an arrow on it to indicate the direction of the magnetic field.

(2)

Figure 10

ResultsPlus
Examiner Comments

This response scores both marks. The lines are not quite equally spaced, but not far off, they are horizontal and the arrows are in the correct direction.

(b) Figure 10 shows two magnetic poles facing each other.

There is a uniform magnetic field between the poles.

Draw field lines, on Figure 10, to show the uniform part of the magnetic field. At least one line must have an arrow on it to indicate the direction of the magnetic field.

(2)

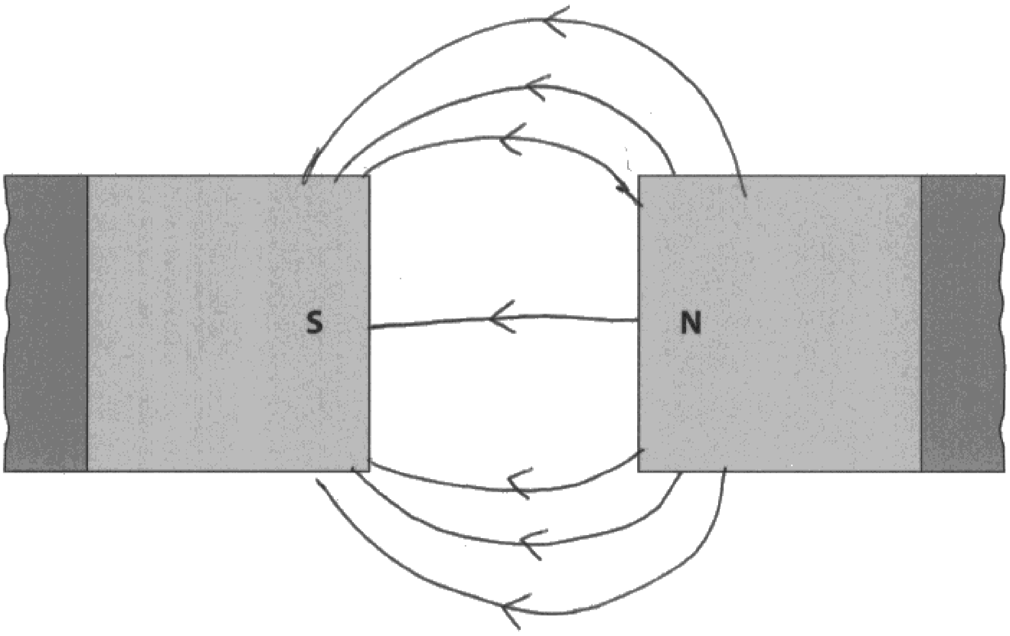


Figure 10

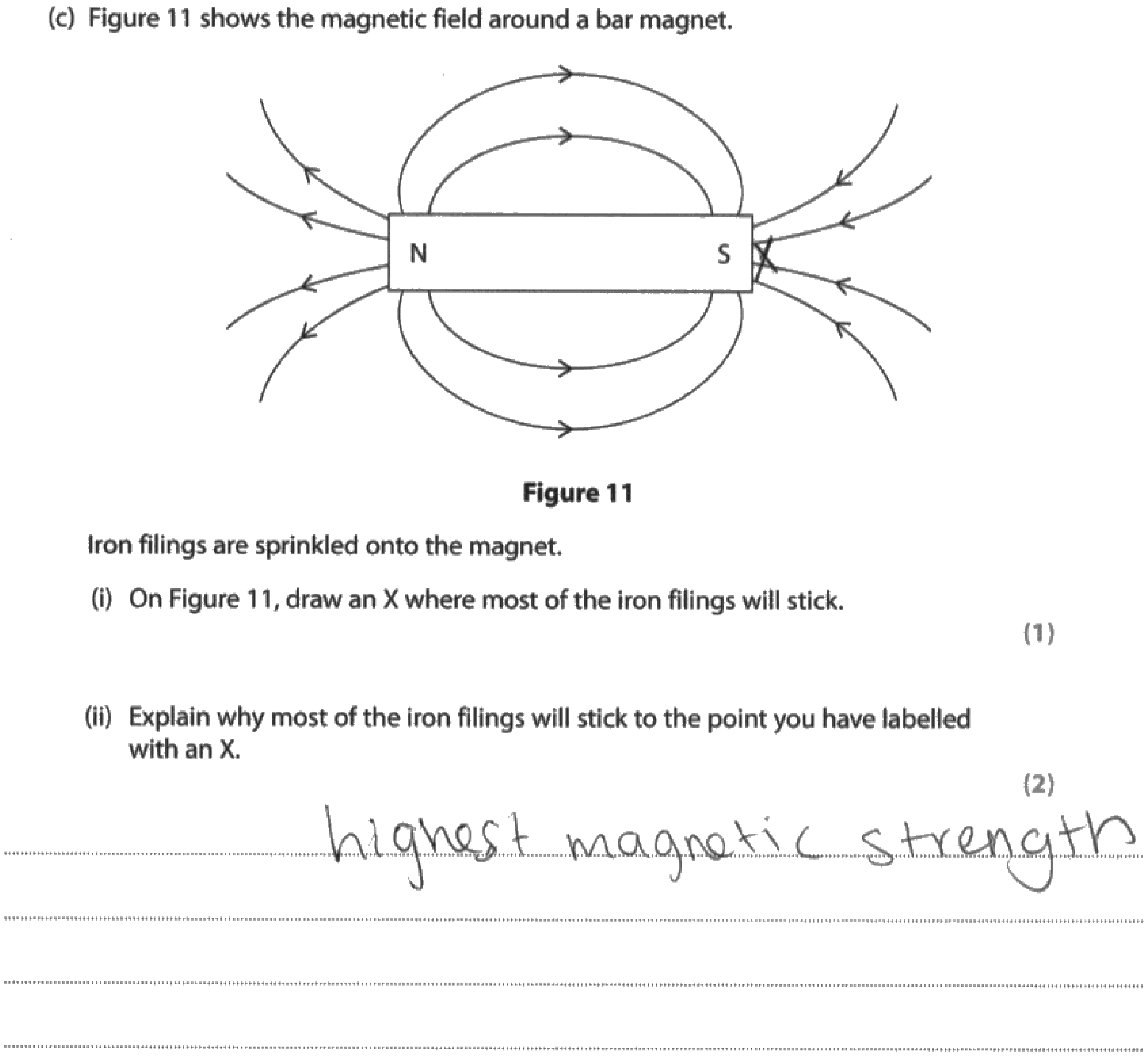
ResultsPlus
Examiner Comments

This response does not score the first mark as only one straight line is shown. However, all drawn arrows are in the correct direction and so the second mark is scored.

Question 5(c)(i-ii)

Most candidates managed to place the X in the correct position, but some placed it in the middle of the magnet.

The explanation did not score as well with many referring to things like 'the greatest magnetism' or 'where the magnet is strongest', neither of which scored credit.



(c) Figure 11 shows the magnetic field around a bar magnet.

Figure 11

Iron filings are sprinkled onto the magnet.

(i) On Figure 11, draw an X where most of the iron filings will stick.

(1)

(ii) Explain why most of the iron filings will stick to the point you have labelled with an X.

(2)

highest magnetic strength

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Examiner Comments

This response scores the mark for Q05(c)(i), but does not score anything for Q05(c)(ii) as there is no reference to the **field** or **force**.

(c) Figure 11 shows the magnetic field around a bar magnet.

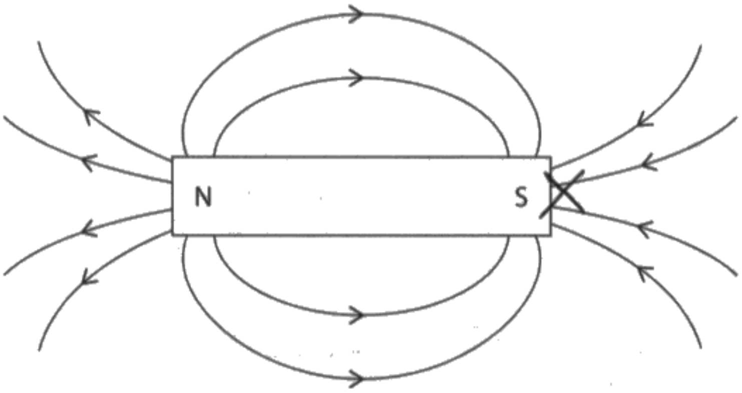

Figure 11

Iron filings are sprinkled onto the magnet.

(i) On Figure 11, draw an X where most of the iron filings will stick.

(1)

(ii) Explain why most of the iron filings will stick to the point you have labelled with an X.

(2)

because it closest to the pole and where the ~~fiel~~ magnetic field lines are closest together their is the most magnetism.

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Examiner Comments

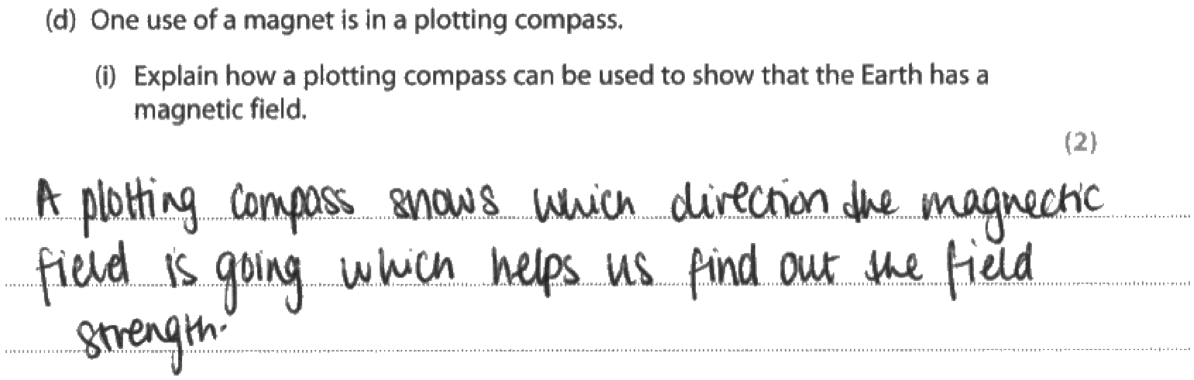
This response scores the mark for Q05(c)(i) and scores one mark for Q05(c)(ii) for describing the field lines are closest at that point, they do not score the first mark though as there is no reference to the **field** or **force** being strongest.

Question 5(d)(i)

To score the marks here candidates had to describe how a compass shows that the earth has a magnetic field. Often candidates described **why** a compass shows the earth has a magnetic field, which is a different question and these answers often did not score any marks.

For example, responses such as 'the compass needle lines up with the magnetic field lines' does not score any marks as it does not answer the question.

Those that did produce answers on the right lines often only scored the first marking point.



(d) One use of a magnet is in a plotting compass.

(i) Explain how a plotting compass can be used to show that the Earth has a magnetic field.

(2)

A plotting compass shows which direction the magnectic field is going which helps us find out the field strength.

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Examiner Comments

Although this is a correct statement it does not answer the question and so scores zero.

(d) One use of a magnet is in a plotting compass.

(i) Explain how a plotting compass can be used to show that the Earth has a magnetic field.

(2)

a compass can show the earths magnetic field as no matter what direction you face the arows will stay pointing ~~n ar~~ N and S.

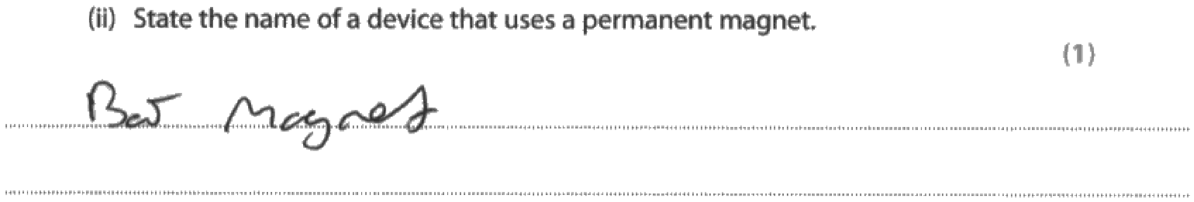
ResultsPlus
Examiner Comments

This is a good response that clearly scores the first marking point. There is no explanation here though and so the second mark is not scored.

Question 5(d)(ii)

A large variety of answers were seen here, many of which did score the mark since the given device does contain a permanent magnet.

The most common responses that did not score were either '(bar) magnet' or a device that contains an electromagnet rather than a permanent magnet.



(ii) State the name of a device that uses a permanent magnet.

(1)

Bar Magnet

ResultsPlus
Examiner Comments

This does not score the mark. It is essentially a repeat of the question.

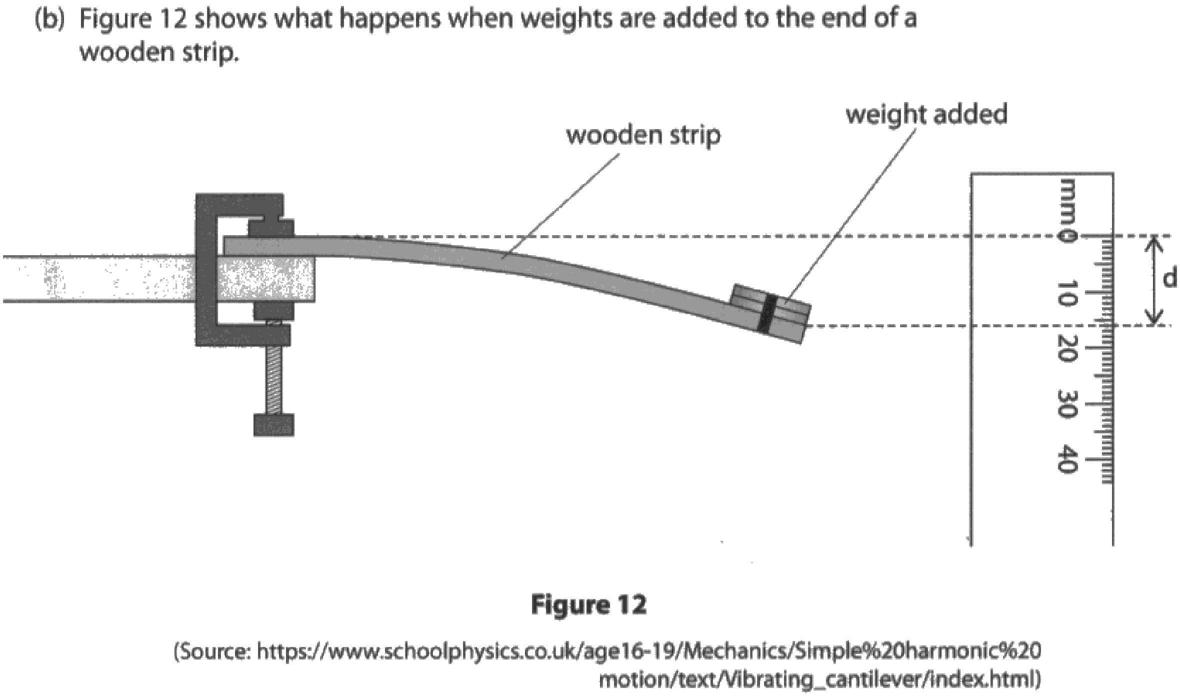
Question 6(b)(i)

This is another question that requires candidates to describe a method.

Most candidates scored at least one mark here. Those that lost marks often did so due to a lack of clarity in their descriptions or by writing out a prediction or conclusion instead of what they would actually do (a method).

The most common ways that marks were lost include:

- Giving a prediction or conclusion rather than a method, eg "as more weight is added the beam will bend more".
- Not describing an actual measurement, eg "see if it bends".
- Not checking the initial position.
- Moving the weight position instead of changing the weight.
- A lack of clarity around whether they were repeating the addition of weight and measurement of d.
- Lack of graphs to check relationship.



(b) Figure 12 shows what happens when weights are added to the end of a wooden strip.

Figure 12

(Source: https://www.schoolphysics.co.uk/age16-19/Mechanics/Simple%20harmonic%20 motion/text/Vibrating_cantilever/index.html)

The end of the strip of wood moves down by a distance, d, as shown in Figure 12.

(i) Describe how a student could investigate how the distance, d, depends on the weight added to the wooden strip.

(4)

The student would add no weight and note the distance moved then add around five weights one by one of different weights and note each weights distance moved of the wood and see if the higher the weight causes the wood to move more ~~on the~~ in an increasing amount then the student will know if it depends on the weight

ResultsPlus
Examiner Comments

This response scores all four marks:

- MP1 - "add no weight and note the distance moved".
- MP2 - "add weight".
- MP3 - "note each weights distance moved".
- MP4 - "...one by one and note each weights distance moved".

Again, the inclusion of the word 'measure' would improve clarity here.

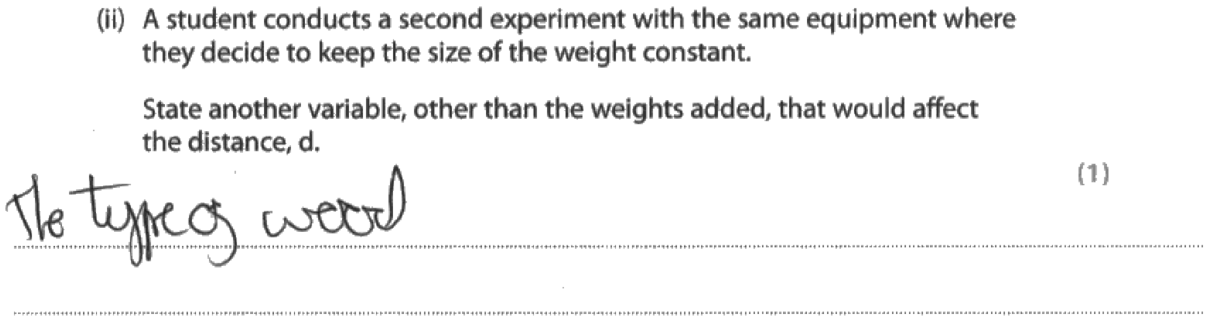
ResultsPlus
Examiner Tip

The word 'measure' is one of the most important words for candidates to use in science exams, experimental questions such as this one are common across the sciences and the use of the word 'measure' improves the clarity of answers.

Question 6(b)(ii)

The majority of candidates scored the mark here for giving a change to some property of the strip such as its dimensions or material.

Those that did not score often suggested a change to the measurement method or to the quantity of weight.



(ii) A student conducts a second experiment with the same equipment where they decide to keep the size of the weight constant.

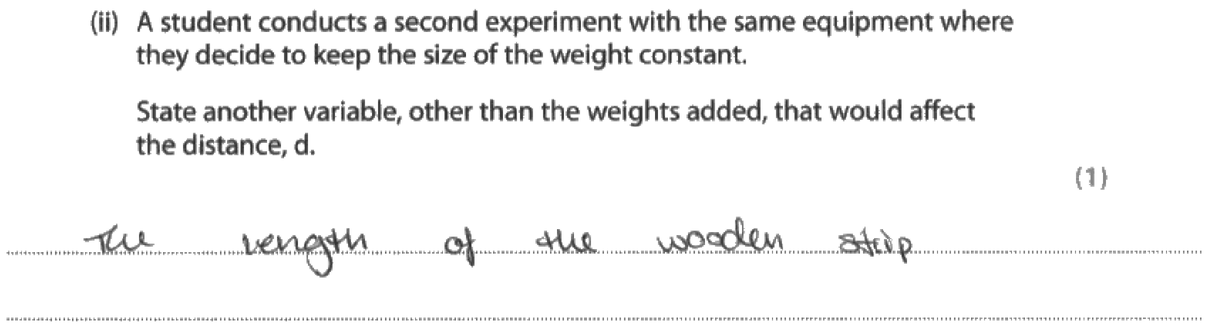
State another variable, other than the weights added, that would affect the distance, d.

(1)

The type of wood

ResultsPlus
Examiner Comments

A change to the strip material scores the mark.



(ii) A student conducts a second experiment with the same equipment where they decide to keep the size of the weight constant.

State another variable, other than the weights added, that would affect the distance, d.

(1)

The length of the wooden strip

ResultsPlus
Examiner Comments

A change to the strip dimensions scores the mark.

Question 6(c)(i)

Most candidates scoring one mark here for correct substitution, but without correct unit conversion.

(c) (i) Figure 13 shows a spring stretched by some weights.

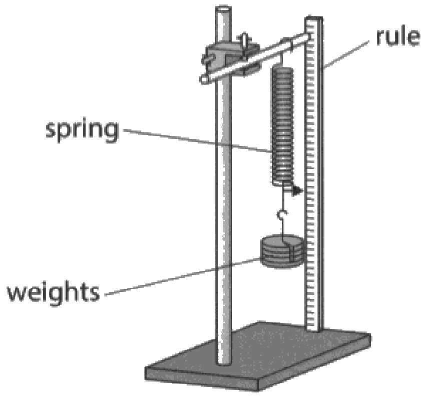


Figure 13

The extension of the spring is 6.2 cm when a weight of 2 N is added.

Calculate the spring constant, *k*, of the spring.

Use the equation

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

$$k = \cancel{\frac{2}{6.2}} = 0.323$$

6.2 ÷ 100 = ~~0.6~~ 0.062m ~~0.062m~~

(2)

$$k = \frac{2}{0.062} = 32.258$$

spring constant, *k* = ~~0.323~~ 32.258 N/m

ResultsPlus
Examiner Comments

This response scores both marks and shows clear working that includes clear conversion of the 6.2cm into 0.062m.

(c) (i) Figure 13 shows a spring stretched by some weights.

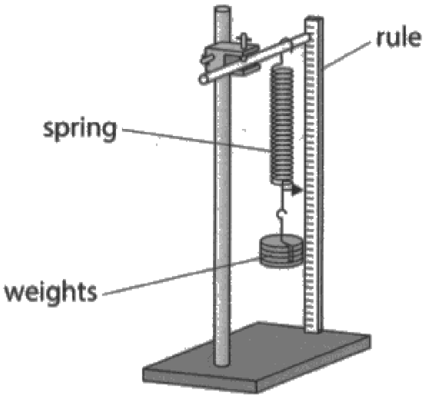


Figure 13

The extension of the spring is 6.2 cm when a weight of 2 N is added.

Calculate the spring constant, *k*, of the spring.

Use the equation

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

(2)

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

$$k = \frac{2}{6.2} = 0.32$$

spring constant, *k* = 0.32 N/m

ResultsPlus
Examiner Comments

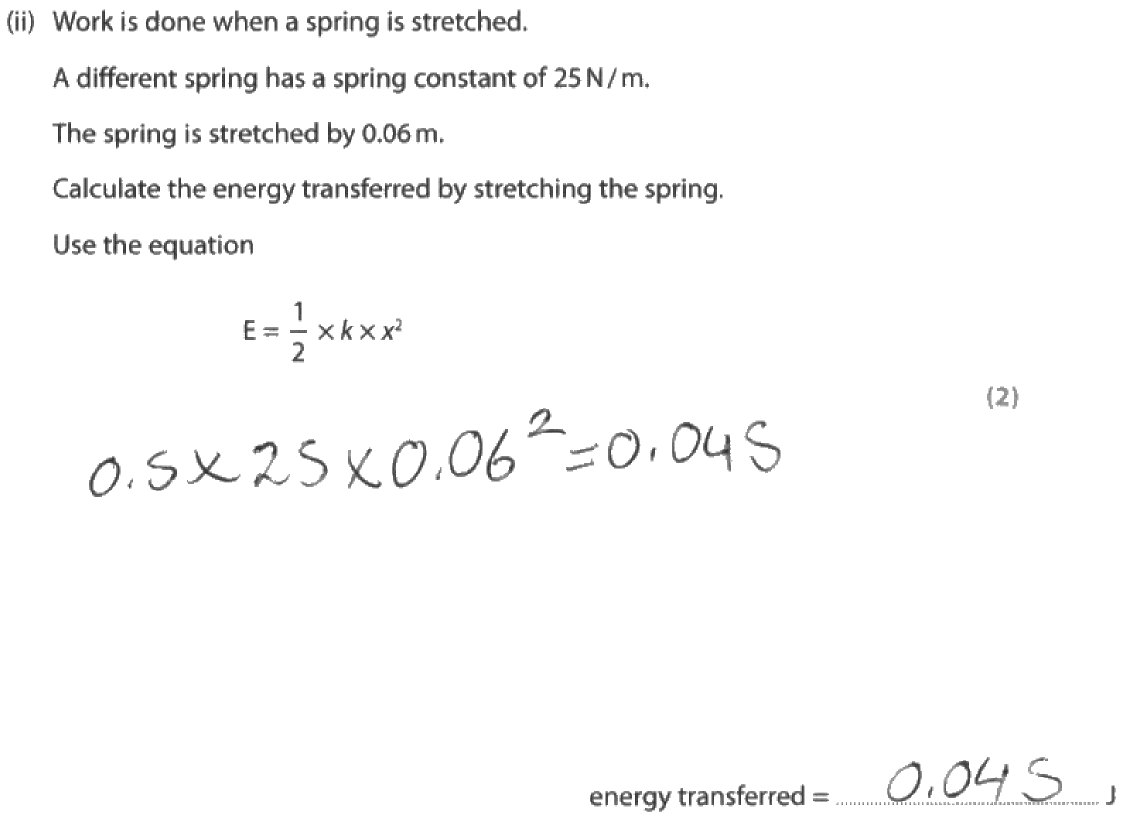
This response scores one mark for the correct answer with a power of ten error due to not converting the extension to metres.

Question 6(c)(ii)

The most common error here was to miss the square on the extension (or to square the wrong number).

Some candidates who showed working scored one mark even though they did not square due to correctly showing the square in the working.

This again demonstrates why clear working is important.



(ii) Work is done when a spring is stretched.

A different spring has a spring constant of 25 N / m.

The spring is stretched by 0.06 m.

Calculate the energy transferred by stretching the spring.

Use the equation

$$E = \frac{1}{2} \times k \times x^2$$

(2)

$0.5 \times 25 \times 0.06^2 = 0.045$

energy transferred = 0.045 J

ResultsPlus
Examiner Comments

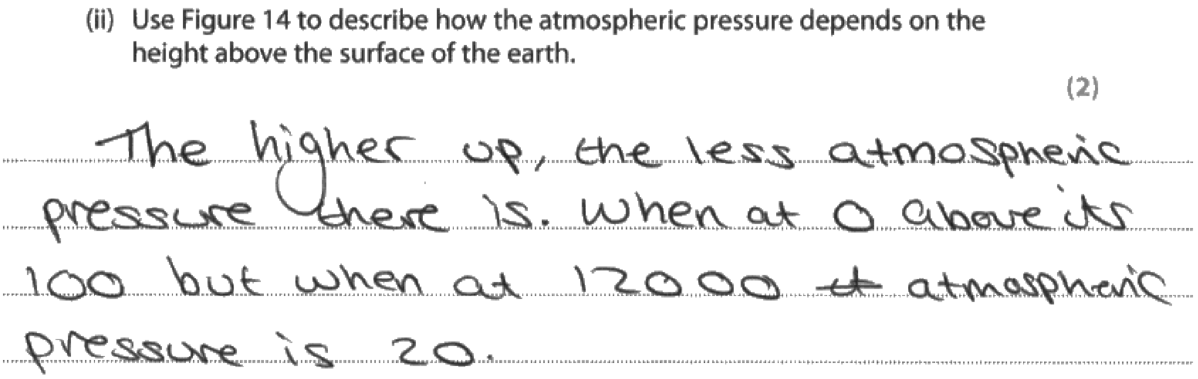
A correct answer showing clear working.

Question 7(a)(ii)

Few candidates were able to score the second marking point here, many did not attempt this part of the description and those that did sometimes said it was linear.

For the first marking point, correct trends were often given in reverse. Some candidates described the trend in both directions but contradicted themselves.

A number of candidates appeared to not understand the graph and said both quantities were increasing.



(ii) Use Figure 14 to describe how the atmospheric pressure depends on the height above the surface of the earth.

(2)

The higher up, the less atmospheric pressure there is. When at 0 above its 100 but when at 12000 ~~it~~ atmospheric pressure is 20.

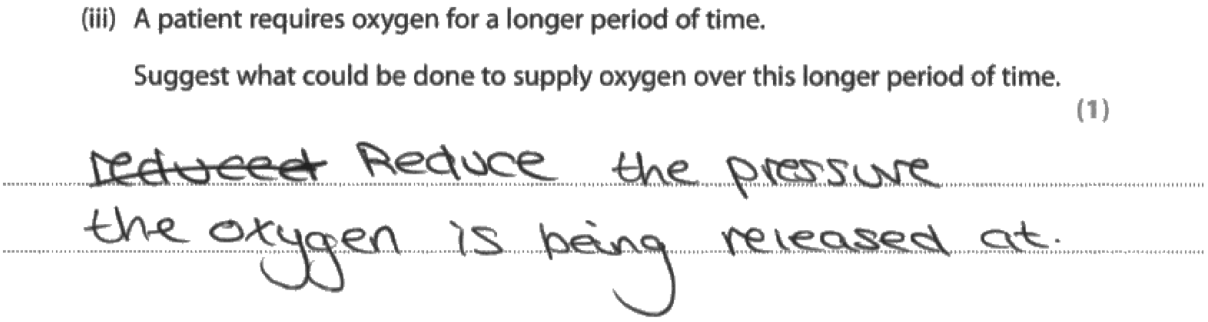
ResultsPlus
Examiner Comments

This response scores the first mark but not the second. Data read from the graph is not enough to score either mark here.

Question 7(b)(iii)

Most commonly scored for the use of a larger tank or greater number of tanks. Some also scored for the idea of reducing the flow rate.

Common incorrect responses included asking the patient to breathe more slowly or less.



(iii) A patient requires oxygen for a longer period of time.

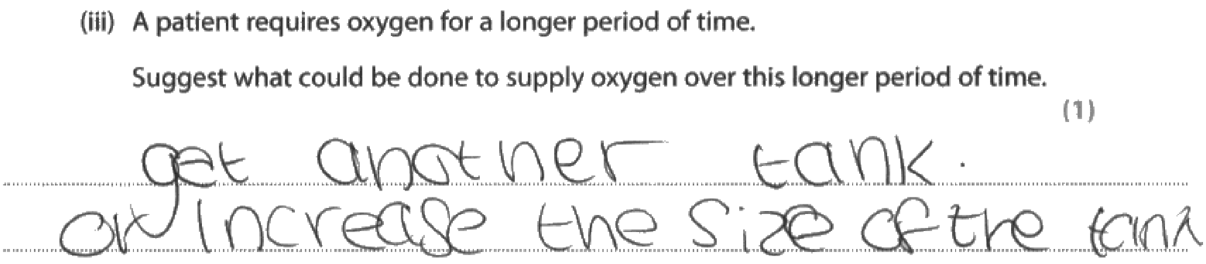
Suggest what could be done to supply oxygen over this longer period of time.

(1)

~~reduceed~~ Reduce the pressure the oxygen is being released at.

ResultsPlus
Examiner Comments

This was accepted as the idea of decreasing the flow rate.



(iii) A patient requires oxygen for a longer period of time.

Suggest what could be done to supply oxygen over this longer period of time.

(1)

get another tank.

or increase the size of the tank

ResultsPlus
Examiner Comments

The idea of using a higher volume tank or more tanks scored the mark.

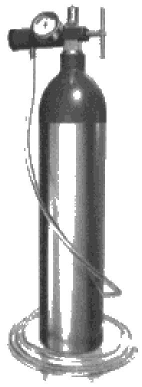
Question 7(b)(i-ii)

Most candidates scored both marks in Q07(b)(i) and showed full substitution.

It should be noted that in 'show that' questions candidates need to show full substitution of numbers and give an answer that is to more significant figures than the 'show that' answer before rounding to show that the calculation has been done.

Q07(b)(ii) was also generally well answered, but different methods were used, some worked down from 100 in steps of 6 therefore costing themselves more time in the exam.

(b) Figure 15 shows an oxygen cylinder used to provide patients with oxygen in hospital.



(Source: Pearson Asset Library)

Figure 15

The volume of the cylinder, V_1, is 2.3 litres.

The pressure of gas in the cylinder, P_1, is 15 MPa.

Oxygen is released from the cylinder to the patient at a pressure of P_2 = 0.35 MPa.

(i) Show that the total volume, V_2, of oxygen that can be released to the patient is about 100 litres at this pressure.

Use the equation

$$V_2 = \frac{P_1 \times V_1}{P_2}$$

(2)

$$\frac{15 \times 2.3}{0.35} = \frac{34.5}{0.35} = 98.6$$

↑

about

100

(ii) The oxygen from the cylinder flows to the patient at 6 litres/minute.

Calculate the time taken for the 100 litres of oxygen to be used up at this rate.

(1)

$100 \div 6$

time taken 16.7 minutes

This is a clear response that scores all marks in both question parts. Full working is shown.

Question 7(c)

Most candidates scored at least level 1 here, usually for the idea that the pressure increased with more weight. Many gave incorrect descriptions of how the volume changed, some saying it increased (possibly referencing the space above the piston) and some stating that it remained the same. Those that stated it remained the same often appeared to be confusing the number of particles (or mass) with volume and therefore understood the idea that the mass of gas had remained constant but had confused this with volume.

Some candidates did score level 3 here and often did so by linking the increased frequency of particle collisions to the force they applied and some even linking this to an increase in pressure.

*(c) Figure 16 shows a cylinder containing some gas.

A piston prevents the gas escaping.

In Figure 16x a small weight pushes down and the volume and pressure of the gas are measured.

Following this, in Figure 16y, a larger weight pushes down and the volume and pressure of the gas are measured again.

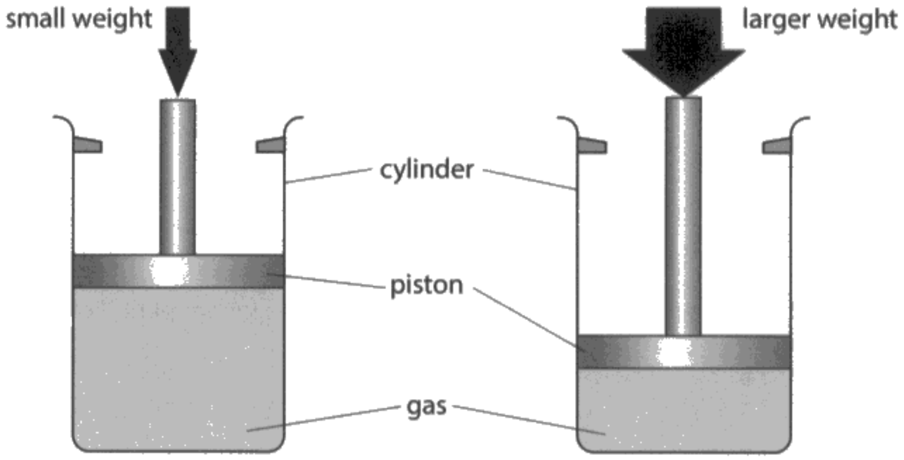


Figure 16x **Figure 16y**

Explain why the pressure and volume of the gas in the cylinder change when the larger weight pushes down on the piston.
The temperature of the gas does not change.

Your answer should include

- how the volume and pressure change
- how the gas particles exert a force on the piston

(6)

- When a weight is pushed down, pressure increases + volume decreases.
- Pressure increases because particles are forced down and to be squished with others.
- Volume decreases as the surface area also decreases as all particles are condensed into a smaller space.
- The larger ~~piston~~ weight has a bigger impact on the

piston as it pushes more particles down easily.

ResultsPlus
Examiner Comments

This response correctly describes the change to pressure and volume but does not go on to explain how the collisions of gas particles exert a force and is therefore limited to level 2. It was awarded four marks.

ResultsPlus
Examiner Tip

Candidates should attempt to address each of the bullet points given in the question. Usually, full credit can only be gained if all bullet points are addressed in the answer.

*(c) Figure 16 shows a cylinder containing some gas.

A piston prevents the gas escaping.

In Figure 16x a small weight pushes down and the volume and pressure of the gas are measured.

Following this, in Figure 16y, a larger weight pushes down and the volume and pressure of the gas are measured again.

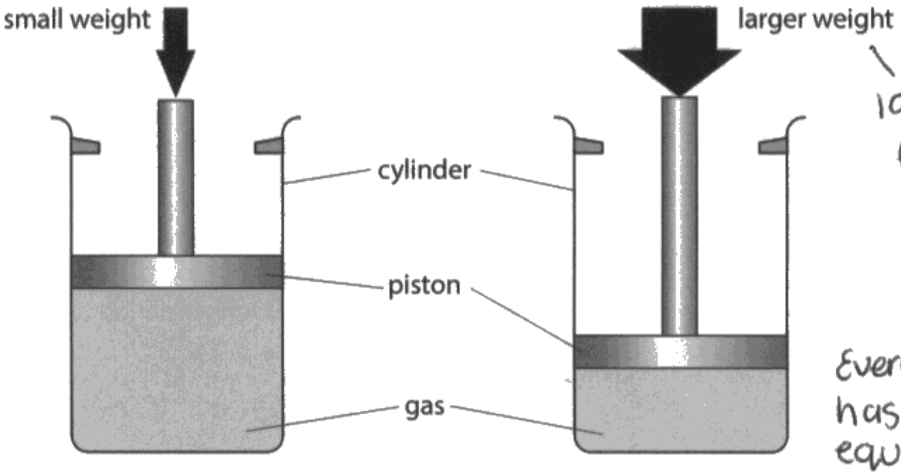
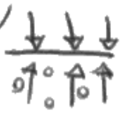


Figure 16x **Figure 16y**

larger force

Every action has an equal and opposite reaction



Explain why the pressure and volume of the gas in the cylinder change when the larger weight pushes down on the piston.
The temperature of the gas does not change.

Your answer should include

- how the volume and pressure change
- how the gas particles exert a force on the piston

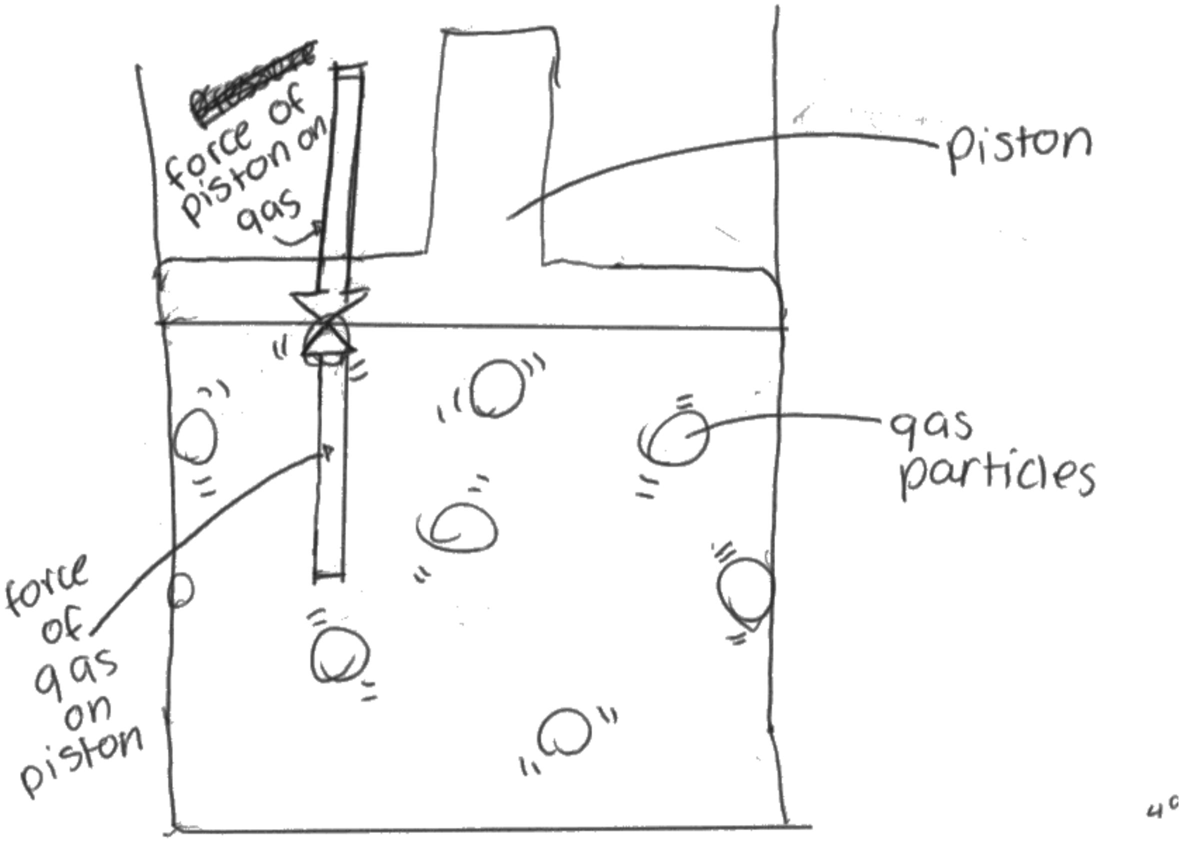
(6)

When a weight is added on top of the piston, it causes the piston to exert more ~~force to~~ force on the gas, therefore causing a build up of pressure as particles are compressed and therefore move faster and bounce off the walls of the cylinder ~~more~~ more frequently. Because, the gas is being compressed, the gas is ultimately decreasing in volume. As a result, we ~~lea~~ learn that a ~~greater~~ larger weight would cause a greater force and therefore more compression,

(Total for Question 7 = 13 marks)

faster/more frequent collision of particles and greater pressure.

The gas particles would also exert a force on the piston, which is demonstrated through ~~I~~ Newton's Law, 'Every action has an equal and opposite reaction'



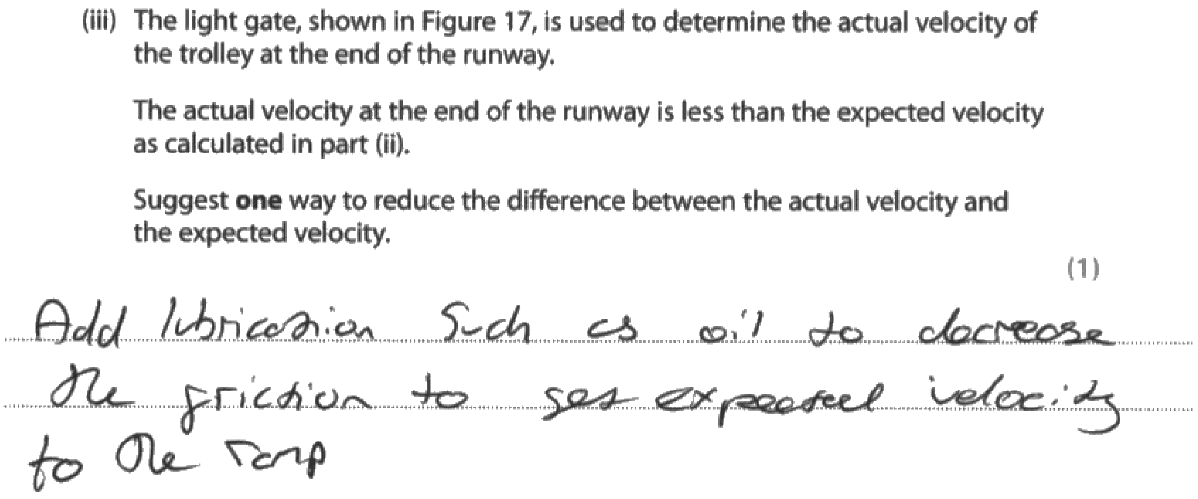
ResultsPlus
Examiner Comments

This is an excellent response that links the change in volume and pressure to the explanation in terms of increased frequency of particle collisions. It is awarded six marks.

Question 8(a)(iii)

The expectation here was that the trolley wheel mechanism was lubricated to reduce friction. However, any addition of lubrication was accepted (even though lubrication of the ramp itself would not help in this context).

Other acceptable answers included increasing the gradient of the ramp or ideas around streamlining of the trolley, but answers were only credited if they gave a physical action, statements such as 'reduce friction' were not credited.



(iii) The light gate, shown in Figure 17, 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 part (ii).

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

(1)

Add lubrication such as oil to decrease the friction to get expected velocity to the ramp

ResultsPlus
Examiner Comments

'Add lubrication' was accepted even if it was not linked to the trolley. This is because the candidate has realised that energy transfers to thermal stores must be reduced and so any use of lubrication was credited.

Question 8(a)(i-ii)

In Q08(a)(i) most candidates scored one mark due to substituting the numbers in without correctly converting the height to metres. This often led to a power of ten error in their answer. Candidates who attempted to artificially correct this by multiplying by 100 to get 1.6 were not awarded the second mark.

In Q08(a)(ii) most candidates managed to calculate the velocity squared by correctly substituting the numbers into the given equation, however, most did not go on to square root their answer to gain the final mark.

8 (a) A student places a trolley at the top of a runway, as shown in Figure 17.

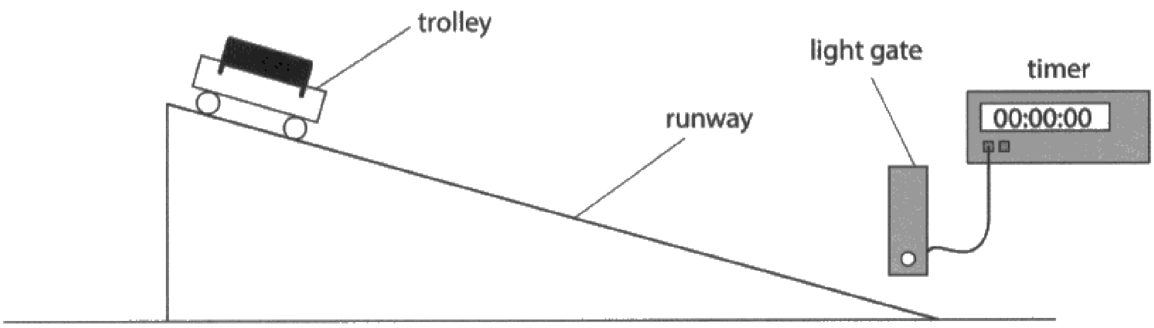


Figure 17

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, ΔGPE, 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

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

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

(2)

$$\frac{4.1}{10 \times 26}$$

$$\hookrightarrow \approx 0.015769 \ldots\ldots$$

$$\hookrightarrow 0.02$$

(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

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

(3)

$$\frac{2 \times 4.1}{1.6} = 5.125$$

expected velocity = 5.125 m/s

ResultsPlus
Examiner Comments

Q08(a)(i) scores one mark for substitution without correct conversion. Note that a multiplication of the answer by 100 would still not score the final mark here, to gain both marks the candidate needed to show correct substitution of 0.26.

Q08(a)(ii) scores two marks for correct calculation of velocity squared. If the candidate had square rooted the answer they would have scored all three marks.

8 (a) A student places a trolley at the top of a runway, as shown in Figure 17.

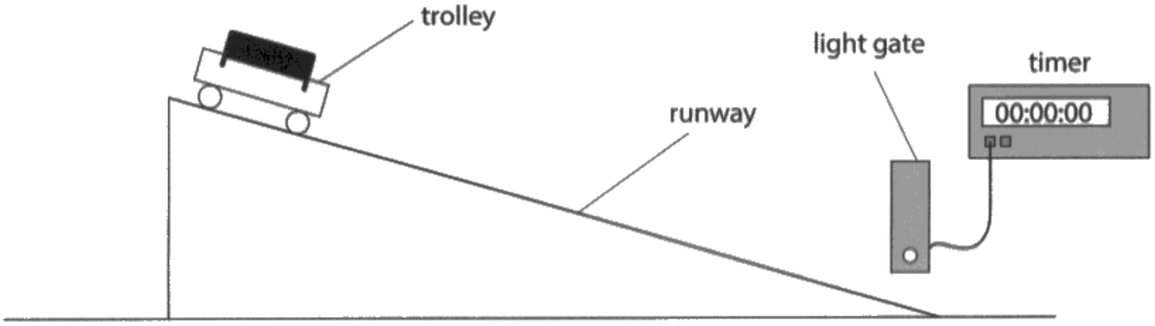


Figure 17

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

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

Use the equation

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

$$\begin{tikzcd} cm \arrow[r] \arrow[r, bend left=60, "\div 100"] & m \arrow[l, bend left=60, "\times 100"] \end{tikzcd}$$

$\frac{26}{100} = 0.26$

(2)

$\frac{4.1}{10 \times 0.26} = 1.57$

round up

$\underline{\underline{1.6\,kg}}$

(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

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

(3)

$$\frac{2 \times 4.1}{0.26} = 31.\dot{5}$$

↓ round up

32

expected velocity = 32 m/s

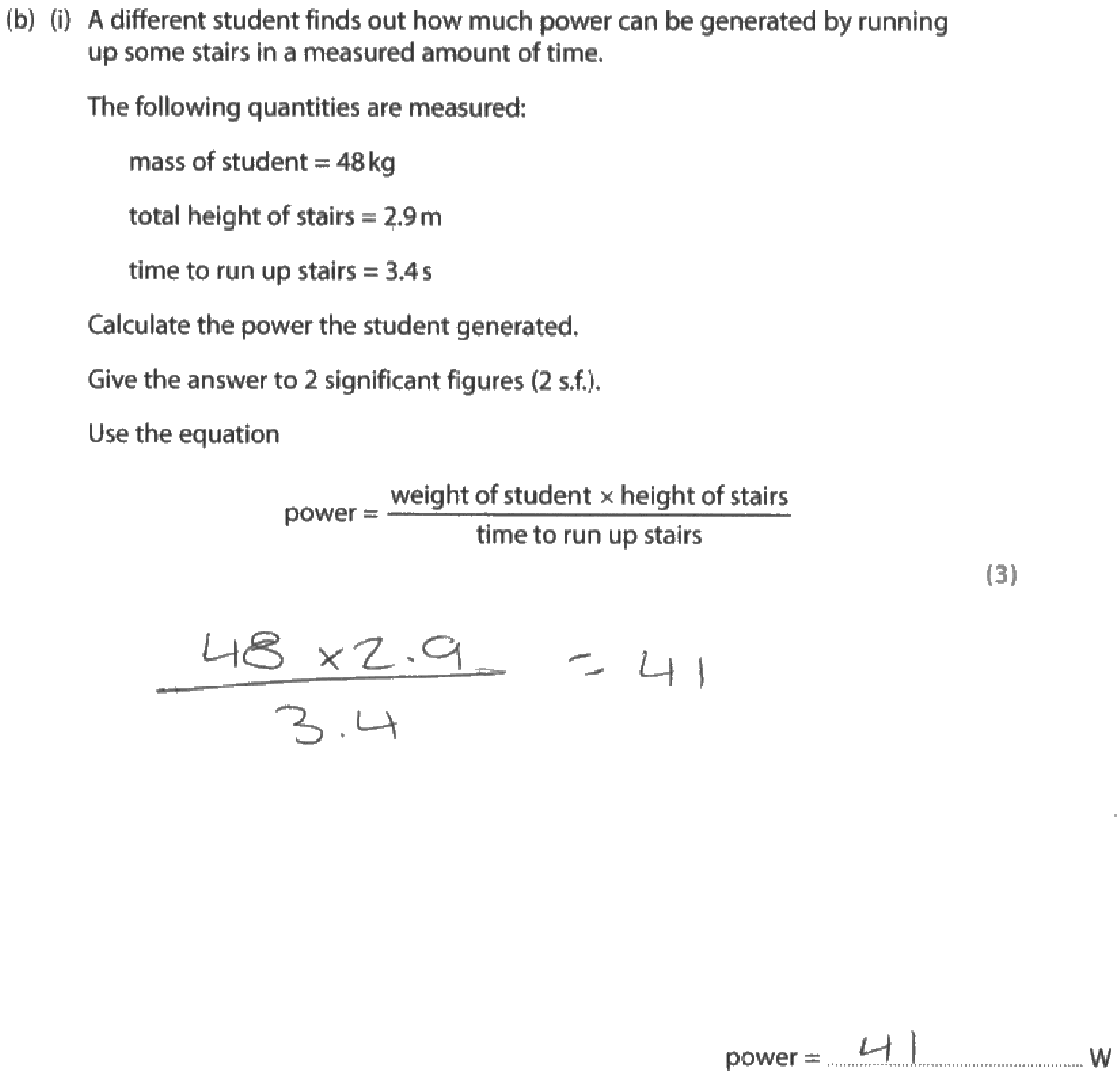
ResultsPlus
Examiner Comments

Q08(a)(i) scores two marks for correct substitution using 0.26 for the height.

Q08(a)(ii) scores zero as the candidate has substituted the height rather than the mass.

Question 8(b)(i)

Most candidates lost marks here for substituting the mass of the student as their weight. Candidates who did this could score a maximum of one mark for giving their answer to two significant figures.



(b) (i) 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)

$$\frac{48 \times 2.9}{3.4} = 41$$

power = 41 W

ResultsPlus
Examiner Comments

This is an example of a common response that does not include the value of g in the calculation. This example does score one mark for giving the answer to two significant figures though.

(b) (i) 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)

48×10

$$409.4 \qquad = \frac{480 \times 2.9}{3.4}$$

power = 409.4 W

ResultsPlus
Examiner Comments

This response scores two marks for correctly calculating the power using the weight of the student.

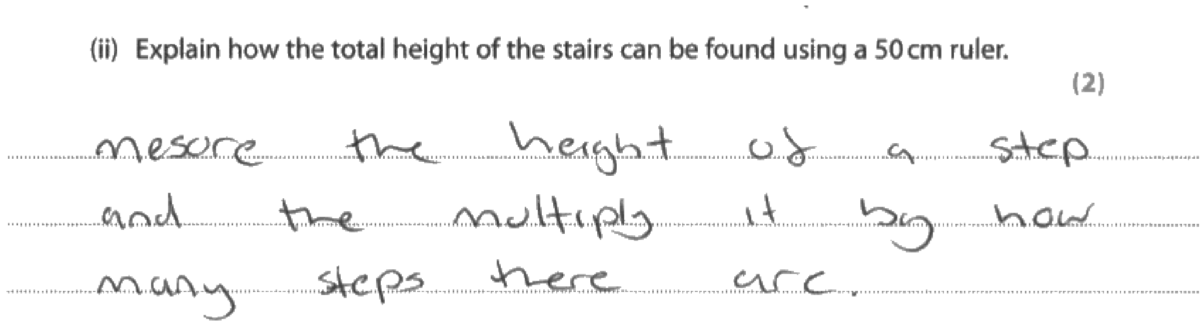
However, the answer is not rounded to two significant figures and so does not score the third mark.

An answer of 410 would score all three marks.

Question 8(b)(ii)

To score both marks here candidates needed to describe a workable method to measure the height of the stairs.

Common incorrect answers included placing rulers end to end in a vertical stack. This is not a workable method and did not receive credit.



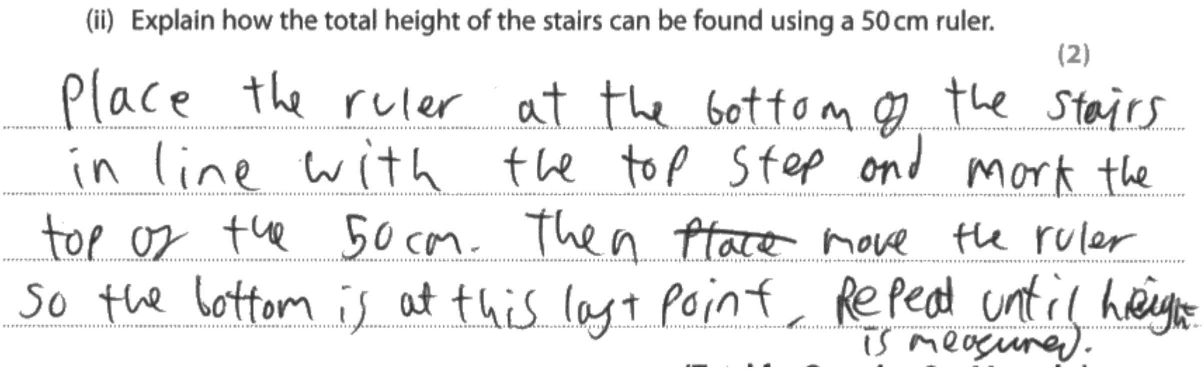
(ii) Explain how the total height of the stairs can be found using a 50 cm ruler.

(2)

mesure the height of a step and the multiply it by how many steps there are.

ResultsPlus
Examiner Comments

This is a good response clearly describing a correct method of measuring the height of a single step and multiplying up.



(ii) Explain how the total height of the stairs can be found using a 50 cm ruler.

(2)

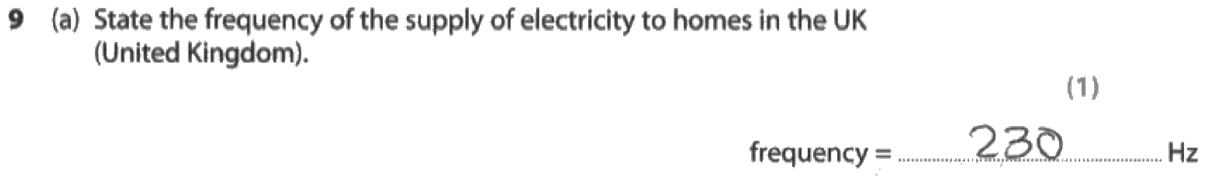
Place the ruler at the bottom of the stairs in line with the top step and mark the top of the 50cm. Then ~~Place~~ move the ruler so the bottom is at this last point, Repeat until height is measured.

ResultsPlus
Examiner Comments

Responses such as this one did not receive credit as it is not a workable method for measuring the height of most stairs and is certainly inferior to measuring a single step and multiplying up or measuring each individual step and adding together.

Question 9(a)

Many incorrect answers given with a variety of numbers seen.



9 (a) State the frequency of the supply of electricity to homes in the UK (United Kingdom).

(1)

frequency = 230 Hz

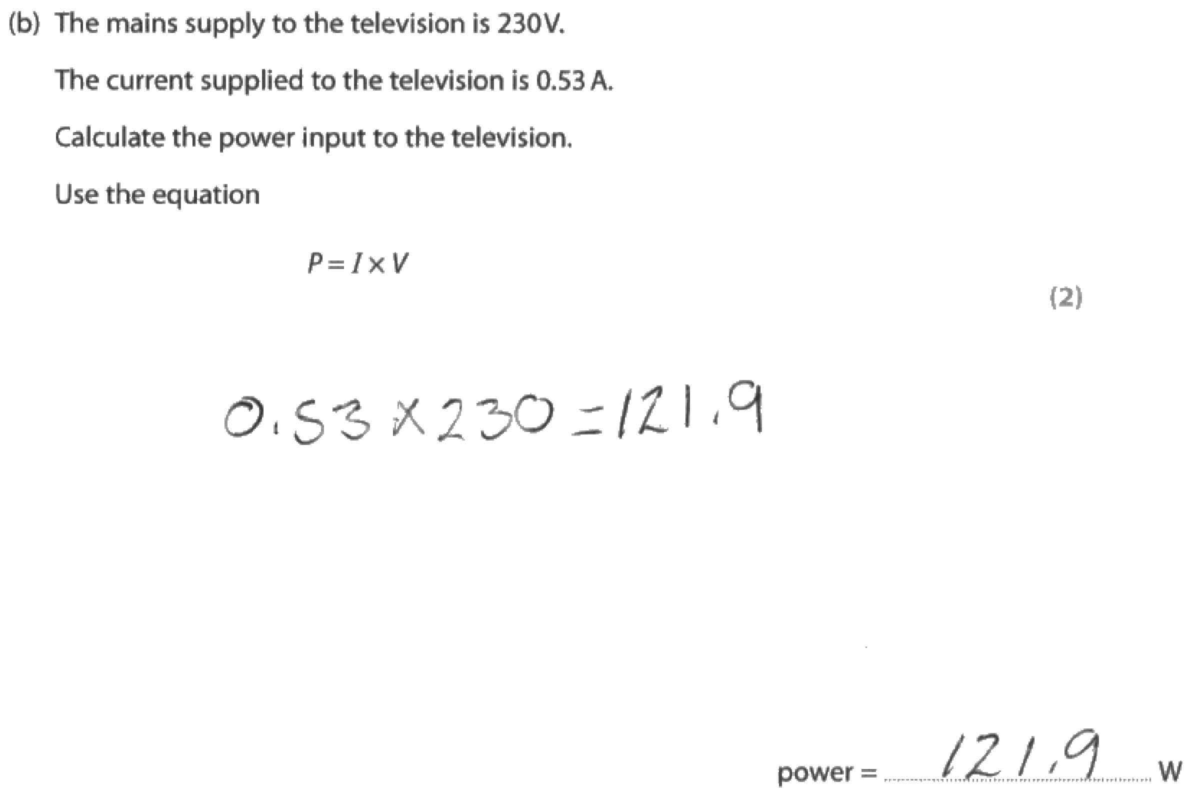
ResultsPlus
Examiner Comments

This was the most common incorrect value, probably confusing mains voltage with frequency.

Question 9(b)

The majority of candidates gave a correct answer here, usually unrounded.

A few candidates had transcription errors from the values given in the question.



(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)

0.53 x 230 = 121.9

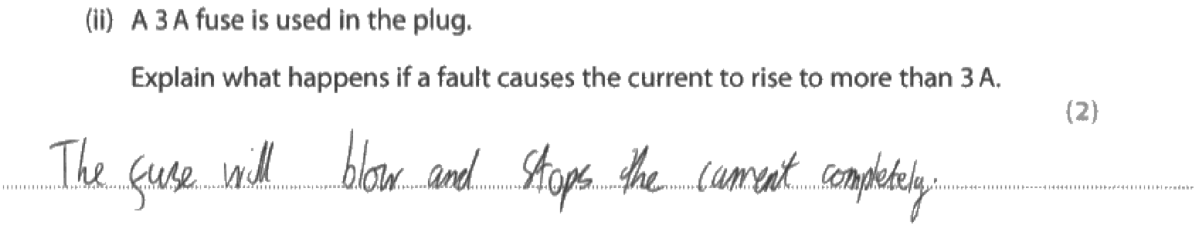
power = 121.9 W

ResultsPlus
Examiner Comments

An example of a clear response with working shown.

Question 9(c)(ii)

Most candidates only scored one mark here, usually for stating that the fuse would melt or blow and going no further, but sometimes stating that the circuit was broken without describing what happened to the fuse.



(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 fuse will blow and Stops the current completely.

ResultsPlus
Examiner Comments

This is a concise response that scores both marks for the action of the fuse and subsequent effect of 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 fuse would stop the current
from flowing through the wire.

ResultsPlus
Examiner Comments

This response scores the second mark only as the action of the fuse is not described. Only one point is made (current stopped).

ResultsPlus
Examiner Tip

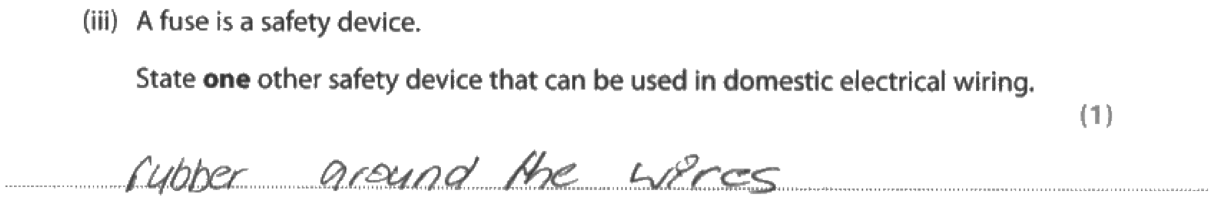
It is worth drawing candidates' attention to the number of marks a question is worth. Candidates who noticed that the question was worth two marks here were more likely to try to make two distinct points.

Question 9(c)(iii)

Most candidates scored this mark for insulation or earth wire or socket cover.

A switch was the most common incorrect response.

The idea of circuit breaker was rarely seen.



(iii) A fuse is a safety device.

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

(1)

rubber around the wires

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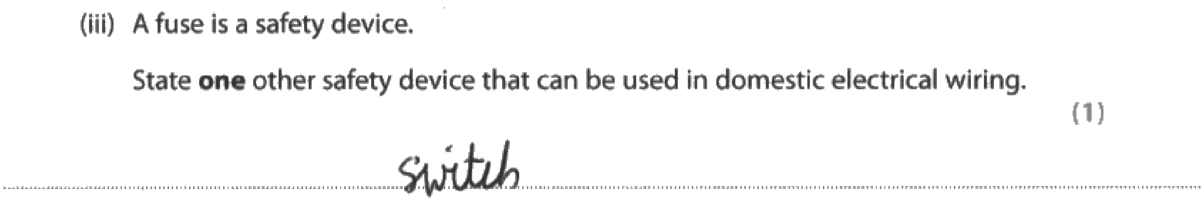
A description of wire insulation scored the mark.



(iii) A fuse is a safety device.

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

(1)

switch

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Examiner Comments

The most common incorrect answer.

Question 9(d)

This question generated a large variation in the depth of understanding seen in responses.

Many responses described the pathway of the power transmission from the diagram or gave values from the diagram but did not give anything beyond what was already given in the question. Many candidates wrote long descriptions, often with frequent repeats of information from the question, but usually only gained level 1 due to no explanation of the action of the transformers or how efficiency is increased.

Common incorrect ideas included electricity stored in transformers/pylons/cables or that energy was the key quantity changed by transformers.

The most common way for candidates to achieve level 2 was to state the type of transformer and how it changes the voltage. However, many did not realise that changing voltage also changes current. Instead, they would often describe mitigating power loss through insulating the overhead power lines.

Very few candidates scored level 3 here as the idea that transformers change the current was rarely seen.

*(d) Figure 18 is a diagram showing a part of the National Grid, used to supply electrical power to homes.

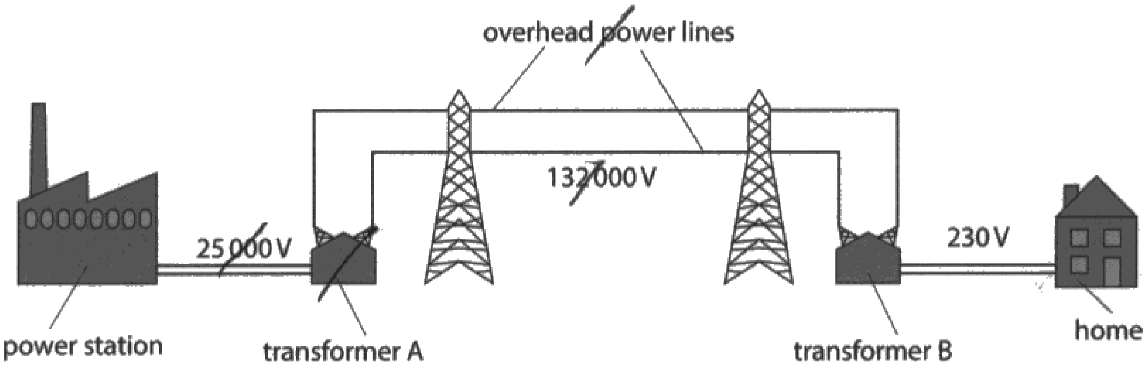

Figure 18

Using information from Figure 18, explain how electrical power is distributed from power stations to homes.

Your answer should refer to

- the role of the transformers
- the different voltages
- how energy losses are reduced

(6)

Answer lines for this question are on page 33.

From the power station, it will produce 25,000v. This will then be transferred to transformer A. Transformer A will increase the Voltage up to 132,000V to help transport it across all the electrical pylons and power lines. The insulation in the power lines will help with reducing any energy loss because it will trap ~~th~~ and contain any current or voltage. After being transferred through the power lines, the ~~cu~~ voltage is passed onto ~~the~~ transfomer B. This is where the voltage will be significantly decreased from 132,000V to only 230v. This is because, ~~th~~ 230v is the limit to which a house can contain without having any risks of a power cut.

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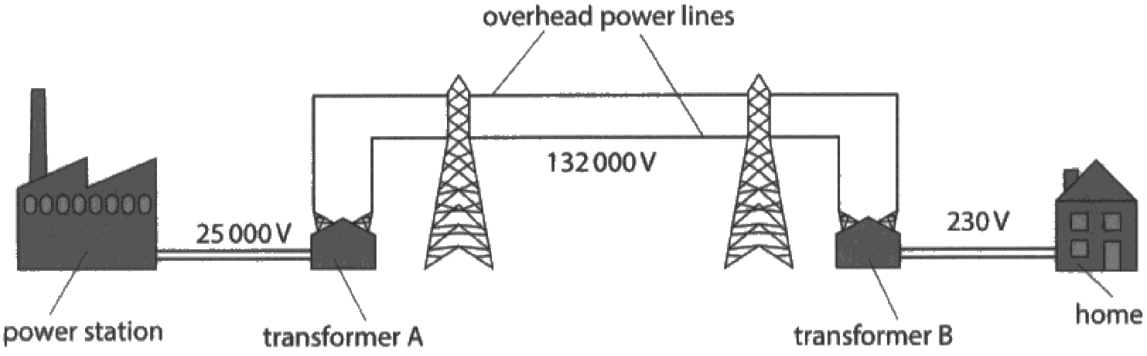
This is a common example of a level 1 response that essentially describes the diagram. No new information is given here beyond what is given in the question and so the response is limited to level 1.

*(d) Figure 18 is a diagram showing a part of the National Grid, used to supply electrical power to homes.



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Answer lines for this question are on page 33.

voltage from Power Stations arrive at a step-up transformer ~~wich~~ which increase voltage that travel by overhead Power lines then arrive to a step-down transformer which decreases the voltage for safer use in homes where the voltage arrives next.

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This response correctly identifies each of the transformers in the diagram and correctly describes their function. This is therefore a level 2 response.

*(d) Figure 18 is a diagram showing a part of the National Grid, used to supply electrical power to homes.

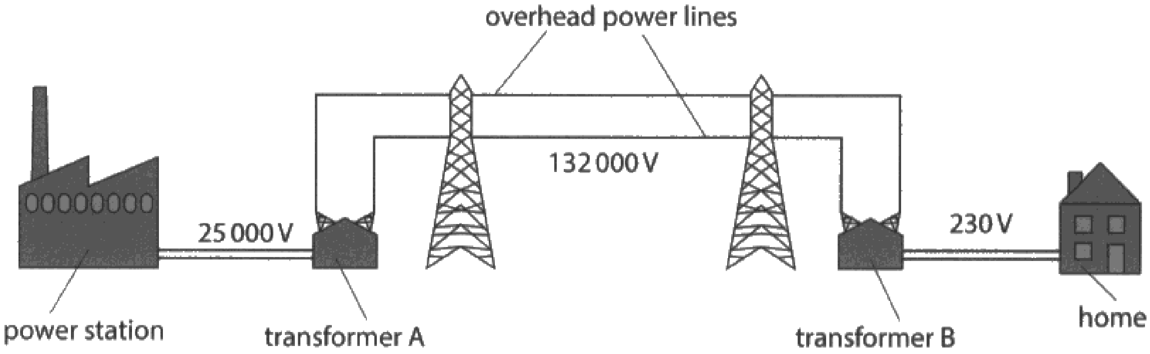

Figure 18

Using information from Figure 18, explain how electrical power is distributed from power stations to homes.

Your answer should refer to

- the role of the transformers
- the different voltages
- how energy losses are reduced

(6)

Answer lines for this question are on page 33.

Electricity is transferred to a step up transformer from a power station (Transformer A). This increases the voltage to 25 000 Volts. This reduces the current as the voltage increases. It also reduces the power lost due to heating from the cables.

Electricity is passed from the step up transformer to the overhead power lines when the voltage has increased to 132,000 Volts. The power lines transfer electricity from the step up transformer to the step down transformer (Transformer B).

The step down transformer reduces the voltage to 230 Volts because the a voltage of 132000 Volts would be too much to enter homes.

After the voltage has been reduced, voltage of 230 Volts is transfered to our homes for people to use as electricity.

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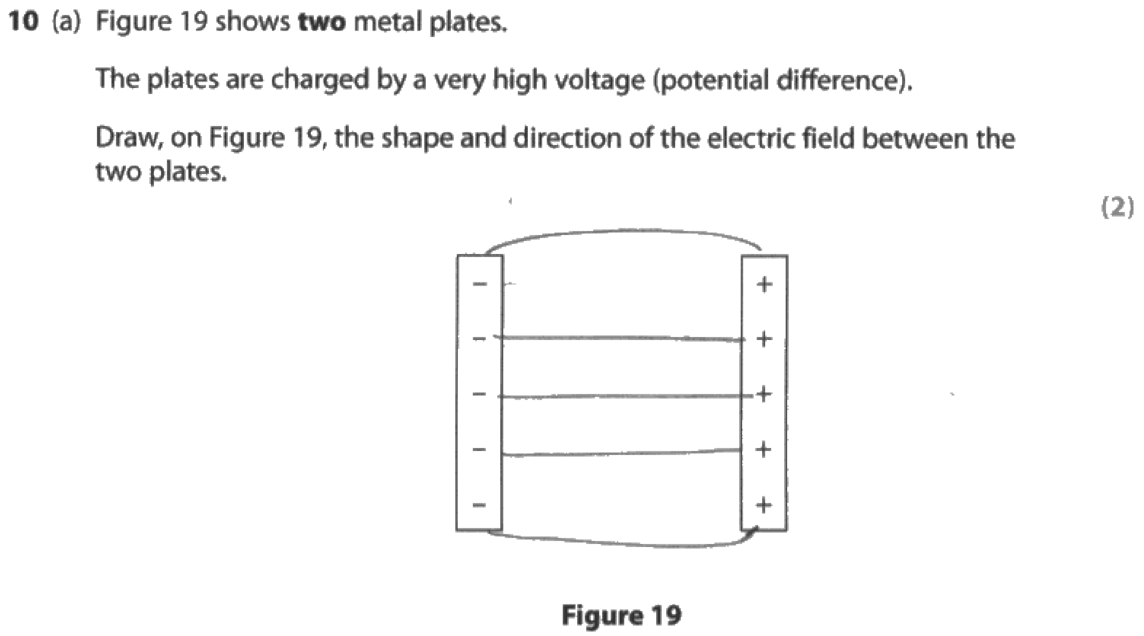
This is a good example of a level 3 response that correctly links the change in voltage and current by the transformer to the reduction in power loss in the overhead cables. This response was awarded full marks.

Question 10(a)

This question required candidates to realise that the field between the plates is uniform.

Most candidates scored at least one mark for drawing the parallel field lines, but many drew arrows pointing in the wrong direction.



10 (a) Figure 19 shows **two** metal plates.

The plates are charged by a very high voltage (potential difference).

Draw, on Figure 19, the shape and direction of the electric field between the two plates.

(2)

Figure 19

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Examiner Comments

This response scores the first mark but not the second as no arrows were drawn. Edge effects were ignored.

10 (a) Figure 19 shows **two** metal plates.

The plates are charged by a very high voltage (potential difference).

Draw, on Figure 19, the shape and direction of the electric field between the two plates.

(2)

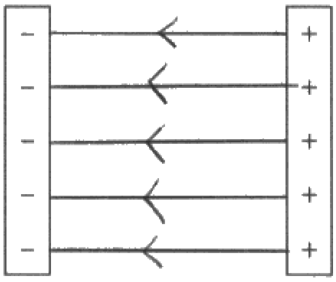

Figure 19

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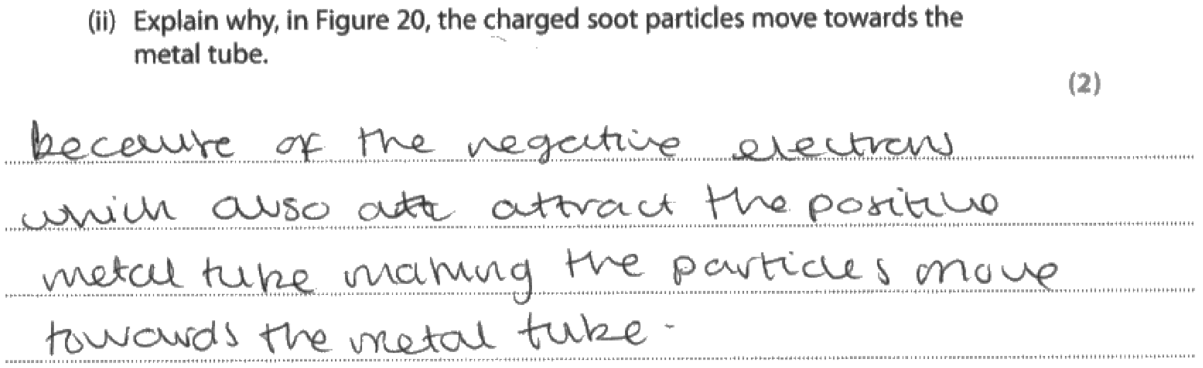
A good response that scores both marks.

Question 10(b)(ii)

Many candidates scored at least one mark here for the idea of attraction. Some went on to describe an attraction between negative soot particles and a positive tube (surface) which scored the second mark.

A recognition that the movement is due to attraction or repulsion gained credit here even if the charge described on the objects were incorrect.



(ii) Explain why, in Figure 20, the charged soot particles move towards the metal tube.

(2)

because of the negative electrons which also ~~att~~ attract the positive metal tube making the particles move towards the metal tube.

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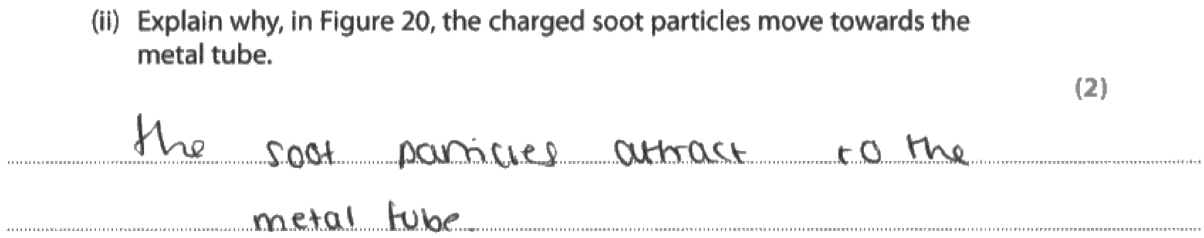
This response scores both marks for attraction and the charges on the objects described correctly.



(ii) Explain why, in Figure 20, the charged soot particles move towards the metal tube.

(2)

the soot particles attract to the metal tube

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Examiner Comments

This response scores one mark for a recognition that attraction causes the movement.

(ii) Explain why, in Figure 20, the charged soot particles move towards the metal tube.

(2)

because the metal tube has a negative charge and the soot particles have a positive. [illegible] ~~A~~ opposites attract

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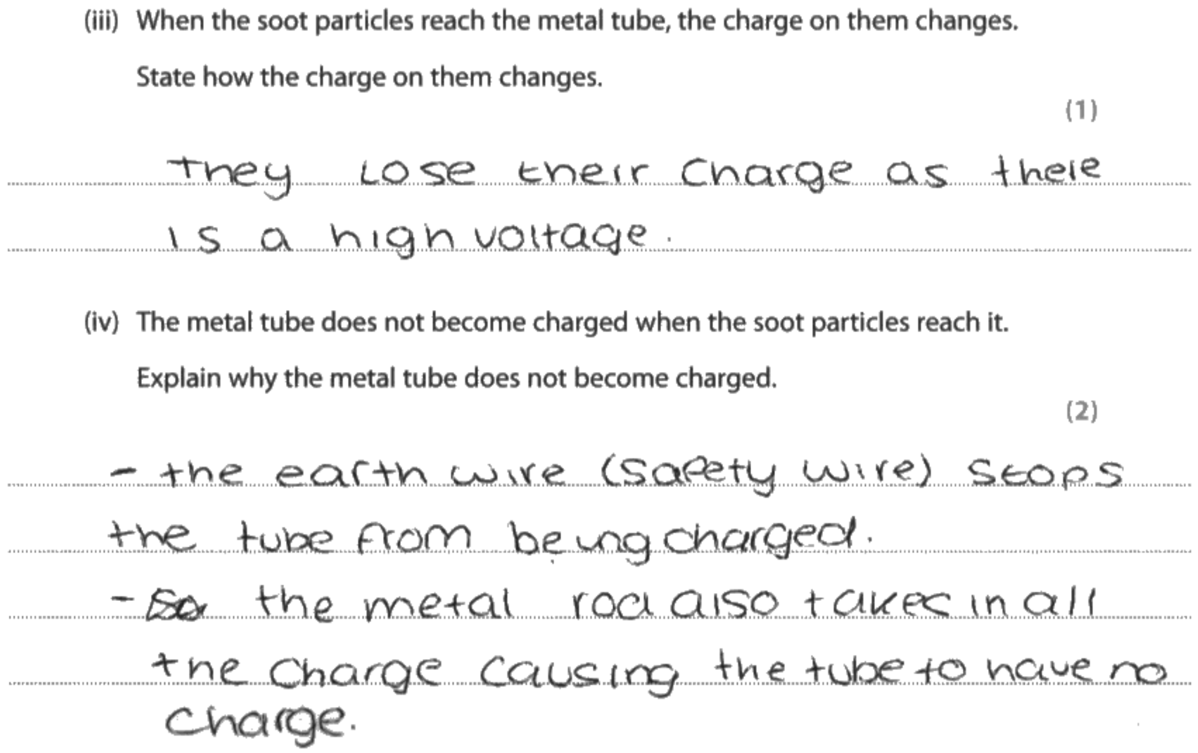
Examiner Comments

The response scores one mark for a recognition that the attraction causes the movement. The description of the charges is incorrect and so the second mark is not scored, this does not affect the first mark though.

Question 10(b)(iii-iv)

Few candidates scored the mark in Q10(b)(iii) and many demonstrated misconceptions such as stating that electrons are positive or that charge changes due to movement of protons. Some described a movement of electrons, but did not give a direction of movement or the correct direction. Answers stating that electrons were 'gained or lost' did not receive credit. Some stated that the soot particles change from positive to negative charge which shows that the candidate has not carefully read the question.

Q10(b)(iv) scored even less often than Q10(b)(iii) with very few candidates scoring any marks. Those that did score usually did so by referring to the fact that the tube was earthed. Only a few candidates scored a mark for the idea that metal is a conductor and in fact some stating that metal is an insulator.



(iii) When the soot particles reach the metal tube, the charge on them changes.

State how the charge on them changes.

(1)

They lose their Charge as there is a high voltage.

(iv) The metal tube does not become charged when the soot particles reach it.

Explain why the metal tube does not become charged.

(2)

- the earth wire (safety wire) stops the tube from being charged.

- ~~So~~ the metal rod also takes in all the charge causing the tube to have no charge.

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Q10(b)(iii) scores one mark for the idea that charge is lost. This demonstrates the correct direction of charge movement.

Q10(b)(iv) scores one mark for the idea that the tube is earthed. There is no reference to the metal conducting or the charge moving through the metal for the other mark.

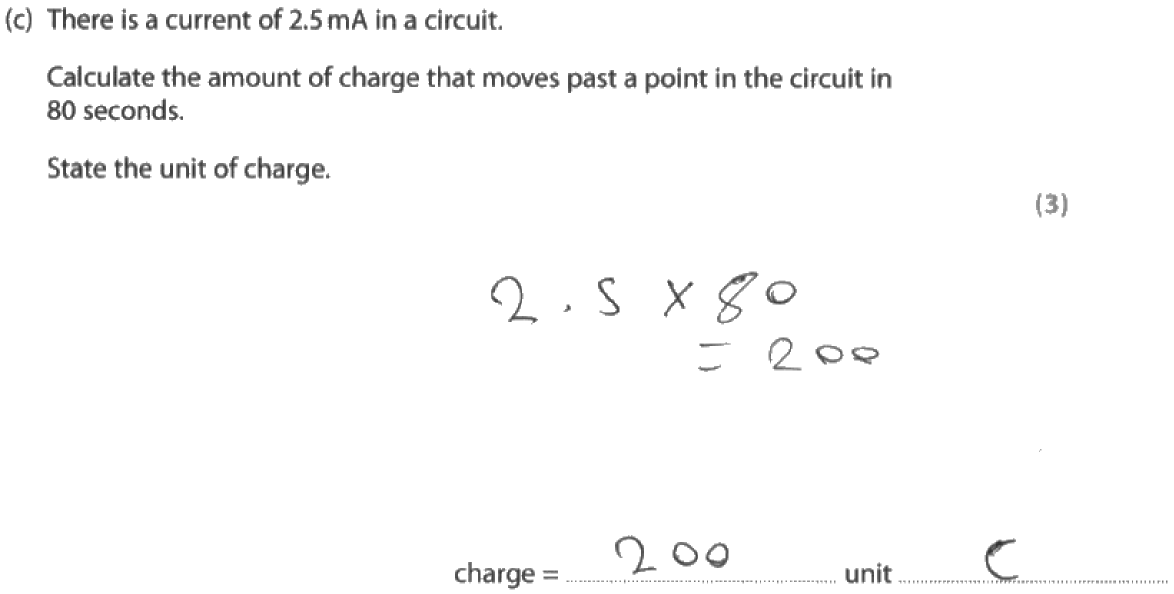
Question 10(c)

Most candidates were able to score one mark for an answer with a power of ten error, often with workings shown.

An answer of 200 but with an incorrect unit was common.

Some candidates were able to use the equation to deduce the unit, but some made an error giving mA/s or A/s.

Other common incorrect units seen were J, W, Q and Hz. Very few candidates gave coulombs.



(c) There is a current of 2.5 mA in a circuit.

Calculate the amount of charge that moves past a point in the circuit in 80 seconds.

State the unit of charge.

(3)

2.5×80

$= 200$

charge = 200 unit C

Examiner Comments

This response scores two marks.

The answer is correct but with a power of ten error due to not converting the current.

The unit mark is independent and so scores here for a recognition that the unit for charge is the Coulomb.

(c) There is a current of 2.5 mA in a circuit.

Calculate the amount of charge that moves past a point in the circuit in 80 seconds.

State the unit of charge.

(3)

~~Charge~~ Charge = ~~Current~~ Current x Time

0.0025 x 80 = 0.2

2.5 ÷ 1000 = 0.0025

charge = 0.2 unit C

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Here is an example of a correct answer with full working shown for three marks.

Paper Summary

Based on their performance on this paper, candidates should:

- Show full substitution into equations before starting to rearrange or calculate.
- Learn the meaning of command words and make sure to answer the question based on the command word used.
- Carefully read questions before starting to answer.
- Take note of the number of marks a question is worth before starting to answer.
- Be careful to use the correct words in descriptions, for example, use of the word ‘measure’ for measuring and the word ‘calculate’ for calculating.
- Be careful to clearly describe how to take measurements and describe experimental methods clearly in a step-by-step fashion.
- Learn key words from each topic and know how to use them in descriptions and explanations.

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