Pearson Edexcel

Examiners' Report June 2024

GCSE Physics 1PH0 2F

ResultsPlus

Edexcel and BTEC Qualifications

Edexcel and BTEC qualifications come from Pearson, the UK's largest awarding body. We provide a wide range of qualifications including academic, vocational, occupational and specific programmes for employers. For further information visit our qualifications websites at www.edexcel.com or www.btec.co.uk.

Alternatively, you can get in touch with us using the details on our contact us page at www.edexcel.com/contactus.

ResultsPlus

Giving you insight to inform next steps

ResultsPlus is Pearson's free online service giving instant and detailed analysis of your students' exam results.

- See students' scores for every exam question.
- Understand how your students' performance compares with class and national averages.
- Identify potential topics, skills and types of question where students may need to develop their learning further.

For more information on ResultsPlus, or to log in, visit www.edexcel.com/resultsplus. Your exams officer will be able to set up your ResultsPlus account in minutes via Edexcel Online.

Pearson: helping people progress, everywhere

Pearson aspires to be the world's leading learning company. Our aim is to help everyone progress in their lives through education. We believe in every kind of learning, for all kinds of people, wherever they are in the world. We've been involved in education for over 150 years, and by working across 70 countries, in 100 languages, we have built an international reputation for our commitment to high standards and raising achievement through innovation in education. Find out more about how we can help you and your students at: www.pearson.com/uk.

June 2024

Publications Code 1PH0_2F_2406_ER

Introduction

This was the seventh examination of paper 2, at Foundation Level, for this specification.

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 11 – Static electricity
- 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 practical procedures specified in the specification, together with further application.

One of the six-mark questions tested knowledge and understanding of the kinetic theory of gases.

The other six-mark question was based on an extension of the core practical to do with a temperature-time graph for melting ice.

Candidates coped well with most questions and did particularly well in the questions asking for calculations using equations. Students' knowledge of practical work continues to show improvement. This was shown particularly in Q04(c)(ii).

Successful candidates:

- were well-acquainted with the content of the specification
- had been engaged with practical work at some stage during their course
- were competent in quantitative work, especially in using equations
- were willing to apply physics principles to the novel situations presented to them
- recognised key command words such as “describe” and “explain” and constructed their responses accordingly

Less successful candidates:

- had gaps in their conceptual knowledge of the topics of this paper
- had gaps in their procedural knowledge, relating to their practical work
- misread and/or misunderstood the symbols used in equations
- failed to set out calculations in a logical way that could be easily followed
- did not focus sufficiently on what the question was asking
- found difficulty in applying their knowledge to new situations

This report will provide exemplification of candidates’ work, together with tips and/or comments, for a selection of questions. The exemplification will come from responses which highlight successes and misconceptions, with the aim of aiding future teaching of these topics.

Question 1 (a)

In this opening question, candidates had to label the components in a circuit diagram. A list of options was provided.

Nearly all candidates scored at least 1 mark with many going on to score all 4 marks.

Answer ALL questions. Write your answers in the spaces provided.

Some questions must be answered with a cross in a box ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

1 (a) Figure 1 shows a circuit containing a battery and **four** other components.

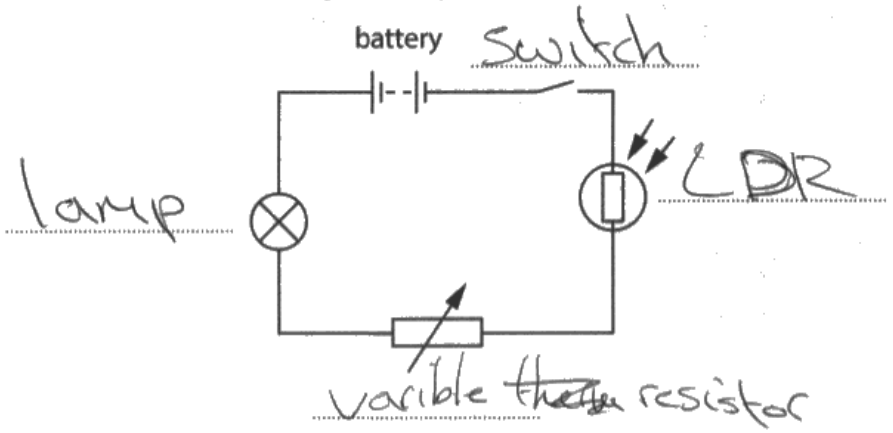


Figure 1

Label the **four** components in Figure 1, using words from the box.

~~ammeter~~ ~~lamp~~ ~~LDR~~

~~switch~~ thermistor ~~variable resistor~~

(4)

ResultsPlus
Examiner Comments

This response gets all four correct labels.

4 marks scored.

Answer ALL questions. Write your answers in the spaces provided.

Some questions must be answered with a cross in a box ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

1 (a) Figure 1 shows a circuit containing a battery and **four** other components.

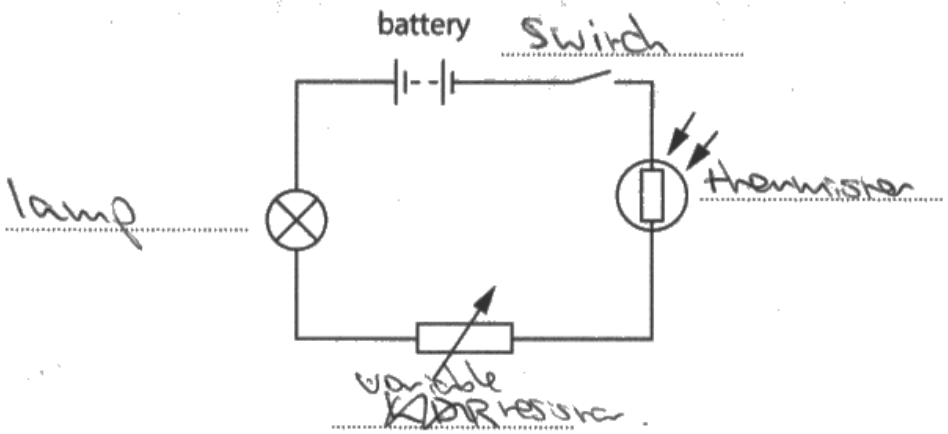


Figure 1

Label the **four** components in Figure 1, using words from the box.

ammeter	lamp	LDR
switch	thermistor	variable resistor

(4)

ResultsPlus
Examiner Comments

This response contains the most common error. The LDR is incorrectly labelled as a thermistor.

3 marks scored.

Question 1 (b)

This was a calculation involving a substitution into a given equation.

The vast majority of candidates scored both marks.

(b) The circuit in Figure 1 is switched on.

A charge of 1.2 C leaves the battery in a time of 4.0 s.

Calculate the current in the circuit.

Use the equation

$$\text{current} = \frac{\text{charge}}{\text{time}}$$

(2)

$\frac{1.2}{4.0} = 0.3$

current = 0.3 A

ResultsPlus
Examiner Comments

A typical example of a correct calculation with clear working shown.

2 marks scored.

Question 2 (a)(ii)

In this question about gears, candidates had to draw an X on the diagram to show the position of a third wheel that would rotate in the opposite direction to wheel Q but at the same speed.

A large number of candidates scored at least 1 of these marks with many going on to score both.

2 (a) Figure 2 shows two gear wheels, **P** and **Q**.

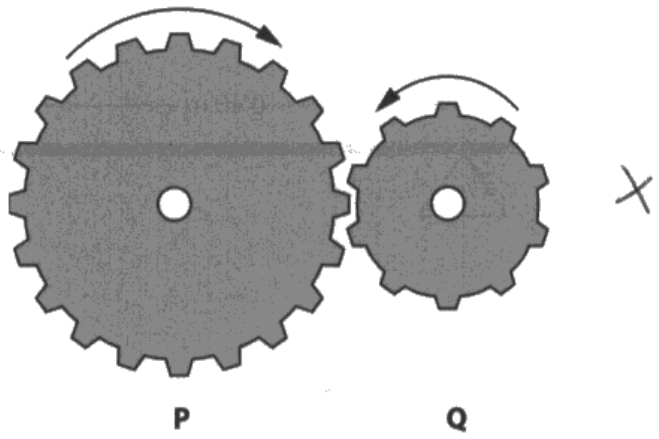


Figure 2

P has 20 teeth.

Q has 10 teeth.

(i) **P** rotates once.

How many times does **Q** rotate when **P** rotates once?

(1)

- ☒ **A** 200 times
- ☒ **B** 20 times
- ☒ **C** 10 times
- ☒ **D** 2 times

(ii) A third gear wheel is added to the system in Figure 2 so that this third wheel **rotates in the opposite direction** to **Q** but **at the same speed** as **Q**.

1. Draw an X on Figure 2 to show the position of this third gear wheel.
2. State how many teeth this third gear wheel has.

(2)

number of teeth = 10

ResultsPlus
Examiner Comments

This response shows the correct position for the third wheel suggests the correct number of teeth.

2 marks scored.

Question 2 (b)

A straightforward moments calculation from a diagram and a given equation.

Most candidates scored both marks.

(b) Figure 3 shows a 9.0 N force acting on a ruler.

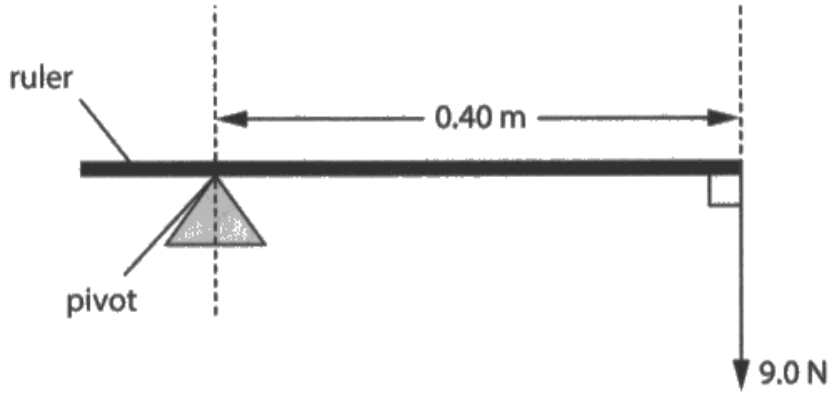


Figure 3

Calculate the moment of the 9.0 N force about the pivot.

Use the equation

moment = force × perpendicular distance of force from pivot

(2)

9.0 × 0.40 = 3.6

moment = 3.6 Nm

ResultsPlus
Examiner Comments

Clear working and the correct answer.

2 marks scored.

Question 2 (c)(ii)

A more difficult calculation than Q02(b) as it involves rearranging the equation. However, the numbers are straightforward, and the solution could be obtained by studying the diagram to balance the ruler.

An encouraging number of candidates were able to score both marks for this question.

1.2

(ii) Force **F** = 8.0 N.

The moment of force F about the pivot = 2.4 N m.

Calculate the distance, *d*, of force **F** from the pivot.

Use the equation $2.4 = 8 \times d$

moment = force × perpendicular distance of force from pivot

(2)

$\frac{2.4}{8}$

distance = 0.3 m

(Total for Question 2 = 8 marks)

ResultsPlus
Examiner Comments

This shows the substitution above the equation.

This is followed by the rearrangement and the correct answer.

2 marks scored.

(ii) Force **F** = 8.0 N.

The moment of force F about the pivot = 2.4 N m.

Calculate the distance, *d*, of force **F** from the pivot.

Use the equation

moment = force × perpendicular distance of force from pivot

$2.4 = 8 \times 0.3$ (2)

~~$8 \div 2.4 = 3.3$~~

$2.4 \div 8 = 0.3$

distance = 0.3 m

ResultsPlus
Examiner Comments

This response calculates and checks the answer.

2 marks scored.

ResultsPlus
Examiner Tip

If you are uncertain about rearranging equations, put your answer back into the original equation to check if it works.

Question 3 (b)

Here candidates had to explain why a positively charged balloon sticks to a wall.

Examiners were looking for attraction between the balloon and the negative charge induced at the surface of the wall.

It was not necessary in this context to mention induced charges or charge separation.

Most scored at least 1 of the 2 marks.

(b) One of the charged balloons is moved so it nearly touches a wall, as shown in Figure 6.

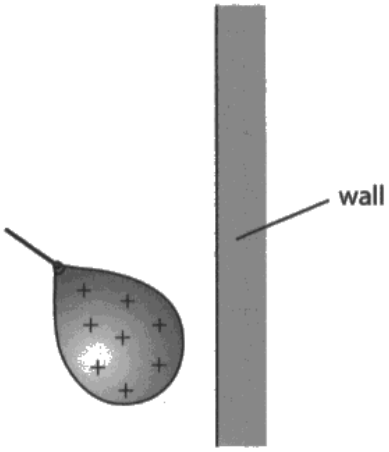


Figure 6

The balloon then sticks to the wall.

Explain why the balloon sticks to the wall.

You may add to the diagram to help your answer.

(2)

The negative charges in the wall attract to the positive charges in the balloon because opposite charges attract.

ResultsPlus
Examiner Comments

This explanation was sufficient to score both marks here.

Question 3 (c)

This was a more demanding question than Q03(b). Examiners were looking for explanations involving electrons (or negative charges) moving from the ground to the sphere.

Credit could be gained for mentioning that the wire was a conductor or that the sphere was earthed.

A good number of candidates scored at least 1 of the 2 marks but only a very few went on to score both marks.

(c) Figure 7 shows a positively charged metal sphere above the ground.

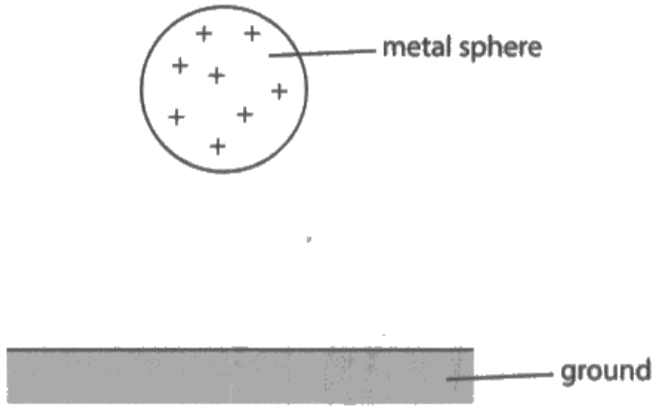


Figure 7

The metal sphere can be discharged by connecting the sphere to the ground with a metal wire.

Explain how this would discharge the sphere.

(2)

The metal sphere would gain negative electrons ~~to make~~ from the ground to make the metal sphere neutral therefore it would discharge the sphere.

ResultsPlus
Examiner Comments

This was one of the few responses that scored both marks.

2 marks scored.

Question 4 (a)(iii)

Candidates were asked to give a reason why the magnetic field was strongest at point X on the field diagram. Only a minority of candidates did this successfully.

(iii) Give a reason why Figure 8 shows the magnetic field is strongest at point **X**.

(1)

It is where the magnetic field line is the closest to the poles.

ResultsPlus
Examiner Comments

This scored the mark for suggesting it was close to the poles.

Question 4 (a)(i-ii)

This question showed a diagram of the shape of a magnetic field around a bar magnet.

Candidates were asked to draw an arrow on a field line to show the direction of the field and mark with an X on the diagram a point where the field is strongest.

The majority of candidates scored at least 1 mark here and a significant number went on to score both marks.

4 (a) Figure 8 shows the shape of the magnetic field lines around a bar magnet.

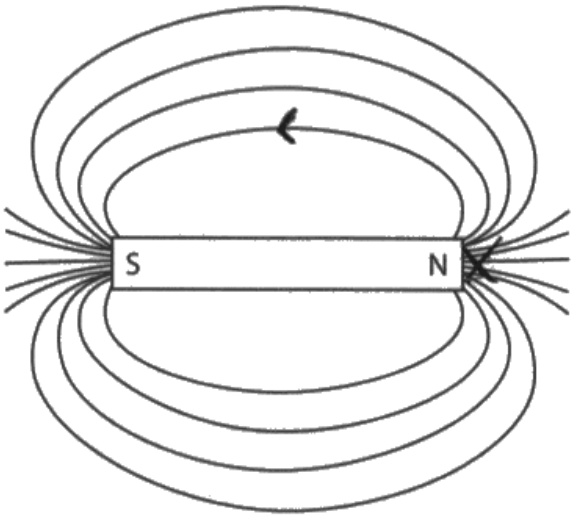


Figure 8

(i) Draw **one** arrow on a magnetic field line in Figure 8 to show the direction of that magnetic field line.

(1)

(ii) Draw an **X** on Figure 8 to show where the magnetic field is strongest.

(1)

ResultsPlus
Examiner Comments

Here the arrow showing the correct direction is clear and the X showing where the field is strongest is also correct but less clear.

2 marks scored.

Question 4 (b)(i)

Here candidates had to draw the shape of the magnetic field between the poles of two magnets with opposite poles facing each other.

Examiners were looking for one straight line and one curved line. Direction arrows were ignored as that was marked in Q04(a)(i).

Most scored at least 1 of the 2 marks available.

(b) A student places two magnets on a smooth bench.

The student holds the magnets close to each other, as shown in Figure 9.

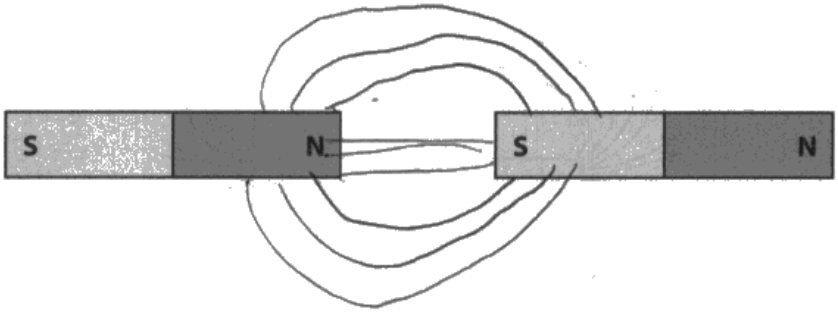


Figure 9

(i) Draw some magnetic field lines on Figure 9 to show the shape of the magnetic field **between** the two magnets.

(2)

ResultsPlus
Examiner Comments

There is one acceptable straight field line and several acceptable curved field lines here.

2 marks scored.

Question 4 (b)(ii)

Here examiners were looking for the idea that the magnet would move towards the other magnet.

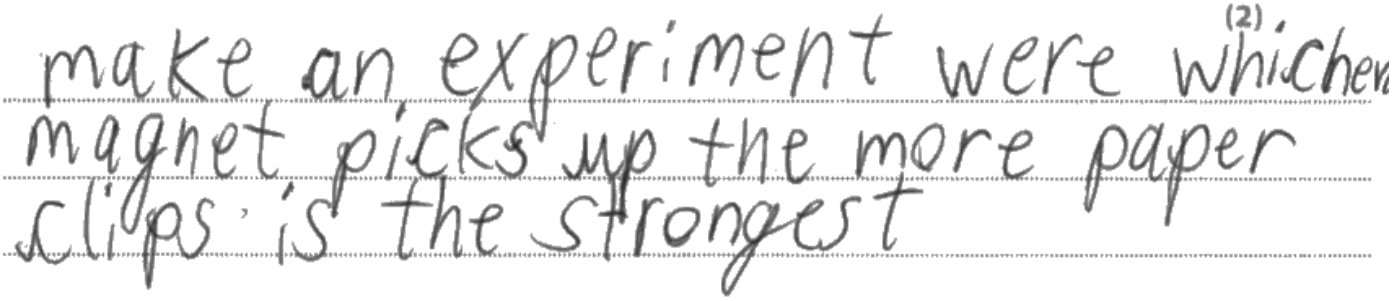
Most candidates scored this mark.

Question 4 (c)(ii)

The description that examiners were looking for here involved what to do and how to judge which was the stronger magnet.

The vast majority of candidates scored at least one mark with the majority of those scoring both marks.

(ii) **Describe how the student could use the paper clips to find out which of the two permanent magnets is the stronger magnet.**



(2)

ResultsPlus
Examiner Comments

picking up paperclips 1 mark

strongest picks up more 1 mark

2 marks scored

Question 5 (a)(i)

This involved a calculation of the work done by a force. Candidates also had to recall the unit for work done.

The vast majority could do the calculation but only about half of these provided a correct unit.

5 (a) Figure 11 shows a truck on a horizontal road.

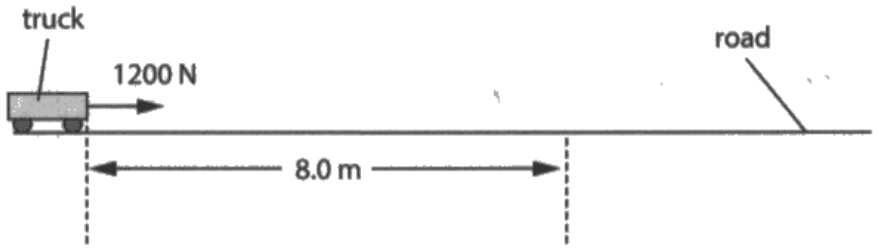


Figure 11

(i) A force of 1200 N pulls the truck along the road for a distance of 8.0 m.

Calculate the work done by the 1200 N force.

Use the equation

work done = force × distance moved in the direction of the force

State the unit of work done.

(3)

1200 x 8 = 9600

work done = 9600

unit J

ResultsPlus
Examiner Comments

Correct numerical answer and unit.

3 marks scored.

5 (a) Figure 11 shows a truck on a horizontal road.

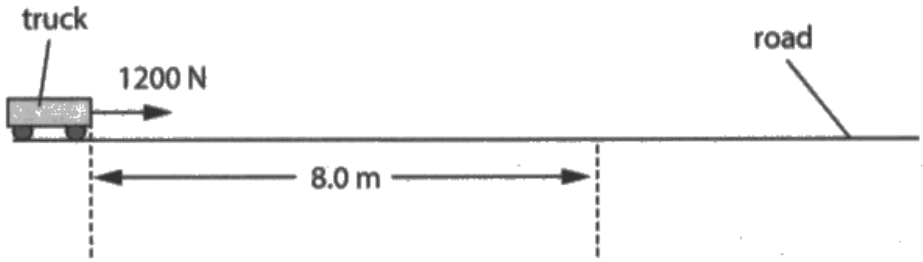


Figure 11

(i) A force of 1200 N pulls the truck along the road for a distance of 8.0 m.

Calculate the work done by the 1200 N force.

Use the equation

work done = force × distance moved in the direction of the force

State the unit of work done.

(3)

Force = 1200N
D = 8.0m

WD = 1200 × 8.0

1200N × 8.0m = 9600

WD = 9600N/m

work done = 9600

unit N/m

ResultsPlus
Examiner Comments

Correct numerical answer but incorrect unit.

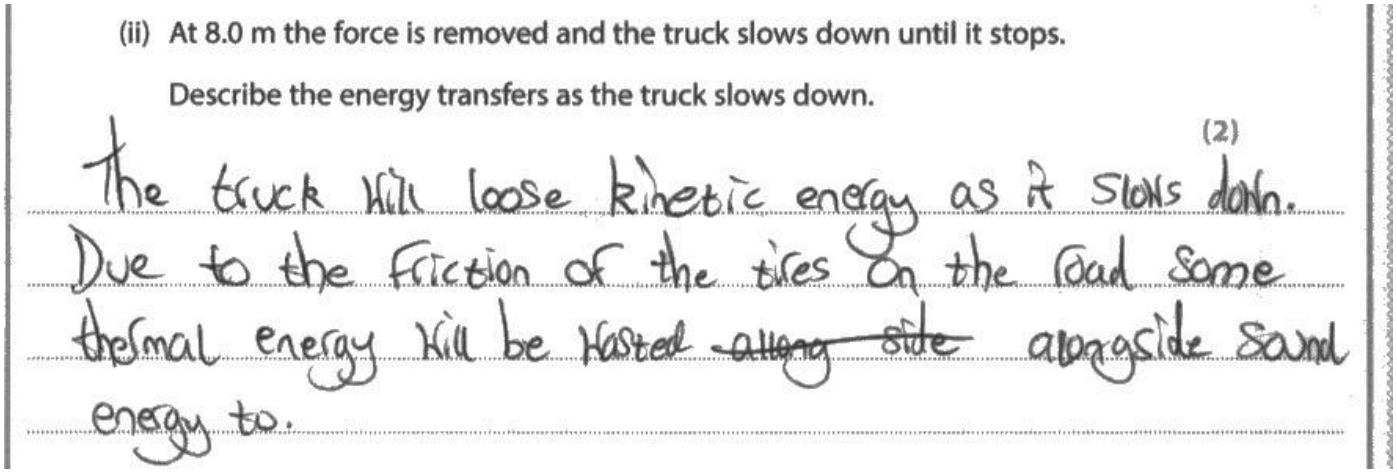
N m would be an allowable unit but not N/m as used in this response.

2 marks scored.

Question 5 (a)(ii)

Examiners were looking for the idea that kinetic energy is dissipated.

A range of answers was acceptable, and most candidates were able to score at least 1 of the 2 marks available.



(ii) At 8.0 m the force is removed and the truck slows down until it stops.

Describe the energy transfers as the truck slows down.

(2)

The truck will loose kinetic energy as it slows down. Due to the friction of the tires on the road some thermal energy will be wasted ~~along side~~ alongside sound energy too.

ResultsPlus
Examiner Comments

An acceptable description.

2 marks scored.

Question 5 (c)(i)

This involved candidates indicating an anomalous point on a graph.

The vast majority of candidates did this successfully.

Figure 13 shows the results of the student's calculations.

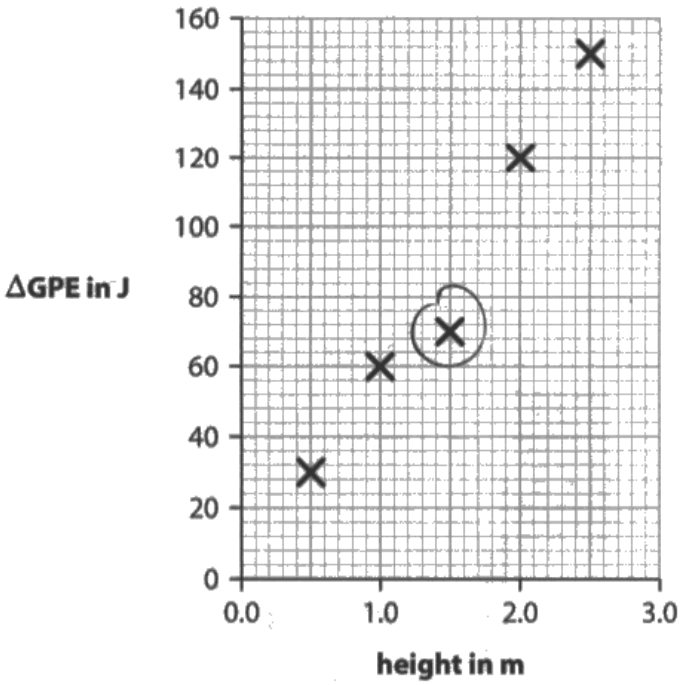


Figure 13

(i) The student has made one incorrect calculation.

On Figure 13, draw a circle round the ✕ for this incorrect calculation.

(1)

ResultsPlus
Examiner Comments

Point clear shown.

1 mark scored.

Question 5 (c)(ii)

Here candidates had to use the graph to find the change in gravitational potential energy (ΔGPE) for a height of 2m and then use this to calculate the power needed to lift the box.

Figure 13 shows the results of the student's calculations.

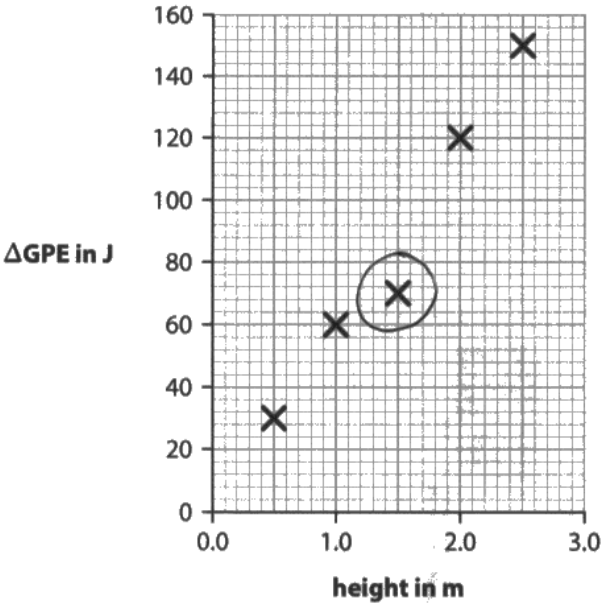


Figure 13

(i) The student has made one incorrect calculation.

On Figure 13, draw a circle round the ✕ for this incorrect calculation.

(1)

(ii) The truck lifts the box from the ground to a height of 2.0 m.

This takes a time of 5.0 s.

Using data from the graph in Figure 13, calculate the power needed to lift the box.

(3)

Use the equation

$$\text{power} = \frac{\Delta GPE}{\text{time}}$$

120 / 5.0 =

power = 24 W

ResultsPlus
Examiner Comments

120 is the correct value for ΔGPE.

Successfully used in the given equation.

3 marks scored.

Question 6 (a)(i-ii)

Here was a table of data about the heating of some milk. Candidates had to use this to calculate the increase in temperature of the milk and then the specific heat capacity of the milk.

The vast majority of candidates scored all 3 of the available marks for this item.

(i) Using data from the table in Figure 15, calculate the increase in temperature of the milk.

(1)

increase in temperature = 30 °C

(ii) Using data from the table in Figure 15, calculate the specific heat capacity of the milk.

Use the equation

$$\text{specific heat capacity} = \frac{\text{change in thermal energy}}{\text{mass} \times \text{increase in temperature}}$$

(2)

$$\frac{96,000}{0.82 \times 30} = 3902.4$$

specific heat capacity = 3902.4 J/kg °C

ResultsPlus
Examiner Comments

Clear working followed by the correct answer.

There was no mention in the question about giving the answer to a particular number of significant figures.

3 marks scored.

Question 6 (b)(i)

Candidates had to calculate the power supplied by a cooker and give their answer to 2 significant figures.

The vast majority of candidates scored at least 2 of the 3 available marks. The most common reason for not scoring all 3 marks was not expressing the answer to 2 significant figures.

(b) The cooker supplies 130 000 J of energy in a time of 87 s.

(i) Calculate the power supplied by the cooker.

Use the equation

$$P = \frac{E}{t}$$

Give your answer to 2 significant figures.

(3)

$\frac{130,000}{87} = P$

1494.2528

1500.00

power = 1500.00 W

ResultsPlus
Examiner Comments

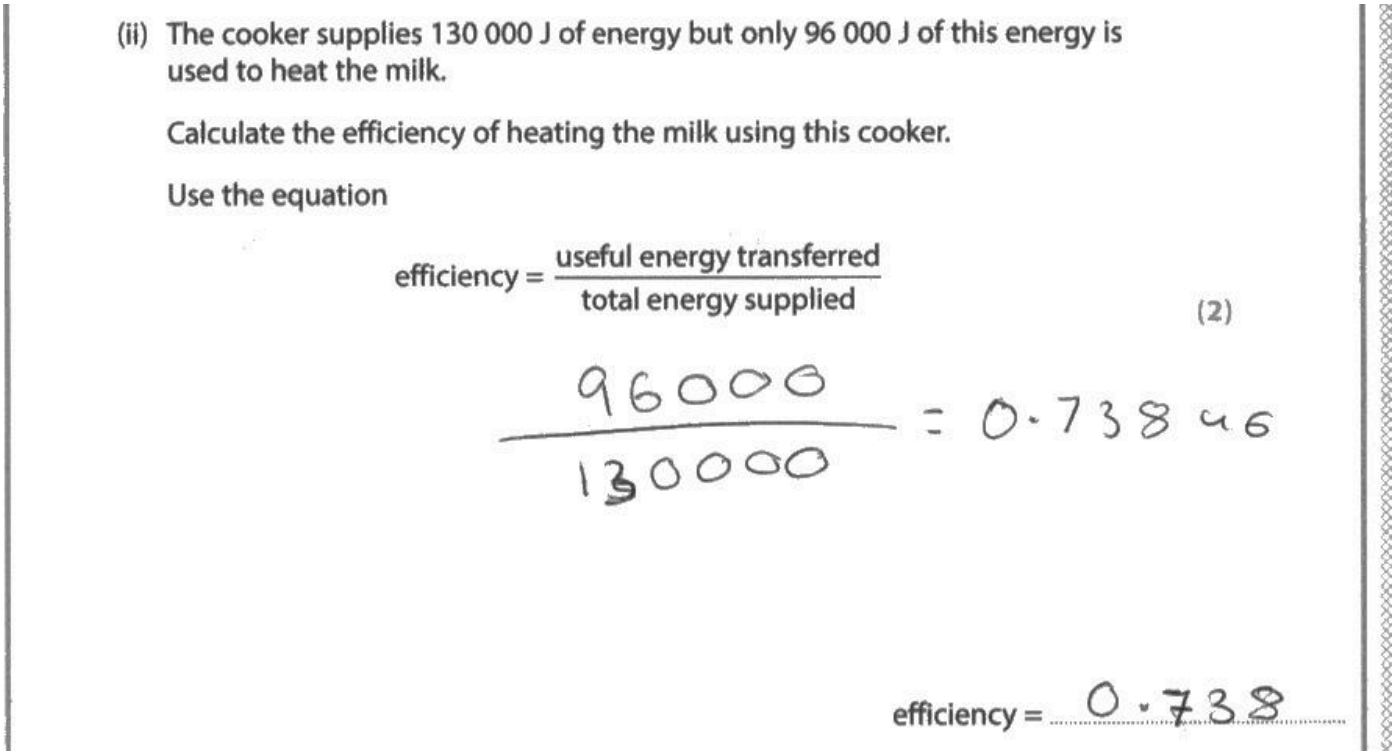
This shows all the steps in the calculation, including giving the correct answer to 2 significant figures.

3 marks scored.

Question 6 (b)(ii)

Here was an efficiency calculation, using a given equation. This did not involve a percentage, but examiners accepted answers expressed correctly as a percentage.

Most candidates scored both marks.



(ii) The cooker supplies 130 000 J of energy but only 96 000 J of this energy is used to heat the milk.

Calculate the efficiency of heating the milk using this cooker.

Use the equation

$$\text{efficiency} = \frac{\text{useful energy transferred}}{\text{total energy supplied}}$$

(2)

$$\frac{96000}{130000} = 0.73846$$

efficiency = 0.738

ResultsPlus Examiner Comments

The correct answer expressed as a decimal.

2 marks scored.

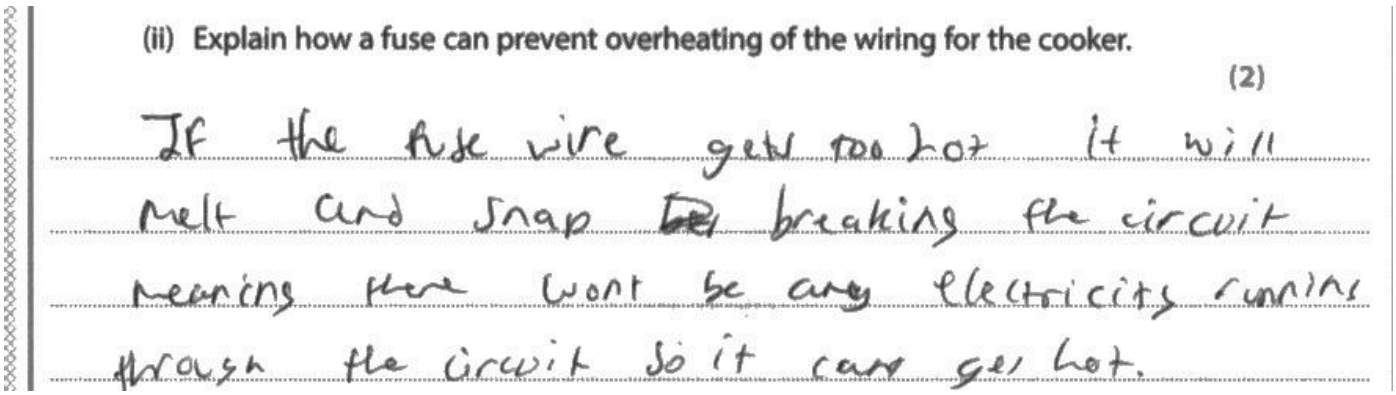
Question 6 (c)(ii)

Candidates were asked to explain how a fuse can prevent overheating of the wiring for a cooker.

Examiners accepted an explanation linking at least two of the three following points.

- if the current is too large
- the fuse melts or breaks
- switching of the current or the circuit.

A majority of candidates scored zero for this item. Of those who did score, about half went on to score both marks.



(ii) Explain how a fuse can prevent overheating of the wiring for the cooker.

(2)

If the fuse wire gets too hot it will melt and snap breaking the circuit meaning there wont be any electricity running through the circuit so it cant get hot.

ResultsPlus
Examiner Comments

This response neatly links the second and third of the two marking points.

2 marks scored.

Question 7 (a)(i-iii)

Most candidates scored all 3 marks available for this item.

It involved plotting a point on a pressure-volume graph, drawing a smooth curve through the points and using the graph to estimate a volume.

7 (a) A technician is investigating the pressure and volume of some gas trapped in a container.

The table in Figure 16 shows the results from the investigation.

pressure in kPa	volume in cm³
100	270
110	245
130	208
150	180
170	159
190	142
210	129

Figure 16

Figure 17 is a graph of the results.

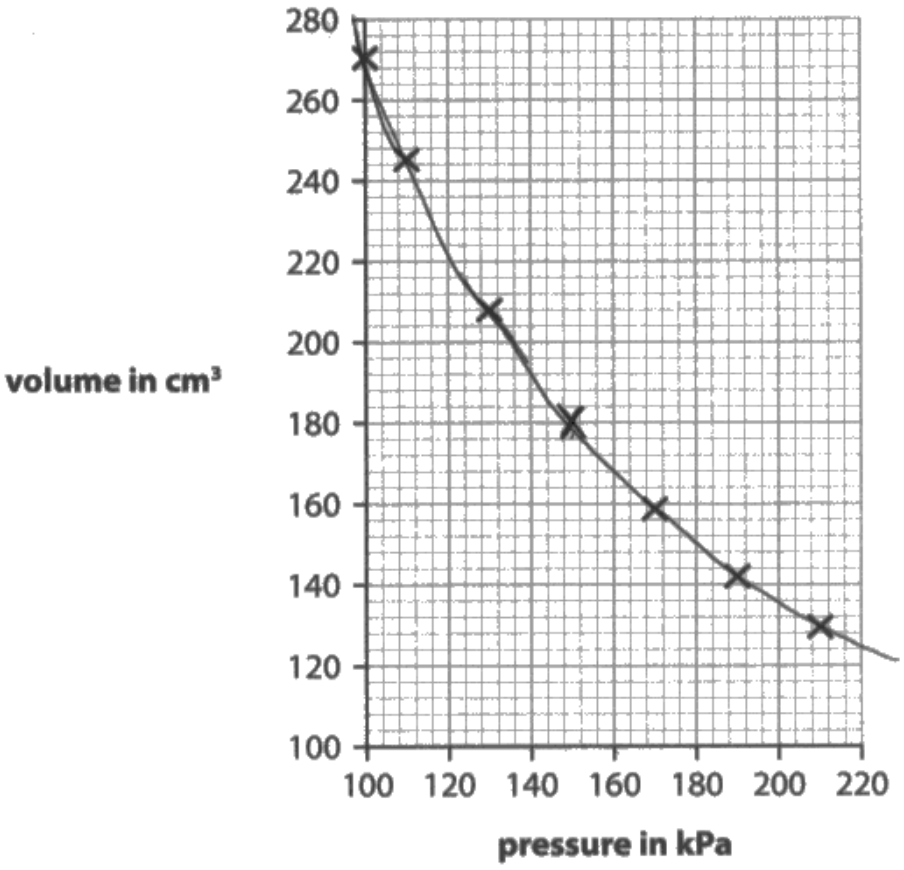


Figure 17

(i) One point has not been plotted on the graph in Figure 17.

The values for this point are shaded in the results table in Figure 16.

Plot the missing point on the graph in Figure 17.

(1)

(ii) Draw a smooth curve through the points on the graph in Figure 17.

(1)

(iii) Use the graph in Figure 17 to estimate the volume at a pressure of 120 kPa.

(1)

volume = 220 cm^3

ResultsPlus
Examiner Comments

The point (150,180) is plotted accurately, the curve is a bit wobbly but acceptable and the value for volume is in the acceptable range (220 to 228 cm^3).

3 marks scored.

Question 7 (b)(i)

In this sentence completion item, examiners were looking for the idea that thermal energy transfers to kinetic energy of the gas particles.

The majority of candidates scored the mark here.

Question 7 (b)(ii)

Here, candidates were presented with a diagram showing the same mass of gas at constant temperature in two different situations.

The candidates had to select the appropriate date from the diagram and substitute this into a given equation to find the 'new' pressure.

In previous examination series, this equation, involving subscript notation, has caused problems for candidates. In this case, the majority were able to score both available marks.

(ii) Figure 19a shows a container of gas.

The gas has a pressure of P_1 and volume V_1.

Figure 19b shows the same container after the gas has been compressed.

The pressure is now P_2 and the volume is V_2.

The temperature of the gas does not change.

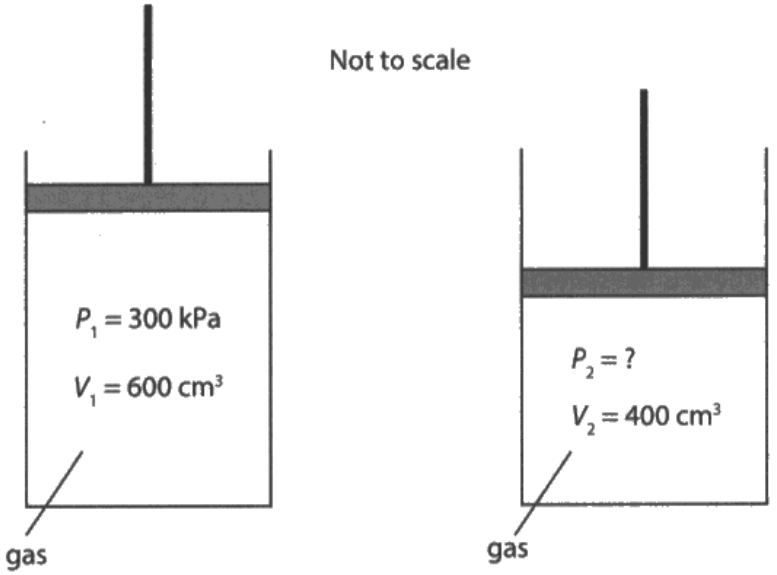


Figure 19a **Figure 19b**

Use data from Figure 19a and Figure 19b to calculate the pressure P_2 of the gas in Figure 19b.

Use the equation

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

(2)

$$\frac{300 \times 600}{400} = 450$$

$P_2 =$ 450 kPa

ResultsPlus
Examiner Comments

This has clearly presented working and the correct final answer.

2 marks scored.

Question 7 (c)

This was about a fixed mass of gas being compressed at a constant temperature.

Candidates had to explain, in terms of gas particles, why the pressure of the gas increases when the volume decreases.

The response had to refer to how the particles exert a pressure and why the pressure increases when the volume decreases.

A significant minority of candidates scored zero for this 6 mark question, but of those who did score, most were able to score at least 4 marks.

*(c) Some gas is trapped in a container similar to the container in Figure 19a.
The gas is compressed at a constant temperature.

Explain, **in terms of gas particles**, why the pressure of the gas increases when the volume decreases.

Your answer should refer to

- how the gas particles exert a pressure
- why the pressure increases when the volume decreases.

(6)

As the volume decreases the pressure increases this is due to them being inversely proportional, The volume decreasing means the gas particles has less room to move freely causing more collisions with the walls of the container. These collisions exert a force ~~with~~ therefore increasing the ~~press~~ pressure of the gas.

ResultsPlus
Examiner Comments

In lines 3 to 5 of this well-structured response, the candidate tells us that the particles collide with the walls of the container and that there are more collisions with the walls of the container after a decrease in volume. In this context, examiners accepted 'more' for 'more often'. The candidate goes on to say that the collisions exert a force and therefore a pressure on the walls of the container.

The response demonstrates accurate and relevant physics understanding in a well-structured explanation.

Level 3, 6 marks.

*(c) Some gas is trapped in a container similar to the container in Figure 19a.
The gas is compressed at a constant temperature.

Explain, **in terms of gas particles**, why the pressure of the gas increases when the volume decreases.

Your answer should refer to

- how the gas particles exert a pressure
- why the pressure increases when the volume decreases.

(6)

Gas particles have higher collisions and a higher pressure when trapped in an enclosed container.
As the volume decreases the particles have a limited amount of space so therefore collisions will take place at a faster rate which causes an increase in the pressure of the gas particles as they are in an enclosed container and ~~will~~ will collide violently

ResultsPlus
Examiner Comments

Even though there is some structure to this response, the ideas lack detail. For instance, collisions are mentioned but not collisions with the walls of the container.

Level 1, 2 marks

Question 8 (b)(i)

Here candidates were asked to add a voltmeter to a circuit diagram, connected to measure the potentail difference across four resistors in parallel.

A minority of candidates scored this mark.

(b) Some students investigate resistors in parallel.

The students set up a circuit containing **four** identical resistors.

The circuit used is shown in Figure 21.

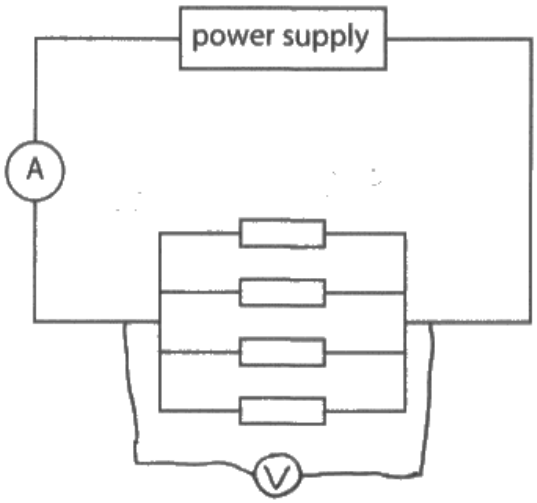


Figure 21

The students measure the current from the power supply and the voltage (p.d.) across the resistors.

(i) On Figure 21, draw a voltmeter connected to measure the voltage (p.d.) across the resistors.

(1)

ResultsPlus
Examiner Comments

This response shows a voltmeter connected correctly, in parallel across the resistors.

1 mark scored.

(b) Some students investigate resistors in parallel.

The students set up a circuit containing **four** identical resistors.

The circuit used is shown in Figure 21.

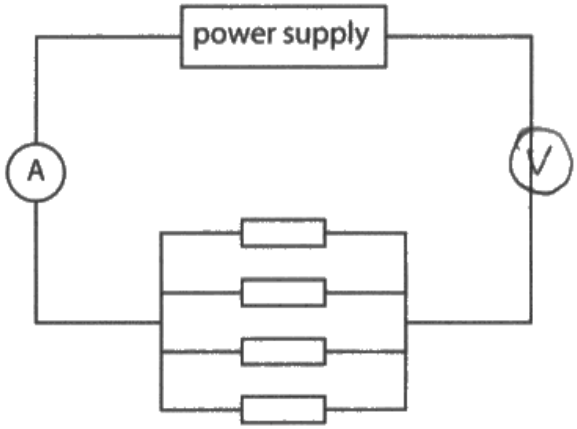


Figure 21

The students measure the current from the power supply and the voltage (p.d.) across the resistors.

(i) On Figure 21, draw a voltmeter connected to measure the voltage (p.d.) across the resistors.

(1)

ResultsPlus
Examiner Comments

This response shows the most common error. Here the voltmeter is connected in series with the resistors.

No marks scored.

Question 8 (b)(ii)

Candidates had to look for a pattern in a table of results and use it to predict a value for the current when four resistors are in the circuit.

Examiners allowed a range of 36 to 37 mA.

Most candidates scored this mark.

The students remove one resistor and measure the current and voltage again with only 3 resistors in the circuit.

They repeat the measurements of current and voltage with only 2 resistors in the circuit and then with only 1 resistor in the circuit.

Figure 22 is a table of their results.

number of resistors	current in mA	voltage in V
4	36.4	6.00
3	27.3	6.00
2	18.2	6.00
1	9.1	6.00

Figure 22

(ii) Using data from the table in Figure 22, predict the current from the power supply when there are 4 resistors in the circuit.

(1)

current = 36.4 mA

ResultsPlus
Examiner Comments

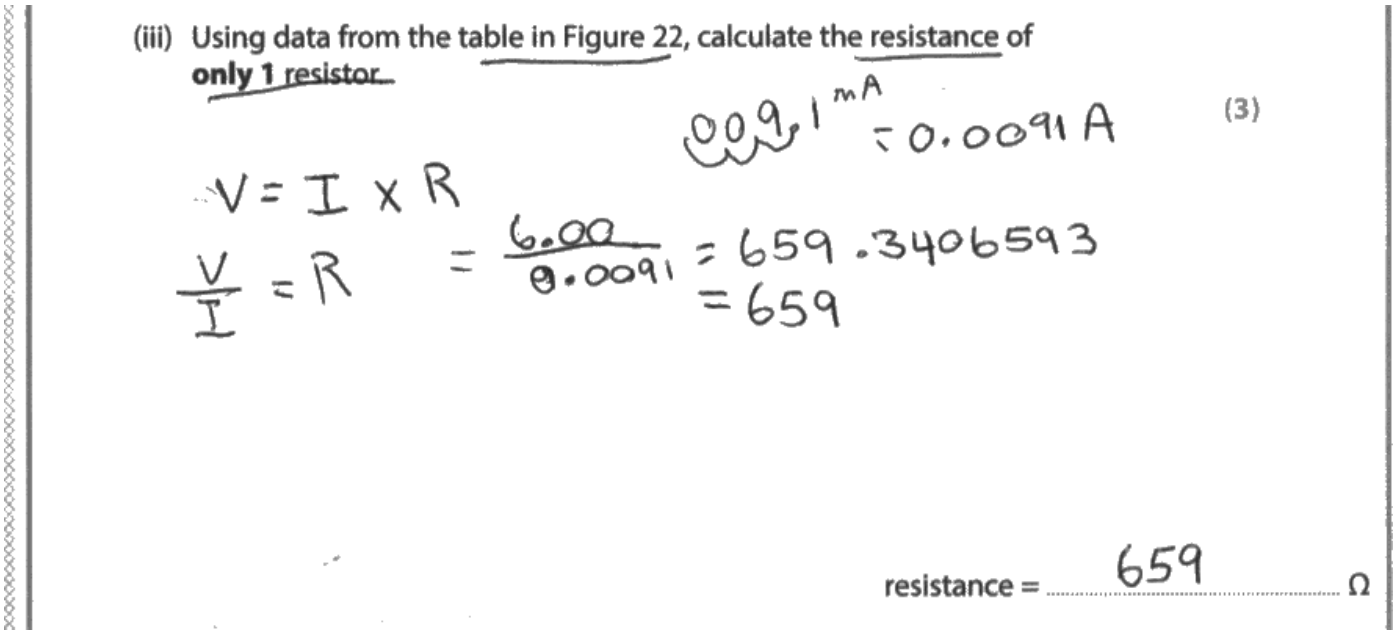
The table in this response shows the candidate has identified a pattern and the final answer is within the allowed range.

1 mark scored,

Question 8 (b)(iii)

There was quite a lot involved in this calculation. Candidates had to select the appropriate values from the table, convert units of mA to A, select the appropriate equation from the equations booklet, rearrange the equation and calculate the resistance.

The majority of candidates did not score in this question. Of those who scored, the majority scored 2 of the 3 available marks, the most common error was not converting mA to A.



(iii) Using data from the table in Figure 22, calculate the resistance of **only 1** resistor

(3)

009.1 mA = 0.0091 A

V = I x R

$\frac{V}{I} = R$ = $\frac{6.00}{0.0091}$ = 659.3406593 = 659

resistance = 659 Ω

ResultsPlus
Examiner Comments

This shows the unit conversion (9.1 mA to 0.0091 A), shows the rearranged equation and gets the correct answer.

3 marks scored.

(iii) Using data from the table in Figure 22, calculate the resistance of **only 1** resistor.

(3)

$\frac{6}{9.1} = 0.659$

$\frac{6}{36.4}$ =

V

I R

current

resistance = 0·659 Ω

ResultsPlus
Examiner Comments

This response does not do the unit conversion but does the rest correctly.

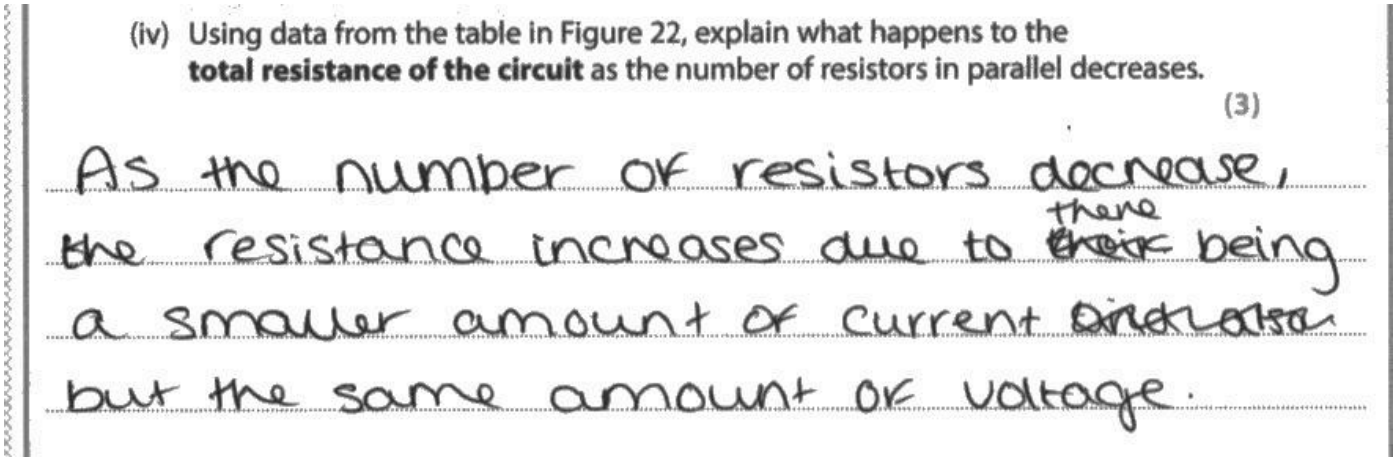
2 marks scored.

Question 8 (b)(iv)

Examiners were looking for an explanation linking a decrease in current with a constant voltage, meaning an increase in resistance.

This was a difficult question, and most candidates did not score any marks. The most common error being to assume that as the number of resistors increased then so did the total resistance of the circuit, without taking into account that the resistors were arranged in parallel.

Of those who did score, the majority scored 1 mark with only a very few scoring all 3 marks.



(iv) Using data from the table in Figure 22, explain what happens to the **total resistance of the circuit** as the number of resistors in parallel decreases.

(3)

As the number of resistors decrease, the resistance increases due to ~~their~~ there being a smaller amount of current ~~circulating~~ but the same amount of voltage.

ResultsPlus
Examiner Comments

This response links all 3 points concisely.

3 marks scored.

(iv) Using data from the table in Figure 22, explain what happens to the **total resistance of the circuit** as the number of resistors in parallel decreases.

(3)

The voltage remains the same but the current in na ~~increases by 9.1 P~~ decreases by 9.1 per resistor removed.

ResultsPlus
Examiner Comments

This states that the current decreases when the voltage stays the same but does not conclude that the total resistance increases.

2 marks scored

Question 8 (c)

Question 8 is mostly an overlap question with the higher tier paper. Part (c) however, appears only on the Foundation paper.

The majority of candidates score full marks for this item.

(c) An electric fire is connected to a 230 V mains supply.

A current of 9.0 A is supplied to the fire.

Calculate the power supplied to the fire.

Use the equation

power = current × voltage

2070 = 9 x 230 (2)

power = 2070 W

ResultsPlus
Examiner Comments

This response clearly shows the correct substitution of values into the equation and the correct answer on the answer line.

2 marks scored.

Question 9 (a)

Here candidates were given the equation for density and some data about a coil of copper wire.

They were asked to calculate the volume of the copper wire in cm^3. This involves rearranging the equation.

The first mark was available for substituting the correct values into the equation.

The second mark was for a correct rearrangement and the third mark for the final evaluation.

9 (a) A coil of copper wire has a mass of 14.1 g.

The density, ρ, of copper is 8.96 g/cm^3.

Calculate the volume of the copper wire.

Use the equation

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

(3)

$8.96 = \frac{14.1}{x}$ $x = 1.573600714285$

$x = \frac{14.1}{8.96}$

volume = 1.57366071428 cm^3

ResultsPlus
Examiner Comments

The substitution, rearrangement and evaluation are all clearly visible here.

The correct answer would score all 3 marks, even without the working.

3 marks scored.

9 (a) A coil of copper wire has a mass of 14.1 g.

The density, ρ, of copper is 8.96 g/cm^3.

Calculate the volume of the copper wire.

Use the equation

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

(3)

14.1 ÷ 8.96 = 129.024

volume = 129.024 cm^3

ResultsPlus
Examiner Comments

This response scores the substitution and rearrangement marks (14.1 ÷ 8.96) but does not score the evaluation mark.

2 marks scored.

9 (a) A coil of copper wire has a mass of 14.1 g.

The density, ρ, of copper is 8.96 g/cm^3.

Calculate the volume of the copper wire.

Use the equation

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

(3)

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

then $V = P \times m$

so $= 14.1 \times 8.96$

$\uparrow$

126.336

volume = 126.336 cm^3

ResultsPlus
Examiner Comments

This has an incorrect rearrangement but because the rearrangement in symbols is visible, the examiner was able to award the substitution mark.

1 mark scored

ResultsPlus
Examiner Tip

This example shows the importance of showing each step in your working.

Without seeing the incorrect rearrangement in symbols, the examiner could not have awarded the substitution mark.

Question 9 (b)

Here candidates had to link the fact that the density of solid aluminium is greater than the density of liquid aluminium with the idea that the distance between the particles in the solid is less than the distance between the particles in the liquid.

(b) Figure 23 gives information about the density of aluminium.

	density in g/cm^3
solid aluminium	2.70
liquid aluminium	2.38

Figure 23

Explain the difference between the density of solid aluminium and the density of liquid aluminium in terms of the arrangement of particles.

(2)

Solid aluminium is ~~de~~ has a larger density compared to liquid aluminium because the particle ~~aroog~~ arrangments in solid aluminium are muen closer to gether and ~~only~~ can vibrate

ResultsPlus
Examiner Comments

This response is concise and correct.

2 marks scored.

Question 9 (c)

The equation was given in this calculation, but candidates needed to be aware of 'L' in standard form and the value of the mass had to be in kg.

(c) A student boils some water.

Calculate the amount of thermal energy needed to change 60.0 g of water to steam at its boiling point.

The specific latent heat of vaporisation of water, L, is 2.26×10^6 J/kg.

Use the equation

$$Q = m \times L$$

(2)

60 ÷ 1000 = 0.06

$0.06 \times 2.26 \times 10^6$

135600

amount of thermal energy = 135600 J

ResultsPlus
Examiner Comments

In this response, the unit conversion for the mass is clearly visible and the correct answer is obtained.

2 marks scored.

Question 9 (d)

In this extended open response question, candidates had to demonstrate their knowledge and understanding of the change of state of a substance and relate this to data from a given graph.

The graph had four sections

- the temperature of ice increasing
- ice melting
- the temperature of water increasing
- water turning to 'steam'

Full marks could be obtained by relating their knowledge and understanding about any two of these sections to data from the graph and mentioning a fact from one of the other sections without getting the graph reference correct.

If a response gets only one section correct but shows other relevant knowledge, level 2 is achieved.

If a response does not get any of the sections correct but still shows relevant knowledge, level 1 is achieved.

*(d) A student is investigating the melting of ice.

The student has some crushed ice in a beaker at a temperature of –20 °C.

The student heats the beaker and its contents for 20 minutes.

Figure 24 is a graph of the student's results.

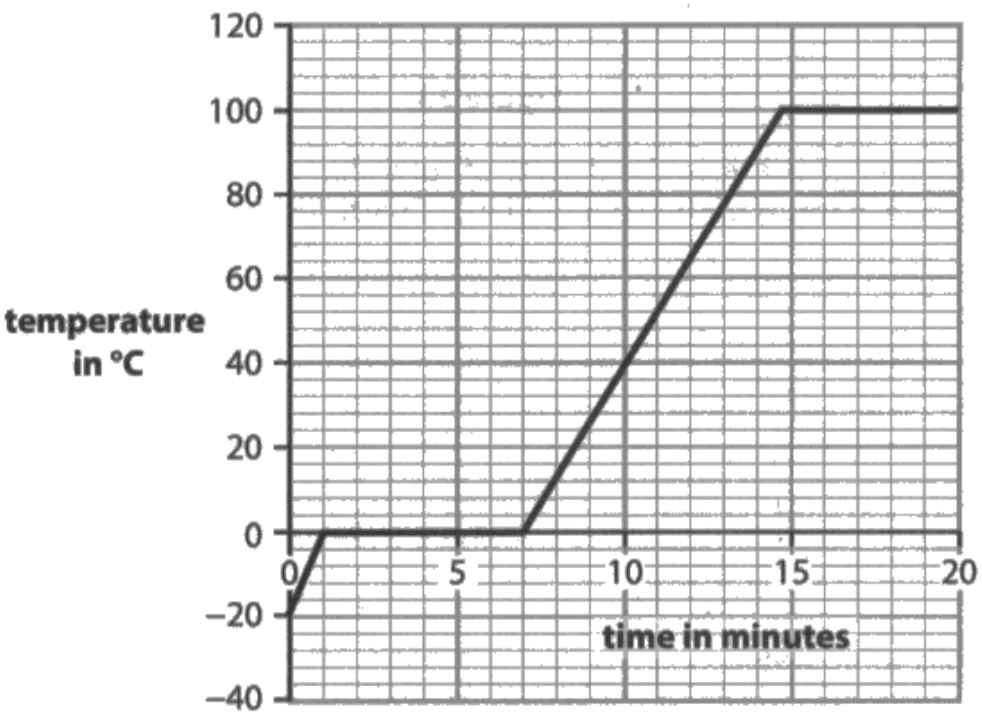


Figure 24

Using information from the graph, describe the changes that take place in the 20 minutes shown on the graph.

Your answer should refer to

- data from the graph
- the state (solid, liquid or gas) of the contents of the beaker.

(6)

Answer lines for this question start on page 31

Between -20°C and 0°C the ice is frozen and is in a solid state. Between 1 minute and 7 minutes at 0°C the ice is melting and turning into water which is a liquid state. There is an increase in 100°C between 7 minutes and 14.5 minutes this is where the water is bubbling as it would be boiling but would still remain in a liquid state. Then at 100°C from 14.5minutes to 25 minutes the water will evaporate into steam which would be a gas state.

ResultsPlus
Examiner Comments

This response correctly relates the first two sections to data from the graph in lines 1 – 3.

The next two sections are not so clear cut but does show knowledge of temperature change and boiling.

This is enough to reach level 3.

6 marks scored.

Question 10 (b)

Here, candidates had to calculate the force exerted by the blade of an ice skate on the ice.

The values given were in standard form and candidates had to give their answers to 2 significant figures.

The rearranged form of the equation was given.

(b) Figure 26 shows an ice skater standing on one skate.

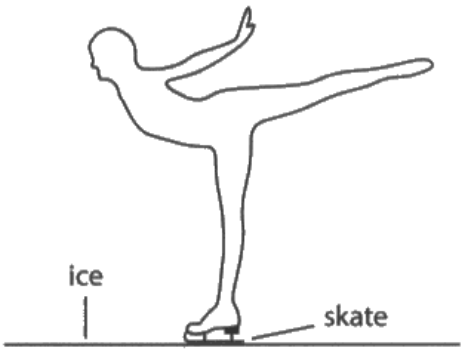


Figure 26

Calculate the force the skate exerts on the ice.

pressure of skate on ice = 4.8×10^{7} Pa

area of blade in contact with ice = 1.2×10^{-5} m^2

Use the equation

force = pressure × area

Give your answer to 2 significant figures.

(3)

$4.8 \times 10^{7} \times 1.2 \times 10^{-5} = 576$

force = 580 N

ResultsPlus
Examiner Comments

This response shows clear working, arriving at a value to 3 significant figures and rounding this to 2 significant figures on the answer line.

This scores all 3 marks.

(b) Figure 26 shows an ice skater standing on one skate.

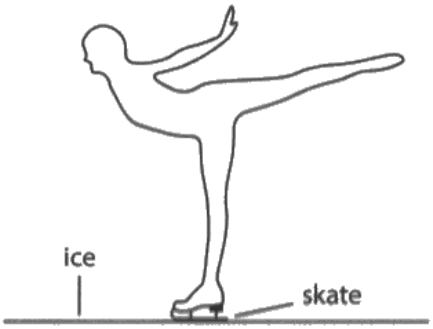


Figure 26

Calculate the force the skate exerts on the ice.

pressure of skate on ice = 4.8×10^{7} Pa

area of blade in contact with ice = 1.2×10^{-5} m^2

Use the equation

force = pressure × area

Give your answer to 2 significant figures.

(3)

48000000 × 0.000012

=

576 = 570

force = 570 N

ResultsPlus
Examiner Comments

In this question, the third mark was for rounding the candidate's evaluation to 2 significant figures.

In this response, the first 2 marks were scored but the rounding of 576 to 580 was incorrect.

2 marks scored.

Question 10 (c)(i)

Candidates were asked to interpret a graph to describe how atmospheric pressure changes with height above sea level.

(c) Figure 27 shows how atmospheric pressure changes with height above sea level.

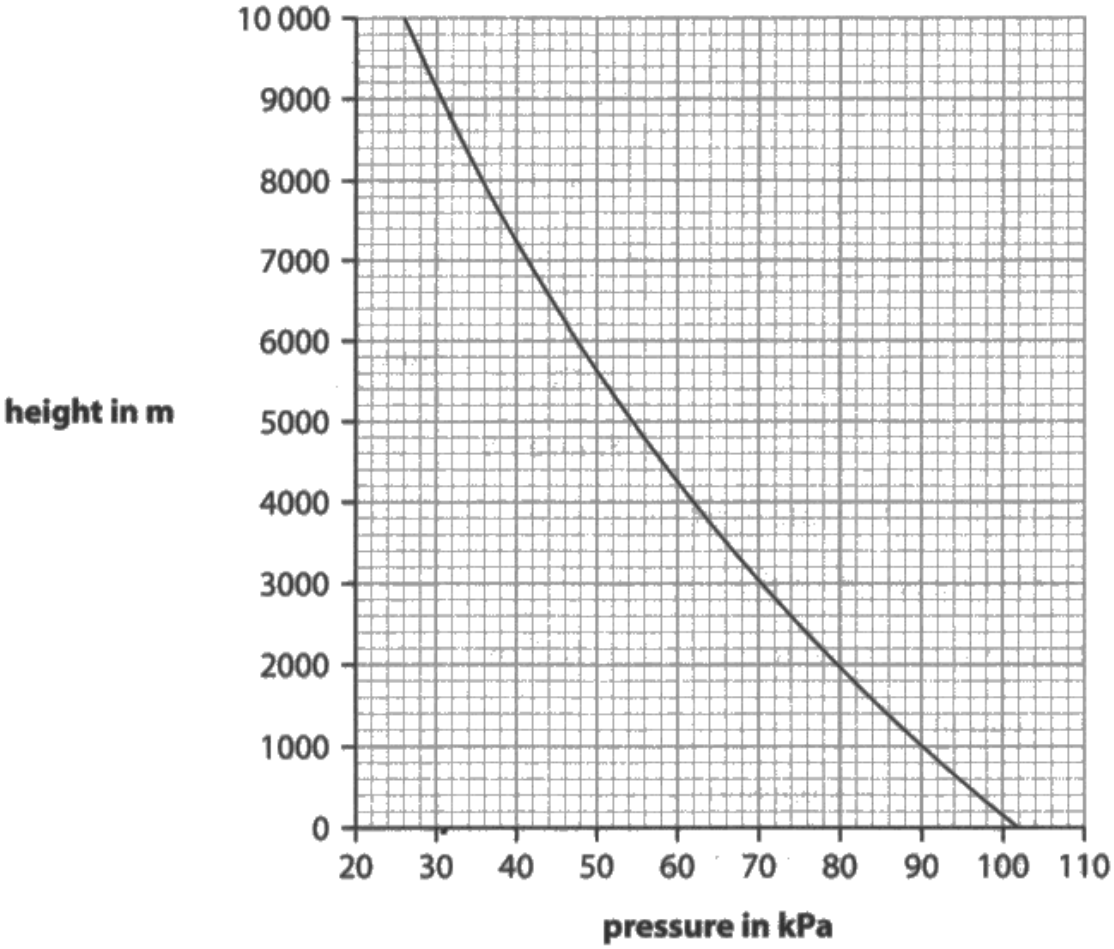


Figure 27

(i) Using the graph, describe how atmospheric pressure changes with height above sea level.

(2)

As the height decreases the pressure is increasing. It is a non linear relationship and is not directly poptional

ResultsPlus
Examiner Comments

This response correctly states that as the height decreases the pressure increases and that the relationship is nonlinear.

This scores both marking points, 2 marks

ResultsPlus
Examiner Tip

Descriptions of relationships between variables on a graph often carry 2 marks. This is an indication that examiners are looking for 2 statements.

For instance, if a graph of *y* against *x* is a straight line, a suitable answer might be

"As *x* increases, *y* increases. The relationship is linear."

Question 10 (c)(ii)

Here, candidates had to use the graph (Figure 27, shown in Q10(c)(i)) to estimate the atmospheric pressure at a given height above sea level.

This was an estimate as the scale was difficult.

Examiners accepted values between 30 and 34 kPa.

(ii) The top of Mount Everest is 8850 m above sea level.
Using the graph, estimate the atmospheric pressure at the top of Mount Everest.

(1)

pressure = 33 kPa

ResultsPlus
Examiner Comments

33 kPa is in the accepted range.

1 mark.

Question 10 (c)(iii)

Candidates were given the values of pressure at two different heights above sea level. Candidates were required to calculate the increase in pressure as a percentage of the pressure at sea level.

(iii) On a different day, the pressure at sea level is 104 kPa and the pressure at a height of 2500 m is 74 kPa.

Calculate the percentage change in pressure from sea level to the height of 2500 m.

$\frac{104-74}{104} \times 100 = 28.85$ (2)

percentage change = 28.85 %

ResultsPlus
Examiner Comments

This response clearly shows the working and a correct evaluation.

Examiners accepted evaluations that rounded to 29 (%).

2 marks scored.

ResultsPlus
Examiner Tip

If a certain number of significant figures is required, it will be stated in the question.

(iii) On a different day, the pressure at sea level is 104 kPa and the pressure at a height of 2500 m is 74 kPa.

Calculate the percentage change in pressure from sea level to the height of 2500 m.

(2)

percentage change = 28.8 %

ResultsPlus
Examiner Comments

This response has an acceptable final answer, even though no working is shown so it scores full marks.

2 marks scored.

ResultsPlus
Examiner Tip

It is always best to show your working. If you do not show your working, one slip on the calculator could cost you all the marks available.

Question 10 (d)

Here, candidates were given a model representing molecules of the Earth's atmosphere. They had to use this model to explain why density varies with height above sea level.

Examiners were looking for explanations linking a decrease in density to an increase in space between molecules.

(d) Figure 28 is a model representing molecules of the Earth's atmosphere.

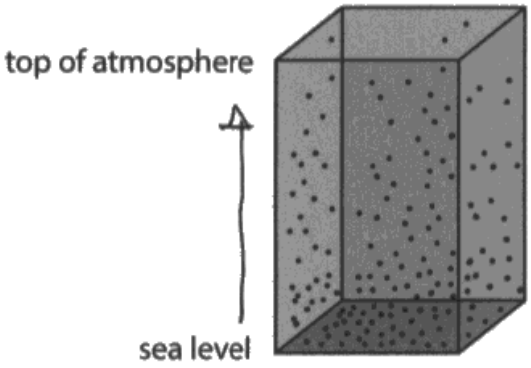


Figure 28

Use Figure 28 to explain how the density of the air varies with height above sea level.

(2)

as height above sea level increases, density decreases as the particles spread further apart.

ResultsPlus
Examiner Comments

This expresses that link satisfactorily and scores both marks.

2 marks scored.

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
- Where a question involves a calculation, make sure they write down the equation they are using 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.

Grade boundaries

Grade boundaries for this, and all other papers, can be found on the website on this link:

https://qualifications.pearson.com/en/support/support-topics/results-certification/grade-boundaries.html

Pearson Education Limited. Registered company number 872828
with its registered office at 80 Strand, London WC2R 0RL.