Pearson
Edexcel

Examiners' Report
June 2025

Int GCSE Physics 4PH1 2PR

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 https://www.edexcel.com or https://www.btec.co.uk.

Alternatively, you can get in touch with us using the details on our contact us page.

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 https://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: https://www.pearson.com/uk.

June 2025

Publications Code 4PH1_2PR_2506_ER

Introduction

The examination was written to assess across the full range of grades from 1 to 9. Consequently, some questions were written to be challenging whilst others were designed to be more straightforward and accessible. A range of different question types were included in the examination such as objective and multiple choice, calculations and both short and long written responses. Approximately 20% of the marks available in the examination were for the candidates' demonstration of experimental skills and understanding. Candidates were provided with a full list of the formulae to be used in this examination. Successful candidates were well-acquainted with the content of the specification and could recall facts whilst applying their understanding to new and complex situations. They were competent in performing quantitative work and could rearrange and substitute data into given formulae to obtain the correct answer. Successful candidates also showed evidence of undertaking all the required practicals themselves and could produce detailed, coherent methods whilst recalling the relevant results of these experiments. Less successful candidates showed gaps in their knowledge of topics and either had limited experience or could not recall information from the required practical tasks. These candidates often did not address the demands of the question and overlooked the importance of the command words being used.

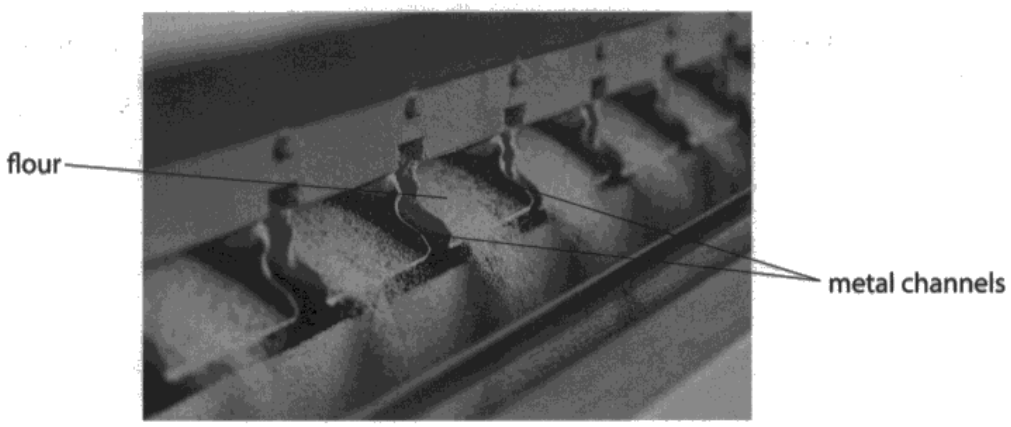
Question 1(a)(i)

Most candidates scored at least one mark in this question, usually for the reference to electrons being transferred. Fewer candidates gave a suitable reason for the transfer by referencing the force of friction or rubbing. The weakest candidates made reference to the transfer of positive charge, which was not credited.

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 flour mill is a factory where flour is produced.

The photograph shows some flour moving through metal channels in the flour mill.



(Source: © Retan/Shutterstock)

(a) The flour particles can become charged as they move through the metal channels.

(i) Explain how the flour particles can become charged.

(2)

flour particles move through and attract charge of positive metal ions. and gain a positive charge

ResultsPlus
Examiner Comments

This response scored zero marks. The reference to the transfer of positive charge is incorrect.

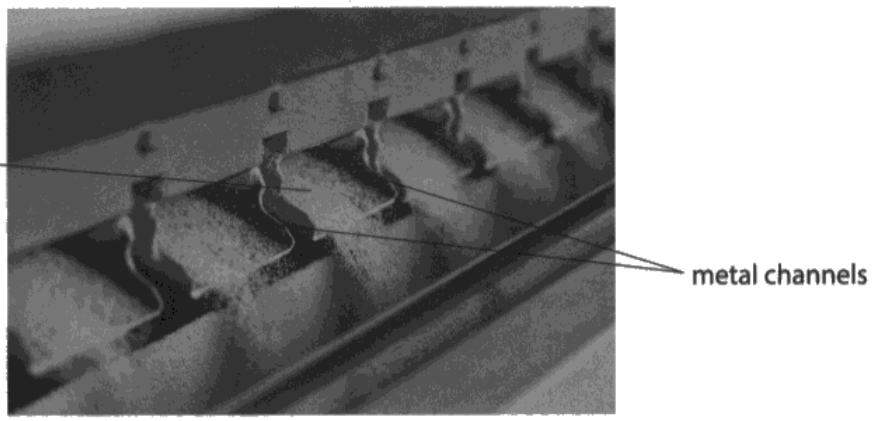
ResultsPlus
Examiner Tip

Candidates should know that only electrons are transferred in electrostatics.

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 flour mill is a factory where flour is produced.

The photograph shows some flour moving through metal channels in the flour mill.



(Source: © Retan/Shutterstock)

(a) The flour particles can become charged as they move through the metal channels.

(i) Explain how the flour particles can become charged.

(2)

When the flour particles come in contact with the metal channels, electrons within the metal channels move into the flour particles, making them negatively charged.

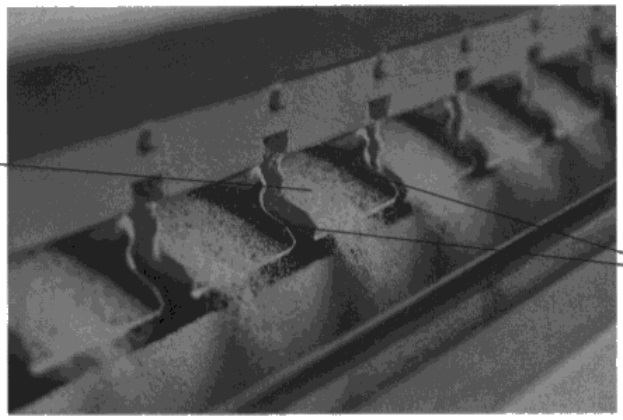
ResultsPlus
Examiner Comments

This response scored one mark for the clear reference to the transfer of electrons. No reason is given for this transfer so the second mark is not given.

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 flour mill is a factory where flour is produced.

The photograph shows some flour moving through metal channels in the flour mill.



(Source: © Retan/Shutterstock)

(a) The flour particles can become charged as they move through the metal channels.

(i) Explain how the flour particles can become charged.

(2)

The flour particles can gain ~~e~~ electrons to make them negatively charged or lose electrons ~~e~~ to make them positively charged when they rub against the metal channels.

ResultsPlus
Examiner Comments

A comprehensive answer that was awarded full marks.

Question 1(a)(ii)

Nearly half of all candidates were awarded both marks in this question. Common mistakes were referring to the charges as "negative" or "positive" for the first word and referring to the forces as "opposite" for the second word. Some candidates thought the forces between the charged object were magnetic.

(ii) The charged flour particles move away from each other as they fall from the end of each channel.

Complete the passage by writing a suitable word or words in each blank space.

(2)

Flour particles move away from each other because they have

negative charges. This causes the flour particles

to exert repelling forces on each other.

ResultsPlus
Examiner Comments

This response scored the second mark only. The reference to the objects being negative was deemed insufficient since there was nothing in the question to arrive at this conclusion.

(ii) The charged flour particles move away from each other as they fall from the end of each channel.

Complete the passage by writing a suitable word or words in each blank space.

(2)

Flour particles move away from each other because they have

like charges. This causes the flour particles

to exert repulsive forces on each other.

ResultsPlus
Examiner Comments

Both marks were awarded in this correct response.

Question 1(b)

Many candidates scored the first marking point, but fewer scored the second marking point, which required an understanding of sparks and earthing. Many reiterated the reduced chance of explosions, which had already been referred to in the question. Teachers are encouraged to revise the idea of earthing, using practical demonstrations where possible to clarify its purpose and how charge is discharged safely.

(b) The dust created by producing flour in a flour mill is dangerous because the dust is flammable. This creates a risk of an explosion.

Explain why connecting the metal channels to earth reduces the risk of an explosion in a flour mill.

(2)

The charges in the flour particals are transfered through the metal channels and into the earth.

ResultsPlus
Examiner Comments

This response scored the first marking point. The description of earthing is valid, but this is not linked to why the risk of an explosion is reduced.

ResultsPlus
Examiner Tip

Candidates should pay attention to the command word used in each question. "Explain" means they should give reasons to support the statement being made in the question.

(b) The dust created by producing flour in a flour mill is dangerous because the dust is flammable. This creates a risk of an explosion.

Explain why connecting the metal channels to earth reduces the risk of an explosion in a flour mill.

(2)

If the metal is earthed, the electrons from the flour will flow into the ground ~~and~~ through the metal and into the ground. This reduces the static electricity present in the flour and lowers chance of an explosion.

ResultsPlus
Examiner Comments

This response also scored one mark. This candidate has attempted to explain why the risk of an explosion is reduced, but has just reiterated much of the information from the question. The specific hazard of a spark is not included in the response.

(b) The dust created by producing flour in a flour mill is dangerous because the dust is flammable. This creates a risk of an explosion.

Explain why connecting the metal channels to earth reduces the risk of an explosion in a flour mill.

(2)

The electrons flow to the Earth and the flour particles are discharged and neutralised. This way a spark will not light and there is a reduction in the risk of an explosion.

ResultsPlus
Examiner Comments

This response scored both marks. The candidate correctly explains that the chance of a spark is reduced as the objects will become discharged.

Question 2(a)

Most candidates scored both marks in this question and the idea of isotopes was clearly well understood. Mistakes were made when referring to the number of electrons being different or, sometimes, confusing protons and neutrons. Other candidates were not awarded the first mark as referring to atoms being of the same element was insufficient. Most candidates chose to compare protons and neutrons, but a minority produced successful answers referring to the atomic and mass numbers of the nuclei.

2 Uranium-239 is an isotope of the element uranium.

(a) State what is meant by the term **isotopes**.

(2)

- same element with different mass number

ResultsPlus
Examiner Comments

This response scored the second mark only. References to the element being the same were not credited.

ResultsPlus
Examiner Tip

Candidates should revise commonly recalled definitions in preparation for examinations.

2 Uranium-239 is an isotope of the element uranium.

(a) State what is meant by the term **isotopes**.

(2)

isotopes have the same protons but different electrons

ResultsPlus
Examiner Comments

This response scored the first mark only. The reference to the differing number of electrons

is incorrect.

2 Uranium-239 is an isotope of the element uranium.

(a) State what is meant by the term **isotopes**.

(2)

Isotopes are atoms of the same element with the same atomic number (same number of protons) but a different mass number (different number of neutrons)

ResultsPlus
Examiner Comments

This response scored full marks and gave both versions of the definition correctly.

ResultsPlus
Examiner Tip

Candidates should be cautious when providing too much detail in their answers. If a contradiction had been made then marks would have been withheld.

2 Uranium-239 is an isotope of the element uranium.

(a) State what is meant by the term **isotopes**.

(2)

Isotopes are atoms with the same number of protons but different number of neutrons

ResultsPlus
Examiner Comments

This concise response was all that was needed to score both marks.

Question 2(b)(ii)

Surprisingly, nearly a quarter of all candidates answered this question incorrectly. Common incorrect responses included alpha and beta.

Question 2(c)(i)

Most candidates answered this half-life calculation competently and scored both marks. The majority of other candidates did not know how to approach the calculation and scored zero. However, some scored a single mark for performing a calculation leading to a value of 2 (half-lives).

(c) Uranium-239 is radioactive and decays by beta emission.

Uranium-239 has a half-life of 23 minutes.

(i) A sample of uranium-239 has an initial mass of 60 g.

Calculate the mass of uranium-239 remaining after 46 minutes.

(2)

$\frac{46}{23} = 2$

$\frac{60}{2} = 30g$

mass = 30 g

ResultsPlus
Examiner Comments

The outcome of this calculation is incorrect, but the first step in the working is sufficient to award the first mark. However, it is then used incorrectly, showing a lack of understanding of half-lives.

(c) Uranium-239 is radioactive and decays by beta emission.

Uranium-239 has a half-life of 23 minutes.

(i) A sample of uranium-239 has an initial mass of 60 g.

Calculate the mass of uranium-239 remaining after 46 minutes.

(2)

46 min = 2 half lives

60 ÷ 2 = 30

30 ÷ 2 = 15

mass = 15 g

ResultsPlus
Examiner Comments

This calculation is correct and scored both marks. The working is clear and easy to follow.

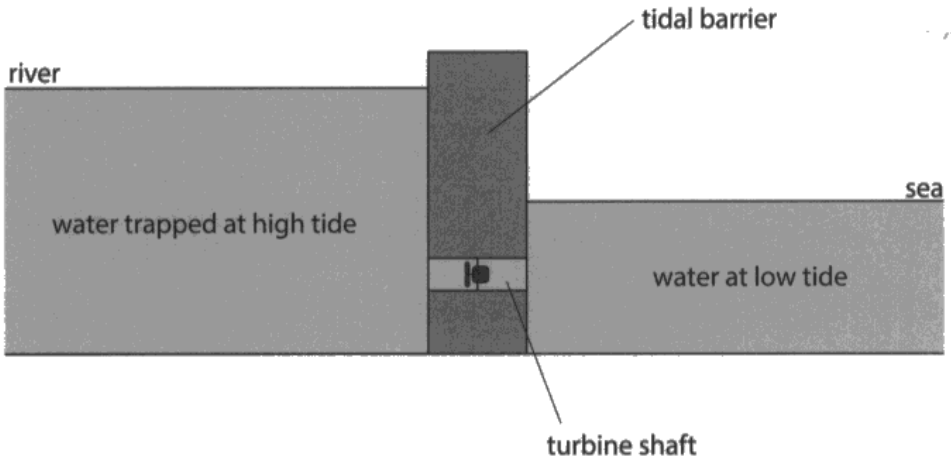
Question 3(a)

Most candidates scored at least one mark in this question, with over a third of all candidates securing both marks. The most commonly seen advantages were that tidal is renewable and produced no greenhouse gases. However, vague references to pollution or toxic gases were ignored. Some candidates referred to tidal taking up a lot of land, being expensive to build or being noisy - all of these were ignored.

3 The photograph shows the tidal power station across the estuary of the river Rance in France.

(Source: © Francois BOIZOT/Shutterstock)

The diagram shows a simplified view of the tidal power station.



At high tide, water is trapped behind the tidal barrier.

At low tide, the trapped water is released through the turbine shaft. This causes a turbine to spin, which generates electricity.

(a) Give two advantages of generating electricity using tidal power.

(2)

1 It is renewable.

2 It is not very expensive

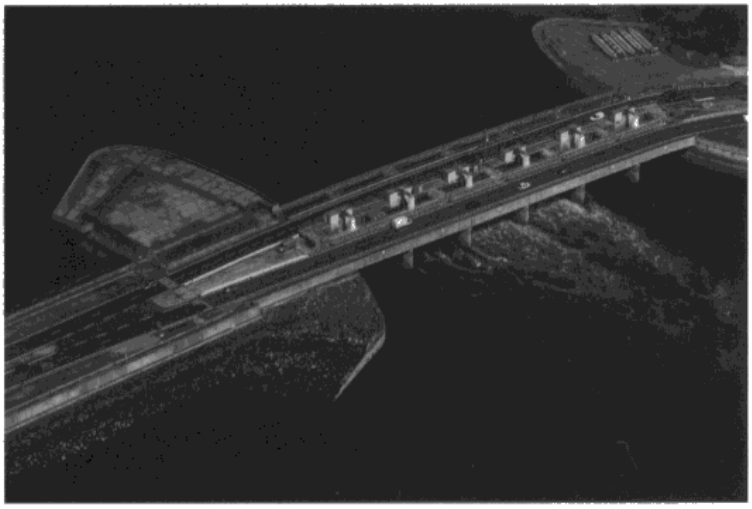
ResultsPlus
Examiner Comments

This response scored one mark for the first suggestion. The reference to cost was ignored.

ResultsPlus
Examiner Tip

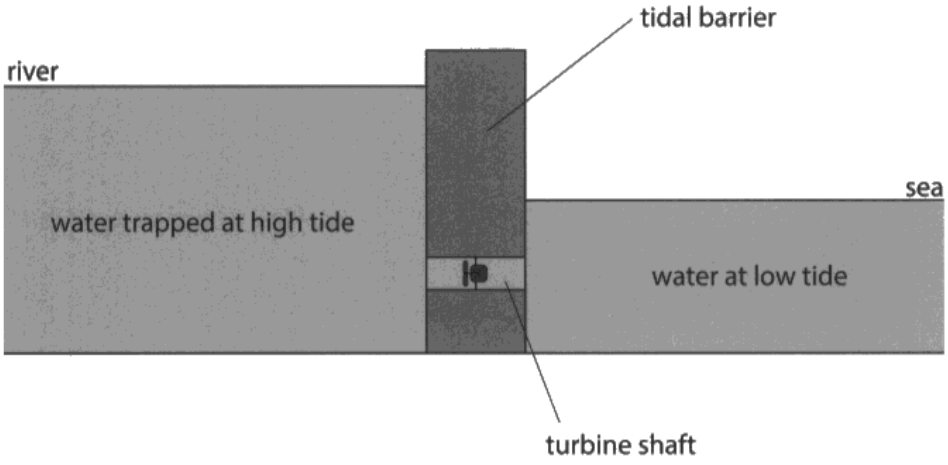
Candidates should avoid referring to cost-related factors when describing advantages/disadvantages of methods of generating electricity since these are rarely given any credit.

3 The photograph shows the tidal power station across the estuary of the river Rance in France.



(Source: © Francois BOIZOT/Shutterstock)

The diagram shows a simplified view of the tidal power station.



At high tide, water is trapped behind the tidal barrier.

At low tide, the trapped water is released through the turbine shaft. This causes a turbine to spin, which generates electricity.

(a) Give two advantages of generating electricity using tidal power.

(2)

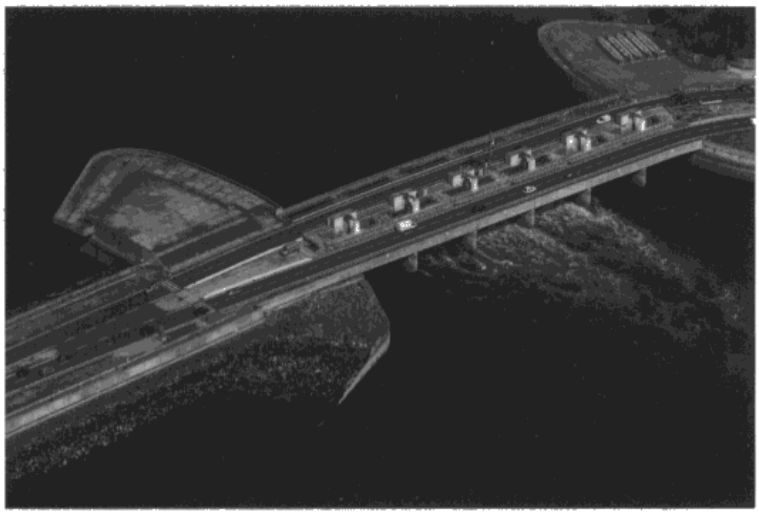
1 It is a renewable source of energy.

2 it produces no toxic gases

ResultsPlus
Examiner Comments

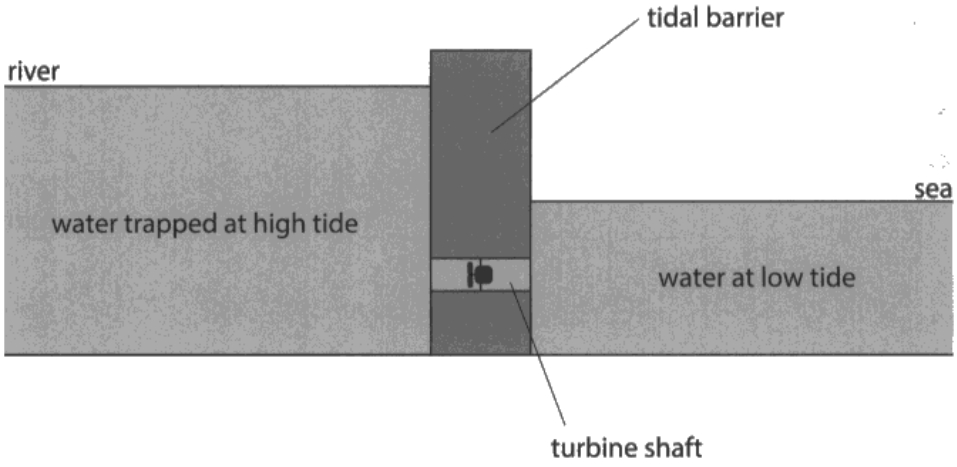
This response also scored one mark. It is a better response, but the second suggestion of not producing toxic gases was deemed too vague to credit.

3 The photograph shows the tidal power station across the estuary of the river Rance in France.



(Source: © Francois BOIZOT/Shutterstock)

The diagram shows a simplified view of the tidal power station.



At high tide, water is trapped behind the tidal barrier.

At low tide, the trapped water is released through the turbine shaft. This causes a turbine to spin, which generates electricity.

(a) Give two advantages of generating electricity using tidal power.

(2)

1 Tides are predictable

2 No CO_2 emissions so no contribution to global warming

ResultsPlus
Examiner Comments

This candidate has a good understanding of tidal power and scored both marks.

Question 3(b)

Candidates found describing the disadvantages of tidal power more challenging than describing the advantages. It was clear from many of the responses that some candidates did not really know what tidal power is and there was a clear confusion between tidal, wave and hydroelectric power. Many responses were superficial and not justified, (unreliable, inefficient, expensive, ruins environment, depends on geography), debatable (causes flooding, visual pollution) or irrelevant (depends on waves). Popular scoring responses were habitat destruction and tides varying output.

(b) Give two disadvantages of generating electricity using tidal power.

(2)

1 High initial construction cost

2 Limited suiteble locations.

ResultsPlus
Examiner Comments

This response scored one mark. The statement relating to cost was ignored, but MP5 was awarded for the second statement.

(b) Give two disadvantages of generating electricity using tidal power.

(2)

1 It can disrupt the shipping route and harm aquatic animals since it's occuring in the river ~~of~~ or ocean

2 There is few suitable locations and expensive to build it

ResultsPlus
Examiner Comments

This response scored two marks for MP3 and MP5. The reference to it being expensive was ignored, so did not prevent MP5 from being awarded.

(b) Give two disadvantages of generating electricity using tidal power.

(2)

1 Unreliable as tides can change any time

2 Damage to marine life especially in shallow waters

ResultsPlus
Examiner Comments

This response also scored two marks for MP4 and MP1.

Question 3(c)

Most candidates scored full marks in these calculations, but Q03(c)(ii) proved more challenging than Q03(c)(i) and some candidates did not know how to approach the non-standard calculation. Surprisingly, some candidates lost marks for incorrectly converting the units of mass from kilograms into grams. Other candidates did not appreciate that the units of power in Q03(c)(ii) needed to be converted from kilowatts to watts. Weaker candidates did not use *g* in their calculations, which was usually treated as a physics error and awarded no marks.

(c) At low tide, water flows through the turbine shaft.

As the height of the trapped water in the river decreases, water falls through a height of 8.0 m to reach the turbine shaft.

(i) Calculate the energy transferred from the gravitational store of the water when 1.0 kg of water flows through the turbine shaft.

Use the formula

change in gravitational potential energy = mass × g × height

(2)

x1000

= 1 x 10 x 8

= 80,000 J

energy transferred = 80,000 J

(ii) The tidal power station has a maximum power output of 240 000 kW when water falls through a height of 8.0 m.

Calculate the mass of water flowing through the turbine shaft in 1 second when the power station is operating at maximum power.

Assume the power station is 100% efficient.

(3)

$= \frac{240,000}{8} = 30,000 \div 1000$

$= 30 kg$

mass of water = 30 kg

This candidate scored one mark in Q03(c)(i) and no marks in Q03(c)(ii). The first calculation is basically correct, but the incorrect conversion of mass from kilograms to grams resulted in a one mark penalty. The approach in the second calculation shows incorrect physics and a general lack of understanding.

Although unusual, candidates should know that the kilogram (kg) is the standard unit of mass and that values of mass used in calculations should be in kg.

(c) At low tide, water flows through the turbine shaft.

As the height of the trapped water in the river decreases, water falls through a height of 8.0 m to reach the turbine shaft.

(i) Calculate the energy transferred from the gravitational store of the water when 1.0 kg of water flows through the turbine shaft.

Use the formula

change in gravitational potential energy = mass × g × height

(2)

GPE = m x g x h

= 1 x 9.8 x 8

= 78.4 J

energy transferred = 78.4 J

(ii) The tidal power station has a maximum power output of 240 000 kW when water falls through a height of 8.0 m.

Calculate the mass of water flowing through the turbine shaft in 1 second when the power station is operating at maximum power.

Assume the power station is 100% efficient.

(3)

mass of water = $\frac{\text{output}}{\text{height}}$

$m = \frac{240000}{80}$

m = 3000 kg

mass of water = 3000 kg

ResultsPlus
Examiner Comments

This candidate scored two marks in Q03(c)(i) and two marks in Q03(c)(ii). Both calculations are basically correct, but the candidate has not converted the units of power from kilowatts (kW) to watts (W) in Q03(c)(ii).

ResultsPlus
Examiner Tip

Candidates should know that the standard unit of power is the watt (W). Candidates should also know how to convert from non-standard units to standard units.

(c) At low tide, water flows through the turbine shaft.

As the height of the trapped water in the river decreases, water falls through a height of 8.0 m to reach the turbine shaft.

(i) Calculate the energy transferred from the gravitational store of the water when 1.0 kg of water flows through the turbine shaft.

Use the formula

change in gravitational potential energy = mass × g × height

(2)

GPE = 1 × 10 × 8 = 80

energy transferred = 80 J

(ii) The tidal power station has a maximum power output of 240 000 kW when water falls through a height of 8.0 m.

Calculate the mass of water flowing through the turbine shaft in 1 second when the power station is operating at maximum power.

Assume the power station is 100% efficient.

(3)

240 000 kW × 1 s = 240000 kJ

= 2.4×10^8 J

~~240000 kJ~~

$2.4 \times 10^8 = 10 \times 8 \times m$

$\frac{2.4 \times 10^8}{10 \times 8} = m = 3000000$

mass of water = 3000000 kg

ResultsPlus
Examiner Comments

This calculation is completely correct and was awarded full marks.

Question 4(a)

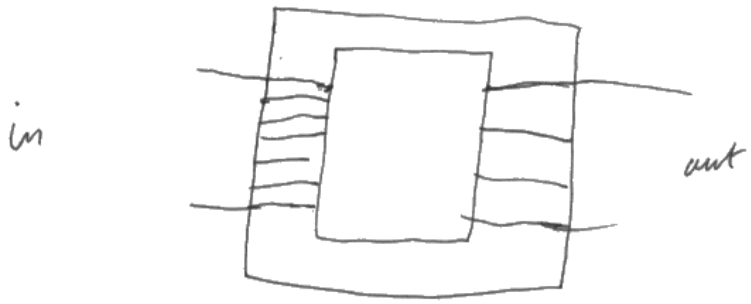
Candidates showed a good understanding of the structure of the step-up transformer and most candidates scored at least two marks. However, the quality of diagrams varied considerably — well-drawn diagrams often scored all three marking points. Marks were most often lost for failing to mention the iron core or for getting the turns ratio the wrong way round. Some candidates went to great lengths to explain how the transformer worked, despite this not being a requirement of the question.

4 This question is about transformers.

(a) Describe the structure of a step-up transformer.

You may draw a diagram to help your answer.

(3)



~~The~~ a step up transformer has more coils of wire on ~~the~~ ~~exit~~ entrance and less coils on the exit. ~~this leads~~ this leads to a higher voltage and lower current.

ResultsPlus
Examiner Comments

This response scored one mark. It is clear that there are two coils, but the turns ratio is the wrong way round.

ResultsPlus
Examiner Tip

Candidates should read the question carefully to ensure they describe the correct type of transformer.

4 This question is about transformers.

(a) Describe the structure of a step-up transformer.

You may draw a diagram to help your answer.

(3)

step up trasformer has more coil(turns) on the secondary coil than primary coil the voltage irreases on the step up transformer.

ResultsPlus
Examiner Comments

This response scored two marks. The structure of the transformer is correct, but the inclusion of an iron core is missing.

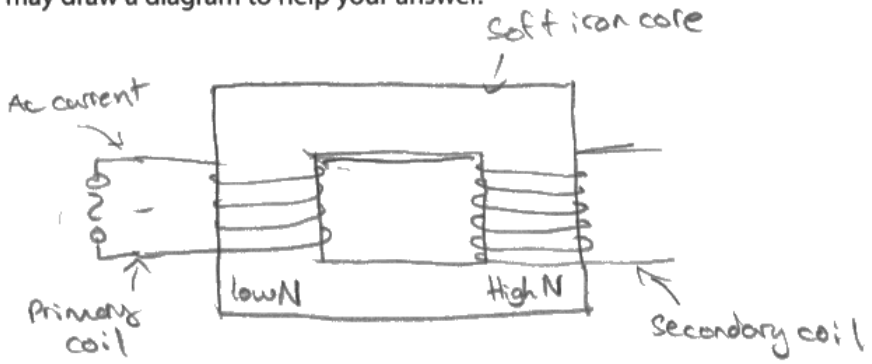
ResultsPlus
Examiner Tip

Candidates should take advantage of opportunities to draw diagrams as marks can be awarded from these in addition to the written response.

4 This question is about transformers.

(a) Describe the structure of a step-up transformer.

You may draw a diagram to help your answer. **(3)**



Primary coil is coiled around one side of soft iron core. Core is made of iron as it is a soft magnetic material which is easily magnetised. Secondary coil is coiled around other side of iron core. Secondary coil has more turns in the coil than primary coil. Primary coil has an alternating current. Voltage is greater in secondary coil. Current is greater in primary coil

ResultsPlus
Examiner Comments

This is an excellent response, which scored full marks. The diagram is good enough that all three marks can be awarded from it.

Question 4(b)

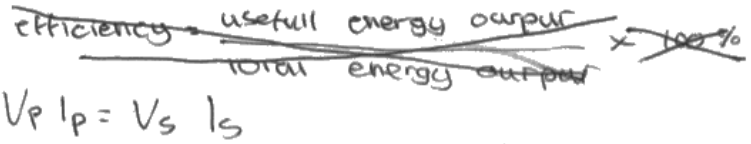
Most candidates completed this calculation correctly. Common errors included selecting an incorrect formula (despite a full formulae sheet being provided in the examination) and experiencing difficulties rearranging the formula.

(b) A step-up transformer has an input voltage of 230V and an input current of 4.5 A.

The output current of the transformer is 0.21 A.

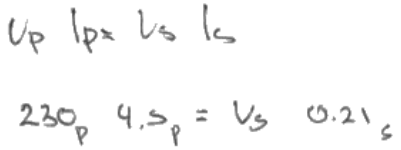
(i) State the formula linking input power and output power for a transformer that is 100% efficient.

(1)



(ii) Calculate the output voltage of the transformer.

(3)



output voltage = 217.35 V

ResultsPlus
Examiner Comments

This candidate has selected the correct formula and substituted the data correctly. However, the rearrangement is then incorrect, which prevents any further marks from being awarded.

ResultsPlus
Examiner Tip

If candidates find rearranging formulae difficult then they should always substitute the data as the first step in their working.

(b) A step-up transformer has an input voltage of 230V and an input current of 4.5 A.

The output current of the transformer is 0.21 A.

(i) State the formula linking input power and output power for a transformer that is 100% efficient.

Input power = output power (1)

(ii) Calculate the output voltage of the transformer.

(3)

$230 \times 4.5 = V_S \times 0.21$

$V_S = \frac{(230 \times 4.5)}{0.21}$

$V_S = 4900$ (2sf)

output voltage = 4900 V

ResultsPlus
Examiner Comments

A fully correct calculation.

Question 5(a)

Candidates performed well in this question and the majority could name the force correctly in addition to drawing it acting downwards through the ball's centre of gravity. The most common mistake was drawing the downward arrow to the side of the ball, which showed a misunderstanding as to how forces should be drawn on a diagram. Weaker candidates also lost the mark for labelling the arrow inappropriately. Although additional arrows were ignored in this question, it was surprising to see a significant number of candidates include upward arrows for air resistance.

5 A tennis ball is dropped from a height above the ground.

(a) Diagram 1 shows the tennis ball at the instant it is released.

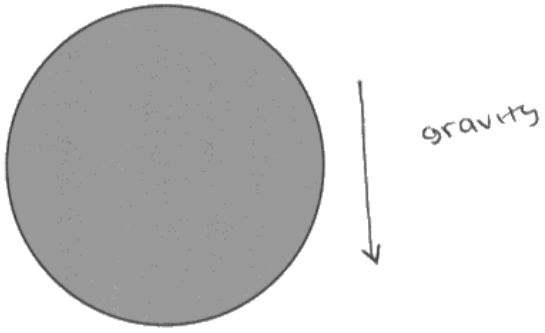


Diagram 1

On diagram 1, draw a labelled arrow to show the force acting on the tennis ball at the instant it is released.

ResultsPlus
Examiner Comments

This response scored zero marks. The force arrow is labelled inappropriately and is not drawn acting through the ball's centre of gravity.

ResultsPlus
Examiner Tip

Candidates should draw weight arrows acting through an object's centre of gravity as this is the point of origin for this force.

5 A tennis ball is dropped from a height above the ground.

(a) Diagram 1 shows the tennis ball at the instant it is released.

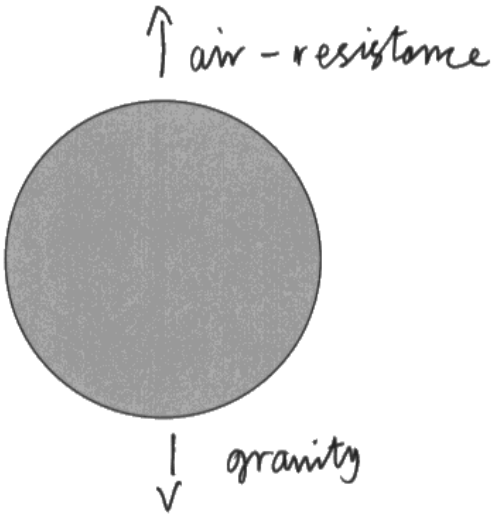


Diagram 1

On diagram 1, draw a labelled arrow to show the force acting on the tennis ball at the instant it is released.

ResultsPlus
Examiner Comments

This response scored one mark. The line of action of the downwards arrow passes through the centre of gravity of the ball, so this mark is given. However, "gravity" is not acceptable as the name of this force.

Note that, despite it being incorrect, the upwards air resistance arrow was ignored.

5 A tennis ball is dropped from a height above the ground.

(a) Diagram 1 shows the tennis ball at the instant it is released.

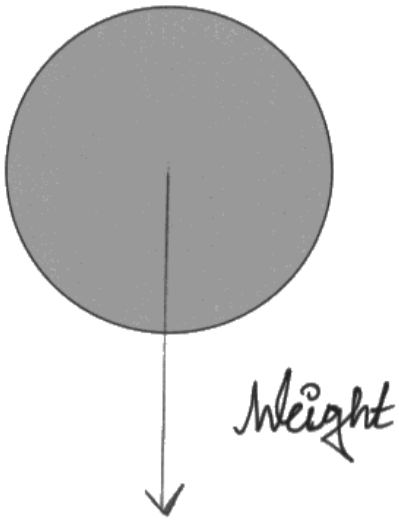


Diagram 1

On diagram 1, draw a labelled arrow to show the force acting on the tennis ball at the instant it is released.

ResultsPlus
Examiner Comments

This response scored both marks. Both marking points are clearly seen.

Question 5(b)

The calculations in these questions performed as expected and offered an excellent differentiation opportunity. In general, candidates performed well, achieving a mode score of six marks. The most common error was not factoring in the vector nature of the momentum of the ball before and after its impact with the ground. This led to candidates obtaining a much lower value for the change in the ball's momentum than the correct value. Other candidates made mistakes when quoting a suitable unit for momentum. In Q05(b)(ii), most candidates performed the calculation successfully, although some candidates did not convert the time into seconds (or tried to, but did so incorrectly), whilst others gave an incorrect (or unclear) direction for the force.

Just before hitting the ground, the tennis ball is moving **downwards** at a velocity of 2.5 m/s.

Just after hitting the ground, the tennis ball is moving **upwards** at a speed of 1.9 m/s.

(i) The mass of the tennis ball is 0.057 kg.

Calculate the change in momentum of the tennis ball when it hits the ground.

Give the unit. (4)

$0.057 \times -2.5 = -0.142$

$0.057 \times 1.9 = 0.108$

~~0.0~~

$0.108 - (-0.142) = 0.25$

change in momentum = 0.25 unit = Nm

(ii) The ball is in contact with the ground for a time of 6.0 ms.

Calculate the force exerted on the ball by the ground.

Give the direction of this force. (3)

$6.0 \times 1000 = 6000$

$\frac{0.25}{6000} = 0.0000416$

force = 0.0000416 N

direction = downwards

ResultsPlus
Examiner Comments

This response scored three marks in Q05(b)(i) and one mark in Q05(b)(ii).

The candidate has appreciated the vector nature of the ball's momentum and calculated the change in momentum correctly. However, the unit for this quantity is incorrect.

The attempt at the force calculation involves a dimensionally correct substitution (change in momentum divided by time), but the candidate has not converted the time into seconds correctly. In addition, the direction of the force is also incorrect.

ResultsPlus
Examiner Tip

Candidates should be familiar with the SI units of all the quantities listed in the specification. Candidates should know that seconds is the SI unit of time and also be able to convert from non-SI units into seconds.

Just before hitting the ground, the tennis ball is moving **downwards** at a velocity of 2.5 m/s.

Just after hitting the ground, the tennis ball is moving **upwards** at a speed of 1.9 m/s.

(i) The mass of the tennis ball is 0.057 kg.

before - after = change

Calculate the change in momentum of the tennis ball when it hits the ground.

Give the unit.

(4)

momentum = mass × velocity

~~before~~

downward = 0.057 × 2.5 = 0.1425

~~upward~~

upward = 0.057 × 1.9 = 0.1083

0.1425 − 0.1083 = 0.0342

change in momentum = 0.0342 unit = kg/s

(ii) The ball is in contact with the ground for a time of 6.0 ms.

Calculate the force exerted on the ball by the ground.

Give the direction of this force.

(3)

$$\text{Force} = \frac{\text{change in momentum}}{\text{Time taken}}$$

$$= \frac{0.0342}{6 \times 10^{-3}}$$

$$= 5.7 \text{ N}$$

6 ms → s

$\frac{6}{1000} = 6 \times 10^{-3}$

force = 5.7 N

direction = downward

ResultsPlus
Examiner Comments

This response scored two marks in Q05(b)(i) and two marks in Q05(b)(ii).

The candidate has not appreciated the vector nature of the ball's momentum and calculated the change in momentum incorrectly. However, marks were awarded for calculating the initial momentum and final momentum correctly. The unit for the change in momentum is also incorrect.

The attempt at the force calculation is correct and error carried forward (ECF) has been applied. However, the direction of the force is incorrect.

Just before hitting the ground, the tennis ball is moving **downwards** at a velocity of 2.5 m/s.

Just after hitting the ground, the tennis ball is moving **upwards** at a speed of 1.9 m/s.

(i) The mass of the tennis ball is 0.057 kg.

Calculate the change in momentum of the tennis ball when it hits the ground.

Give the unit.

(4)

~~$MV - mu = 0.057 \cdot 2.5$~~

change in momentum $= mv - mu$

$= 0.057 \cdot 1.9 - (0.057 \cdot (-2.5))$

$= 0.251$

change in momentum = 0.251 unit = kg ms^{-1}

(ii) The ball is in contact with the ground for a time of 6.0 ms.

Calculate the force exerted on the ball by the ground.

Give the direction of this force.

(3)

$$F = \frac{0.251}{6 \div 1000}$$

$= 41.8$ N

force = 41.8 N

direction = upwards

ResultsPlus
Examiner Comments

This response scored four marks in Q05(b)(i) and three marks in Q05(b)(ii).

All parts of these questions have been completed correctly. This candidate is clearly working near the top of the grade range.

Question 5(c)

The marking of this question was split into three sections (variables, accuracy and reliability) to match the scaffolding incorporated into the question.

- Variables: Some candidates got these marks by clearly identifying the variables, whilst many candidates talked about the processes of getting the materials or required equipment but did not identify the types of balls as the **independent variable**. The lack of clarity in responses meant that sometimes these marks could not be awarded.
- Accuracy: The use of a diagram allowed a lot of candidates to identify that the ruler should be held or kept vertical, but the majority of candidates that did not have a mark missed out at least one mark by not talking about the setup properly. The most common marks given here were for the use of a camera or measuring at eye level (identification of a vertical rule without a photo was uncommon).
- Reliability: Most candidates got both marks by talking about repeating the process or experiment and finding the average OR identifying anomalies. Some candidates talked about repeating the process with the other balls and missed this mark, but this was not common.

(c) The coefficient of restitution can be used to determine how high a ball will bounce. The higher the value of the coefficient of restitution, the higher the ball will bounce.

Diagram 3 shows a ball being dropped from a height (h_1) above the ground.

The ball hits the ground and bounces.

At the top of its bounce, the ball reaches a height (h_2) above the ground.

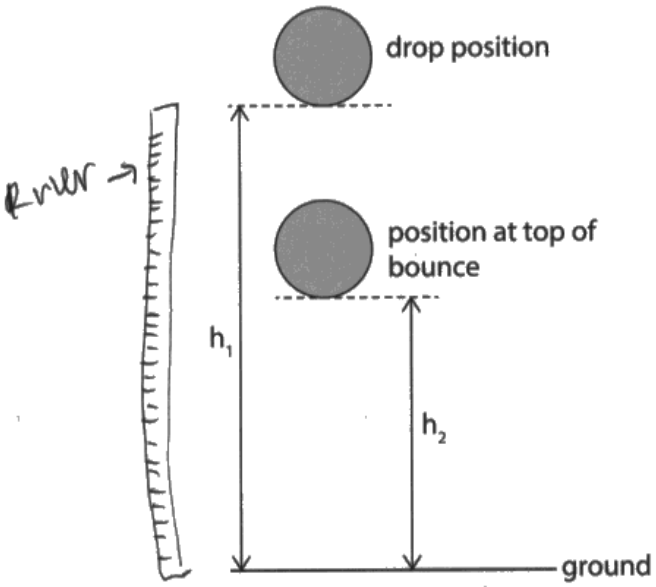


Diagram 3

The coefficient of restitution can be determined using the formula

$$\text{coefficient of restitution} = \sqrt{\frac{h_2}{h_1}}$$

A student decides to do an investigation to compare the coefficient of restitution for different types of ball.

Design a method for the student's investigation.

Your answer should include details of

- the variables in the investigation
- how to obtain accurate measurements
- how to obtain reliable results

You may add to diagram 3 or draw an additional diagram to help your answer.

(6)

Place a clamp next to a straight ruler, and choose a height to drop the ball from, the higher the more reliable as it is a larger range. Place the different types of balls on the clamp and release. Read the position at top of bounce on eye level with the ruler and table. Repeat the experiment 3 times with the same type of ball and repeat method. Calculate the coefficient of restitution using formula $\frac{h_2}{h_1}$. Use a ruler with many decimal places to take accurate reading. Make sure table is at the same slant height and not tipping over.

ResultsPlus
Examiner Comments

This response scored two marks.

MP6 and MP8 were both awarded. The diagram was not clear enough to award MP4.

ResultsPlus
Examiner Tip

Candidates should take care when drawing diagrams to do so neatly. Had this ruler been drawn more vertically then MP4 would have been awarded.

(c) The coefficient of restitution can be used to determine how high a ball will bounce. The higher the value of the coefficient of restitution, the higher the ball will bounce.

Diagram 3 shows a ball being dropped from a height (h_1) above the ground.

The ball hits the ground and bounces.

At the top of its bounce, the ball reaches a height (h_2) above the ground.

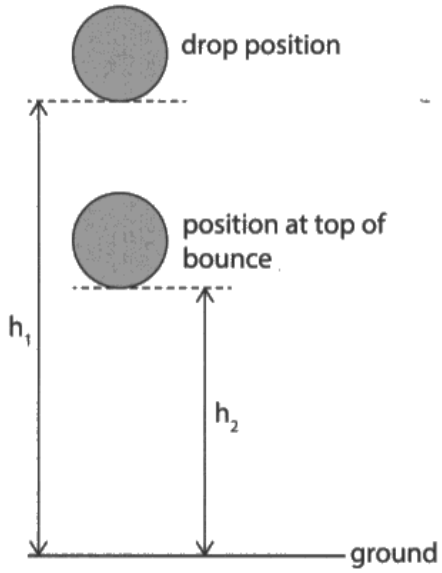


Diagram 3

The coefficient of restitution can be determined using the formula

$$\text{coefficient of restitution} = \sqrt{\frac{h_2}{h_1}}$$

A student decides to do an investigation to compare the coefficient of restitution for different types of ball.

Design a method for the student's investigation.

Your answer should include details of

- the variables in the investigation
- how to obtain accurate measurements
- how to obtain reliable results

You may add to diagram 3 or draw an additional diagram to help your answer.

(6)

use different type of balls and measure the height of h_1 and h_2 make sure to drop all the balls from the same height you can use a tape meter to measure the height and substitute the values into the formula coefficient of restitution $= \sqrt{\frac{h_2}{h_1}}$ to find the coefficient of restitution and make a conclusion and also make sure all different type of balls hit the same ground and repeat the experiment multiple times and calculate the mean for each type of ball for more reliable results

ResultsPlus
Examiner Comments

This response also scored two marks.

MP8 and MP10 were both awarded. Only the weakest candidates did not mention these marking points.

(c) The coefficient of restitution can be used to determine how high a ball will bounce. The higher the value of the coefficient of restitution, the higher the ball will bounce.

Diagram 3 shows a ball being dropped from a height (h_1) above the ground.

The ball hits the ground and bounces.

At the top of its bounce, the ball reaches a height (h_2) above the ground.

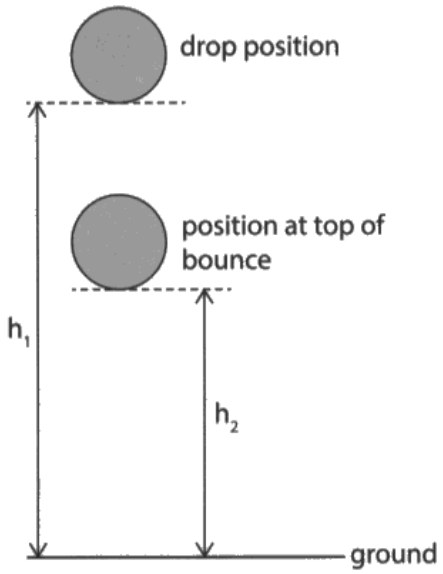


Diagram 3

The coefficient of restitution can be determined using the formula

$$\text{coefficient of restitution} = \sqrt{\frac{h_2}{h_1}}$$

A student decides to do an investigation to compare the coefficient of restitution for different types of ball.

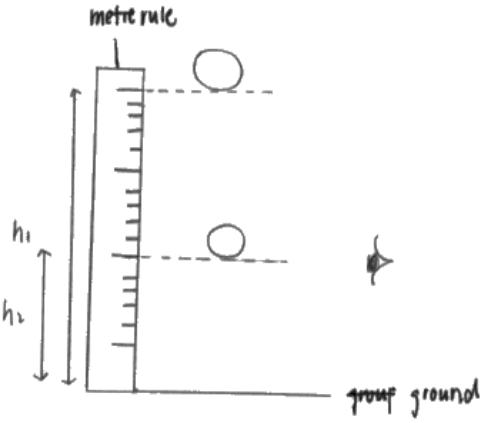
Design a method for the student's investigation.

Your answer should include details of

- the variables in the investigation
- how to obtain accurate measurements
- how to obtain reliable results

You may add to diagram 3 or draw an additional diagram to help your answer.

(6)



Prepare different types of ball such as basketball, volleyball.

Use ~~meter~~ metre rule to measure the ~~drop~~ height of drop position (h_1) with set square. Keep h_1 to be the same.

Drop the ball at h_1. ~~Obtain~~ Obtain the height that the ball bounce with a ~~meter~~ metre rule next to it. ~~The~~ Make sure that the eye level ~~should~~ should be ~~not~~ parallel to the metre rule horizontally.

Repeat the experiment and calculate the average results.

ResultsPlus
Examiner Comments

This response scored four marks.

The diagram was sufficient to award both MP4 and MP6. MP5 is also mentioned in the written response, but only two marks maximum could be awarded from each section of the mark scheme.

MP8 and MP10 were also both awarded.

The candidate has not made a clear enough reference to the variables in the investigation to be awarded marks from the first section.

(c) The coefficient of restitution can be used to determine how high a ball will bounce. The higher the value of the coefficient of restitution, the higher the ball will bounce.

Diagram 3 shows a ball being dropped from a height (h_1) above the ground.

The ball hits the ground and bounces.

At the top of its bounce, the ball reaches a height (h_2) above the ground.

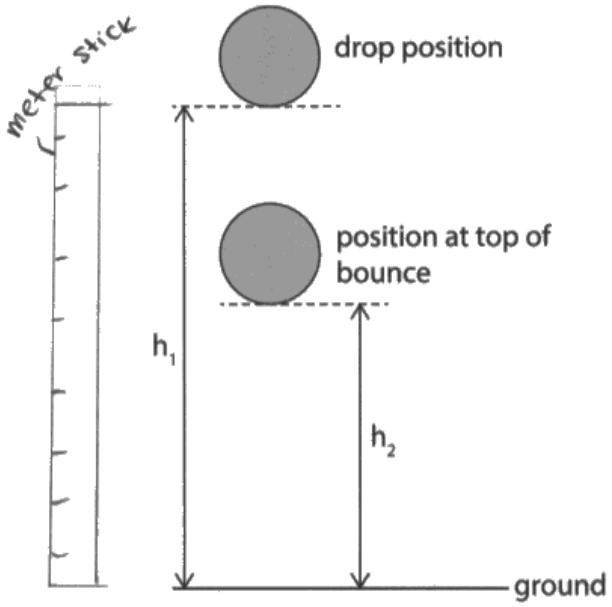


Diagram 3

The coefficient of restitution can be determined using the formula

$$\text{coefficient of restitution} = \sqrt{\frac{h_2}{h_1}}$$

A student decides to do an investigation to compare the coefficient of restitution for different types of ball.

Design a method for the student's investigation.

Your answer should include details of

- the variables in the investigation
- how to obtain accurate measurements
- how to obtain reliable results

You may add to diagram 3 or draw an additional diagram to help your answer.

(6)

Use a meter stick to determine h_1 and h_2. To obtain reliable results repeat the investigation 5 times for each type to get an average h_2 ~~and h_1~~. To obtain accurate measurements take the reading kneeling down so it is as close to eye level as possible. Or take a video and watch it back to see the exact height for h_2. ~~tee~~ For the dependent variable, it is the height ~~and~~ the ball bounces and the coefficient of restitution. The independent variable is the type of ball. The controlled variables are, the height it is dropped from (1m), the temperature of the ball and the type of surface of the ground. Ensure to also drop the ball not push it down. Finally the student can plot a bar graph to compare the coefficient of restitution for each type of ball.

ResultsPlus
Examiner Comments

This excellent response scored six marks.

The addition to the diagram was sufficient to award MP4. MP6 and MP7 are also mentioned in the written response, but only two marks maximum could be awarded from each section of the mark scheme.

MP8 and MP10 were also both awarded.

The candidate then gives a clear account of the independent, dependent and control variables in the investigation, scoring MP1, MP2 and MP3 (but only two marks maximum).

Question 6(a)

Most candidates scored at least three marks in this question. The most common error was not showing the conversion to millimetres at the end of the calculation.

6 This question is about cosmic microwave background radiation (CMBR) and the Big Bang.

(a) CMBR has a mean frequency of 1.6×10^{11} Hz.

(i) State the formula linking wave speed, frequency and wavelength.

(1)

$v = f \times \lambda$

(ii) Show that the mean wavelength of CMBR is about 2 mm.

[speed of light = 3.0×10^{8} m/s]

(3)

$3.0 \times 10^{8} = 1.6 \times 10^{11} \times \lambda$

$\frac{3.0 \times 10^{8}}{1.6 \times 10^{11}} = 1.875 \times 10^{-3}$

ResultsPlus
Examiner Comments

This candidate scored only two marks in Q06(a)(ii). Their calculation gives the correct answer in metres, but the question asks candidates to show that the wavelength is approximately 2mm. The absence of the conversion to millimetres results in a one mark penalty.

6 This question is about cosmic microwave background radiation (CMBR) and the Big Bang.

(a) CMBR has a mean frequency of 1.6×10^{11} Hz.

(i) State the formula linking wave speed, frequency and wavelength.

(1)

wave speed = frequency × wavelength

(ii) Show that the mean wavelength of CMBR is about 2 mm.

[speed of light = 3.0×10^{8} m/s]

(3)

$3.0 \times 10^{8} = 1.6 \times 10^{11} \times$ wavelength

$\text{wavelength} = \frac{3.0 \times 10^{8}}{1.6 \times 10^{11}}$

$= 1.875 \times 10^{-3}$ m

$= 1.875$ mm

ResultsPlus
Examiner Comments

This candidate shows the essential final step in the working to score full marks.

Question 6(b)

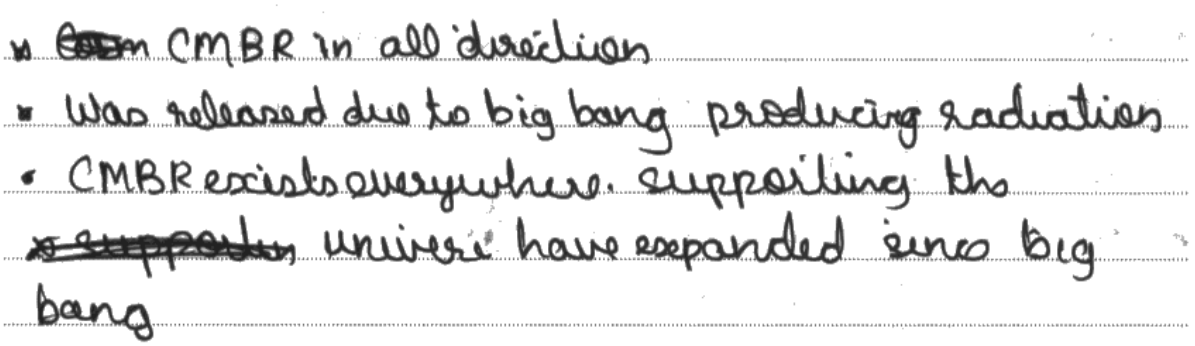
Many candidates gave general comments about CMBR, such as its universal detection and its relation to the cooling of the universe. However, fewer candidates focused on how the increase in wavelength supports the Big Bang theory by demonstrating the expansion of the universe. This suggests candidates need clearer guidance on how to interpret data and explain its connection to the Big Bang theory.

(b) CMBR was first released after the Big Bang.

When CMBR was first released it had a wavelength of about 9×10^{-5} mm, but now it has a wavelength of about 2 mm.

Using this information, explain how CMBR supports the Big Bang theory.

(2)



ResultsPlus
Examiner Comments

This candidate has given lots of information about CMBR without properly reading the question. The candidate has not used the information in the question in their response, so only scored one mark for the idea that the universe has expanded.

ResultsPlus
Examiner Tip

Candidates need to read questions carefully to ensure they answer questions appropriately.

(b) CMBR was first released after the Big Bang.

When CMBR was first released it had a wavelength of about 9×10^{-5} mm, but now it has a wavelength of about 2 mm.

Using this information, explain how CMBR supports the Big Bang theory.

(2)

The wavelength of CMBR has increased since it was first released, meaning that the waves were stretched. This suggests that the universe is expanding and so, it ~~was~~ once originated from a single point.

ResultsPlus
Examiner Comments

This response scored two marks. The candidate has correctly interpreted the information in the question and used it to explain the expansion of the universe.

Question 6(c)

This question proved to be very good at differentiating between candidates working towards the top of the grade range. Some candidates gave very good explanations linking cosmological redshift to the Big Bang theory. However, many responses stated that more distant galaxies move faster without clearly connecting this to the observation of greater redshift. Additionally, some candidates only described what redshift and blueshift are, without explaining how this evidence supports the Big Bang theory. This suggests that candidates would benefit from clearer guidance on linking observed redshift to the expansion of the universe as key evidence for the Big Bang.

(c) Explain how the cosmological red-shift of galaxies also supports the Big Bang theory.

(4)

Red-shift is the decrease in frequency observed in waves coming from galaxies moving away from Earth due to the doppler effect. This shows that the universe is expanding and pulling apart galaxies.

ResultsPlus
Examiner Comments

This response scored one mark. The candidate has identified that red-shift means the galaxies are moving away from Earth, but not given the additional observations and their explanation to properly support the Big Bang theory.

(c) Explain how the cosmological red-shift of galaxies also supports the Big Bang theory.

(4)

- universe started from a single point
- due to high temperature and gravitional pull it caused a gigantic explosion
- which caused the universe to expand
- which creates a red shift
- galaxies move further away from eachother

ResultsPlus
Examiner Comments

This response scored two marks. The candidate was awarded MP4 in addition to MP1, but has not given the additional observations and their explanation in support of the Big Bang theory (MP2 and MP3).

(c) Explain how the cosmological red-shift of galaxies also supports the Big Bang theory.

(4)

Galaxies that are further away have a greater red-shift. They also ~~move~~ travel faster when they ~~are further away~~ have a greater red-shift. This means all the galaxies are moving away from one another. Meaning the universe is expanding and one point in time long ago ~~it was~~ all the galaxies were from a single point.

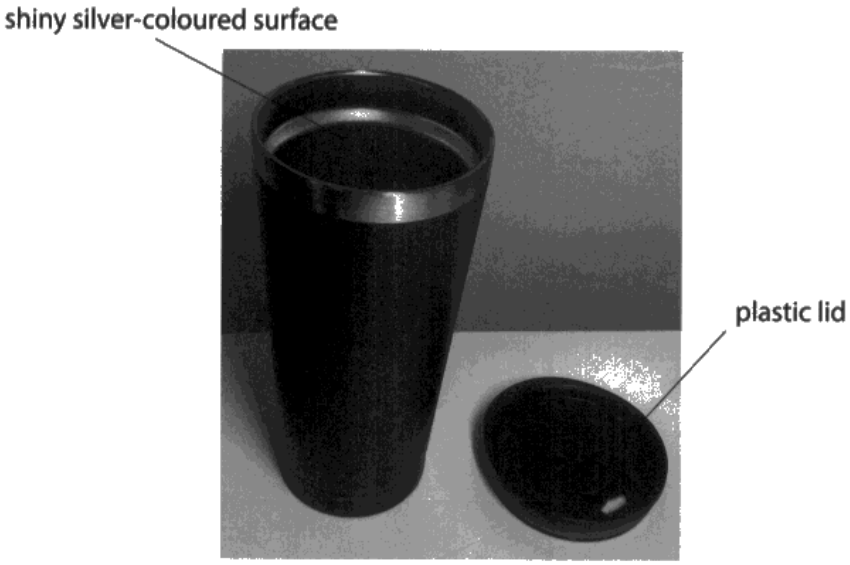
ResultsPlus
Examiner Comments

This response scores all four marks. The candidate has demonstrated a comprehensive understanding of how the red-shift of galaxies supports the Big Bang theory.

Question 7(a)

Most candidates knew that the silver surface of the cup would be a good reflector or poor absorber. However, very few candidates linked this property to infrared to score a second mark.

7 The photograph shows a cup that is designed to keep a drink hot.



(a) The inside surface of the cup is shiny and silver-coloured.

Explain how the shiny silver-coloured surface helps to keep a drink hot.

(2)

The shiny surface does not absorb heat, it reflects it. This means heat is being reflected into the drink at all times, increasing convection of the drink, keeping it hot.

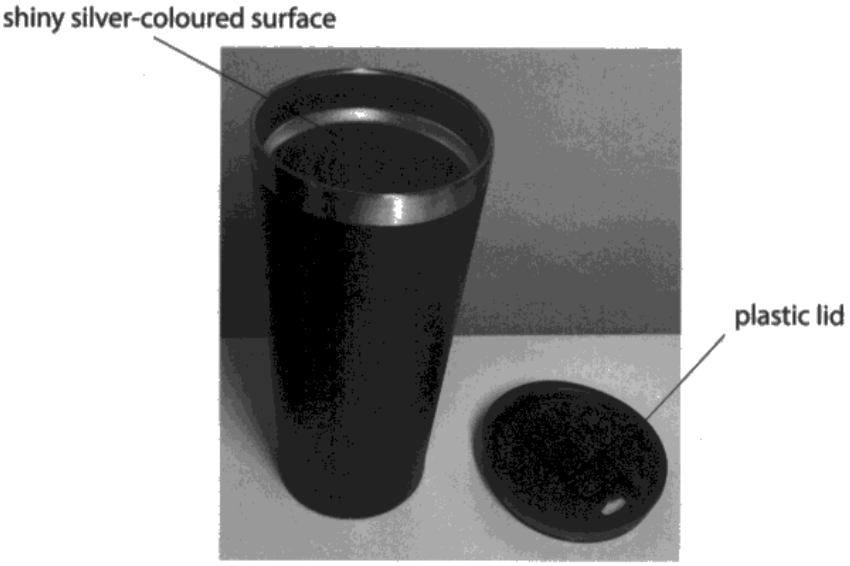
ResultsPlus
Examiner Comments

This response scored one mark. The candidate has correctly identified that the silver surface does not absorb, but reflects. However, the link to "heat" is too weak in terms of physics to be awarded an additional mark.

ResultsPlus
Examiner Tip

The term "heat" should be used to refer to a process, eg heating. It should not be used as a noun in a scientific context.

7 The photograph shows a cup that is designed to keep a drink hot.



(a) The inside surface of the cup is shiny and silver-coloured.

Explain how the shiny silver-coloured surface helps to keep a drink hot.

(2)

Shiny sliver color is a bad absorber and a good reflector of infra red radiation

ResultsPlus
Examiner Comments

This is a better response, which scored both marks.

Question 7(b)

Many candidates stated that the lid would be a poor conductor due to its plastic construction, but this was not credited since the air between the hot liquid and the lid is already a poor conductor. Most candidates who scored, did so for a reference to the lid preventing or reducing convection. Only the most able candidates linked this to the lid's ability to trap air between the hot liquid and the lid.

(b) Explain why a drink in the cup will stay hot for longer when the lid is placed on the cup.

(2)

By putting the lid on the cup, heat wont escape from the cup by convection, and keeps the drink stay hot for longer.

ResultsPlus
Examiner Comments

This response scored one mark for the reference to the lid reducing convection.

(b) Explain why a drink in the cup will stay hot for longer when the lid is placed on the cup.

(2)

The lid traps air. Air is a poor conductor and good insulator, so it reduce heat loss by convection, reduce convection current. Lid is also insulator.

ResultsPlus
Examiner Comments

This response scored both marks. The candidate has a good understanding of how the lid is keeping the drink hot.

ResultsPlus
Examiner Tip

Many scenarios involving conduction, convection and radiation can be explained using the same ideas. Candidates should be shown as many examples as possible of reducing energy transfers by heating and radiation so that they can practise applying their knowledge and understanding.

Question 7(c)

This question proved to be challenging, but accessible and delivered an equal distribution of scores across its mark range. Tangents were generally drawn well in Q07(c)(i), where attempted. Some candidates drew tangents at the wrong time, and some did not attempt this part of the question.

Many candidates chose a single point on the graph and did temperature/time, therefore not achieving any marks in Q07(c)(ii). Where a successful attempt at calculating gradients was completed, many candidates did not include a negative sign in their answer, therefore unfortunately missing out on MP3.

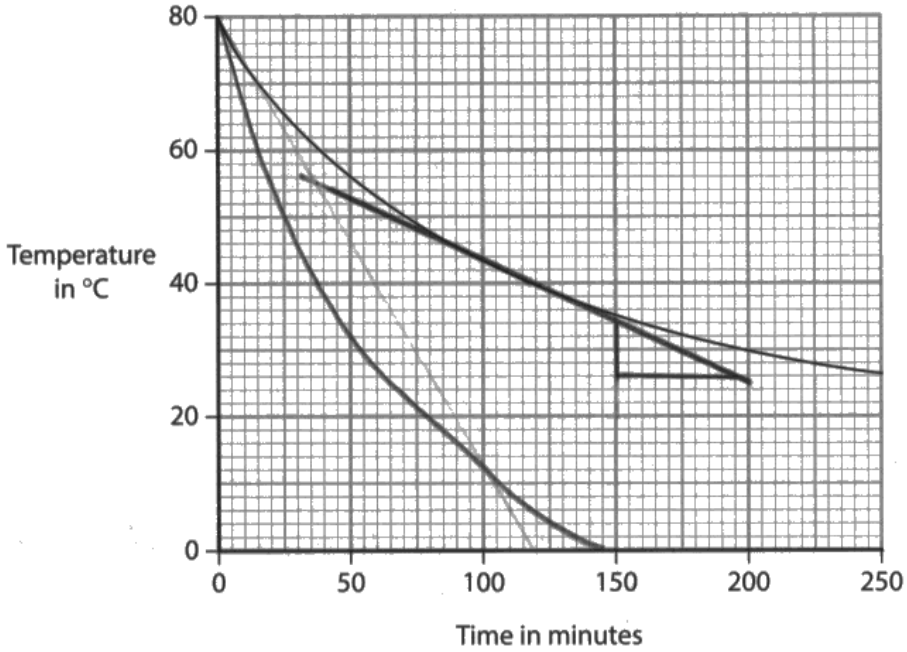
Curves were generally drawn well in Q07(c)(iii) again, where attempted. Some candidates missed this part of the question, whilst some went below 20 degrees, therefore missing MP2. Some candidates drew lines which did not begin at 80 degrees, or met the original curve at the end, therefore missing out on both marks. <<<

(c) A student investigates how the temperature of a drink in the cup varies with time.

This is the student's method.

- pour some hot water into the cup and place the lid on the cup
- wait for the water to cool to 80 °C and then start a stopwatch
- measure the temperature of the water in the cup every 10 minutes

The graph shows the student's results.



(i) On the graph, draw a tangent to the curve when the temperature is 40 °C.

(1)

(ii) Calculate the gradient of the tangent to find the rate of temperature change of the water when the temperature is 40 °C.

Give your answer in °C/minute.

(3)

Rise / Run 8 / 45 = 0.178 °C/minute

rate of temperature change = 0.178 °C/minute

(iii) The student is working in a laboratory with a room temperature of 20 °C.

Draw a line on the graph to show how the temperature of the water in the cup would change if there was no lid on the cup.

(2)

ResultsPlus
Examiner Comments

This response scored one mark in Q07(c)(i), two marks in Q07(c)(ii) and one mark in Q07(c)(iii).

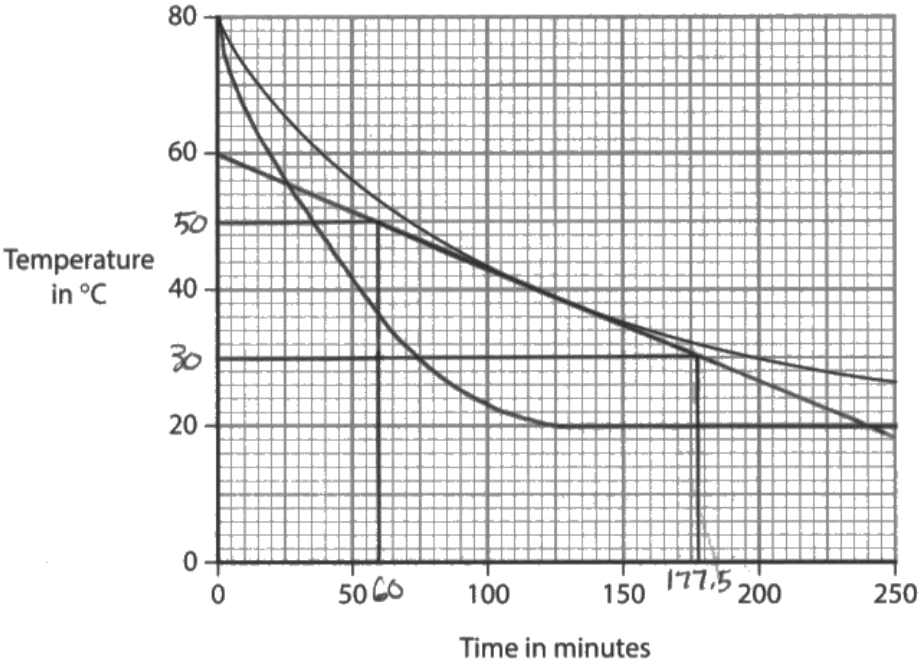
The tangent has been drawn successfully and has been used correctly to determine its gradient. However, the candidate has overlooked the importance of the negative gradient and so has lost a mark. The curve drawn shows a lack of understanding that the temperature would not decrease below room temperature.

(c) A student investigates how the temperature of a drink in the cup varies with time.

This is the student's method.

- pour some hot water into the cup and place the lid on the cup
- wait for the water to cool to 80 °C and then start a stopwatch
- measure the temperature of the water in the cup every 10 minutes

The graph shows the student's results.



(i) On the graph, draw a tangent to the curve when the temperature is 40 °C.

(1)

(ii) Calculate the gradient of the tangent to find the rate of temperature change of the water when the temperature is 40 °C.

Give your answer in °C / minute.

(3)

177.5 − 60 = 117.5 ~~temp~~ time

50 − 30 = 20 temp

= ~~temp / time~~ 117.5

= 20 / 117.5

= 0.170212766

rate of temperature change = 0.170212766 °C / minute

(iii) The student is working in a laboratory with a room temperature of 20 °C.

Draw a line on the graph to show how the temperature of the water in the cup would change if there was no lid on the cup.

(2)

ResultsPlus
Examiner Comments

This response scored one mark in Q07(c)(i), two marks in Q07(c)(ii) and two marks in Q07(c)(iii).

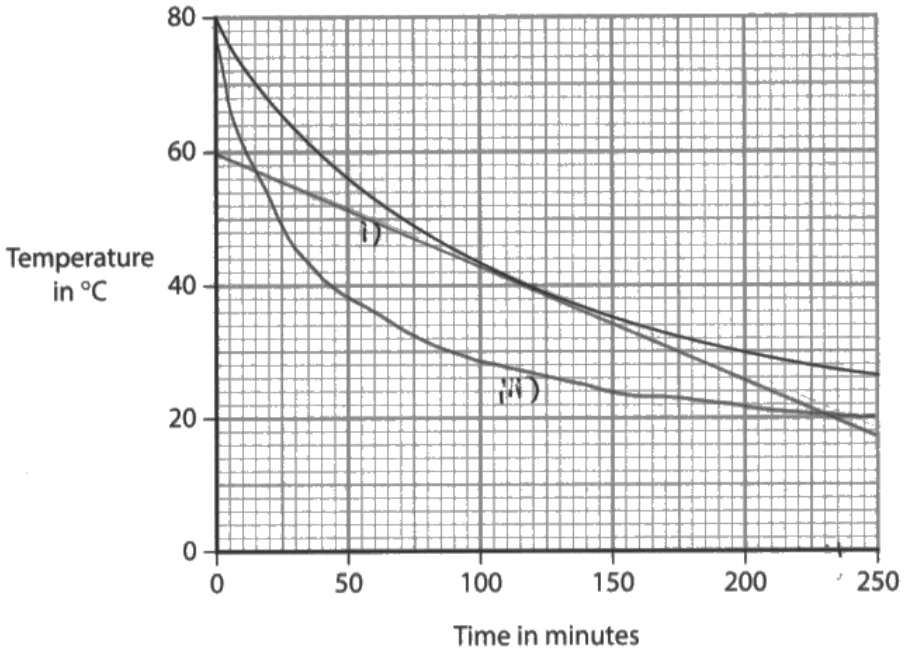
The tangent has been drawn successfully and has been used correctly to determine its gradient. However, the candidate has, again, overlooked the importance of the negative gradient and so has lost a mark. This time, the curve has been drawn to demonstrate the candidate's understanding of how cooling curves behave.

(c) A student investigates how the temperature of a drink in the cup varies with time.

This is the student's method.

- pour some hot water into the cup and place the lid on the cup
- wait for the water to cool to 80 °C and then start a stopwatch
- measure the temperature of the water in the cup every 10 minutes

The graph shows the student's results.



(i) On the graph, draw a tangent to the curve when the temperature is 40 °C.

(1)

(ii) Calculate the gradient of the tangent to find the rate of temperature change of the water when the temperature is 40 °C.

Give your answer in °C/minute.

(3)

$\frac{20-60}{235-0} = -\frac{8}{47}$

rate of temperature change = −0.17 °C/minute

(iii) The student is working in a laboratory with a room temperature of 20 °C.

Draw a line on the graph to show how the temperature of the water in the cup would change if there was no lid on the cup.

(2)

ResultsPlus
Examiner Comments

This response scored one mark in Q07(c)(i), three marks in Q07(c)(ii) and two marks in Q07(c)(iii).

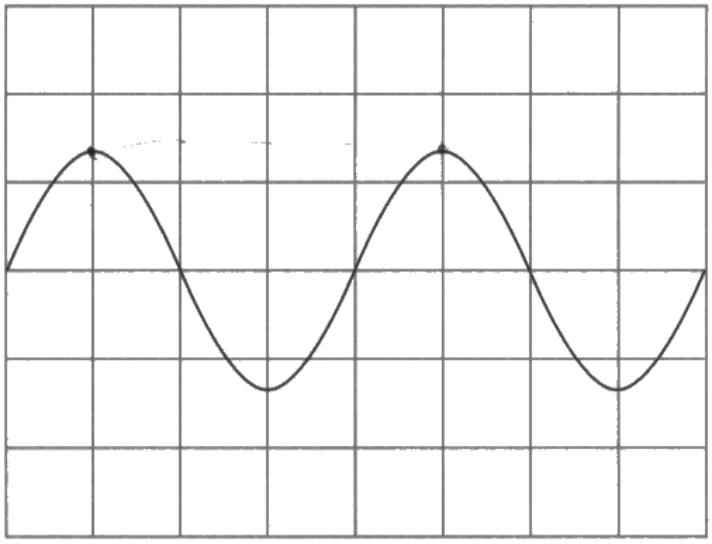
All elements of this question have been completed correctly by the candidate.

Question 8(a)(b)

In Q08(a), many candidates gave a wide range of answers for the maximum frequency humans can hear, showing some uncertainty. In Q08(b), several candidates obtained the “time period” incorrectly from the oscilloscope trace, leading to wrong answers. Some mistakenly used 10mV as the wavelength in the equation $v = f\lambda$, showing confusion about the terms. Many also gave yes/no answers without explaining their reasoning, which limited their marks. Candidates would benefit from more practice in reading oscilloscope traces and explaining their answers clearly.

8 A high-frequency sound wave is detected by a microphone and displayed on an oscilloscope.

The diagram shows the oscilloscope screen when the sound wave is detected. It also shows the oscilloscope settings.



oscilloscope settings:

x direction: 1 square = 20×10^{-6} s
y direction: 1 square = 10 mV

(a) Give the maximum frequency of sound that can be heard by humans.

(1)

25000 Hz

(b) Determine if the sound wave displayed on the oscilloscope could be heard by humans.

(4)

$4 \times 20 \times 10^{-6}$

$= 8 \times 10^{-5}$

Frequency $= \frac{1}{8 \times 10^{-5}}$

$= 12500$

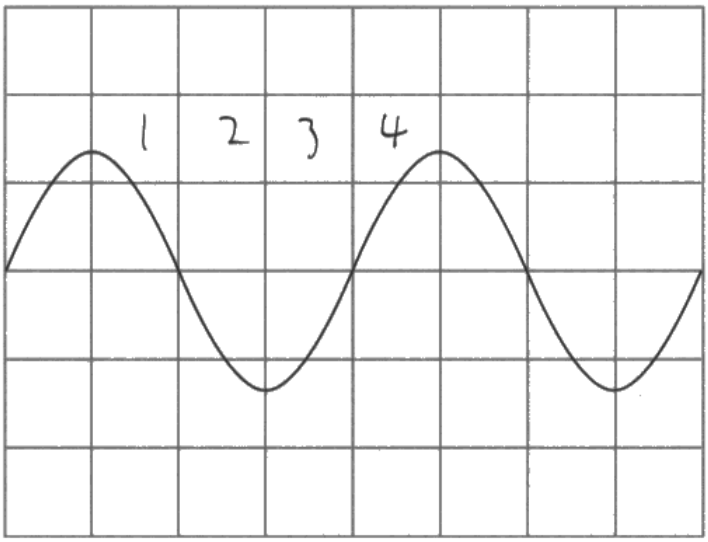
The sound wave cannot be heard by humans as it is above the hearing range.

ResultsPlus
Examiner Comments

The candidate has given an incorrect upper limit of human hearing in Q08(a), but has correctly calculated the frequency of the sound in Q08(b). Surprisingly, they have then concluded that the sound wave cannot be heard, which is incorrect.

8 A high-frequency sound wave is detected by a microphone and displayed on an oscilloscope.

The diagram shows the oscilloscope screen when the sound wave is detected. It also shows the oscilloscope settings.



oscilloscope settings:

x direction: 1 square = 20×10^{-6} s
y direction: 1 square = 10 mV

(a) Give the maximum frequency of sound that can be heard by humans.

(1)

20000 hz

(b) Determine if the sound wave displayed on the oscilloscope could be heard by humans.

(4)

Period = $(20 \times 10^{-6}) \times 4 = 8 \times 10^{-5}$ s

$f = \frac{1}{P}$ $\frac{1}{8 \times 10^{-5}} = 12500$ Hz = F

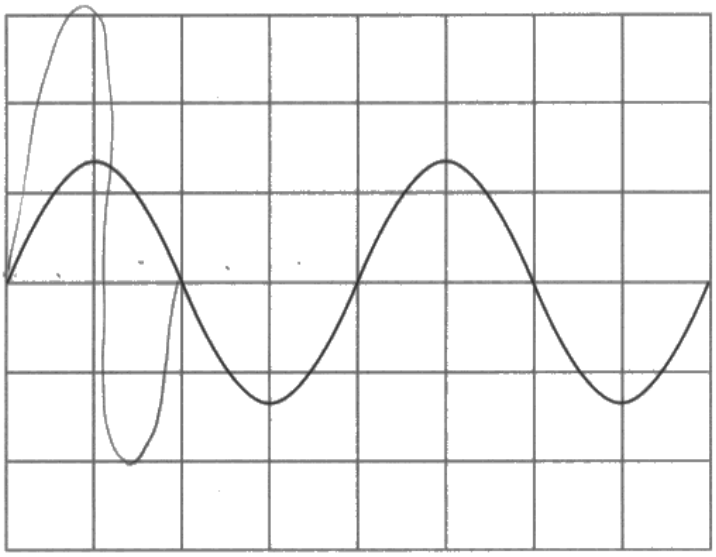
Probably, if the person is young and their ears are good.

ResultsPlus
Examiner Comments

This time, the candidate has given the correct upper limit of human hearing in Q08(a). However, despite calculating the correct frequency in Q08(b), the final conclusion lacks substance and is insufficient to gain the final mark. A comparison between the frequency and the answer to Q08(a) was expected.

8 A high-frequency sound wave is detected by a microphone and displayed on an oscilloscope.

The diagram shows the oscilloscope screen when the sound wave is detected. It also shows the oscilloscope settings.



oscilloscope settings:

x direction: 1 square = 20×10^{-6} s
y direction: 1 square = 10 mV

(a) Give the maximum frequency of sound that can be heard by humans.

(1)

20 000 Hz or 20 kHz

(b) Determine if the sound wave displayed on the oscilloscope could be heard by humans.

(4)

Time period = $4 \times 20 \times 10^{-6} = 8 \times 10^{-5}$

Frequence = $\frac{1}{\text{Time period}}$

$= \frac{1}{8 \times 10^{-5}} = 12500$ (Hz)

12 500 Hz is larger than 20 Hz and smaller than 20 000 Hz.

Therefore, the sound wave displayed on the oscilloscope could be heard by humans

ResultsPlus
Examiner Comments

This candidate has completed all elements of these questions correctly. The conclusion gives a clear comparison between the frequency calculated in Q08(b) and the value quoted in Q08(a).

Paper Summary

Based on their performance on this paper, candidates should:

- Take note of the number of marks available for each question and use this as a guide for the amount of detail expected in the answer.
- Take note of the command word used in each question to determine how the examiner expects the question to be answered, for example, whether to give a description or an explanation.
- Be able to use the formulae listed in the specification confidently in terms of substitution, rearrangement and evaluation.
- Know the SI units for physical quantities and be able to convert from non-SI units to SI units when required.
- Show all working so that some credit can still be given for answers that are only partly correct.
- Take advantage of opportunities to draw labelled diagrams as well as, or instead of, written answers.

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.