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Examiners' Report
June 2022

International GCSE Physics Science Double Award
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Introduction

As in examinations for previous sessions, most candidates handled the calculations well. Candidates who gave the best practical descriptions usually appeared to be writing from first-hand experience. Responses to the longer questions showed that the less able candidates tend to struggle when assembling a logical description or when asked to offer more than one idea. There was a wide range of responses and it was good to see that many candidates could give full and accurate answers.

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Question 1 (d)

Many candidates correctly linked the effect of mass on gravitational field strength. References to size or just 'bigger' were ignored.

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Question 2 (a)

Common misconceptions here include ultraviolet being used in human vision or x-rays being used for cooking food.

Many candidates scored very well on this question, however, showing that electromagnetic waves and their uses are well learnt.

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Question 2 (b)

Candidates occasionally referred to internal heating of cells yet usually hazards of electromagnet waves were also well learned.

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Question 2 (c)

There were many and varied suggestions to protect from ultraviolet waves, the vast majority of which were acceptable.

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Question 3 (a)(i)

Most candidates remembered that the required component was a voltmeter with many of those drawing the voltmeter in parallel with at least one of the other components in the circuit. Others missed the second line of the question which required the voltmeter to be drawn in parallel with component X.

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Question 3 (a)(ii)

High numbers of candidates correctly identified component X as a Light Dependent Resistor (LDR).

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Question 3 (b)(iii)

Some students incorrectly referred to the lamp being dimmer because the card was in between the lamp and the human eye. This does not answer the question, as it is component X, a Light Dependent Resistor (LDR) that is being covered. Many candidates scored full marks here because they made the link between the decreased light intensity and the LDR's increased resistance and correctly deduced the effect on the current in the circuit.

(iii) Explain what happens to the brightness of the lamp when component X is covered with a dark sheet of paper.

(2)

The brightness of the lamp reduces as the light dims. This is because component X is covered with a dark sheet of paper which reduces the light intensity and hence increases the resistance. This results in less current flowing through the circuit and less current flowing through the lamp.

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Examiner Comments

This candidate has answered the question well by mentioning the effect of the light intensity on the LDR (increases its resistance) which has increased the total resistance of the circuit and therefore decreased the current. The candidate has therefore justified why the lamp will get dimmer.

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Examiner Tip

Questions about the effect on one variable when changing another are commonplace. They can be worth more than 2 marks. In this case, it was not required as part of the answer that the voltage supply was the same, nor that the equation I=V/R provides further justification. Had this question occurred later in the paper, it would certainly have been worth at least 3 marks.

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Question 3 (b)(i-ii)

Candidates broadly read the correct value off the graph, often without drawing lines on the graph to indicate their method.

Acceptable answers lay within 1/2 a small square of the correct answer, giving a range of 100 ohms from 1650-1750 ohms.

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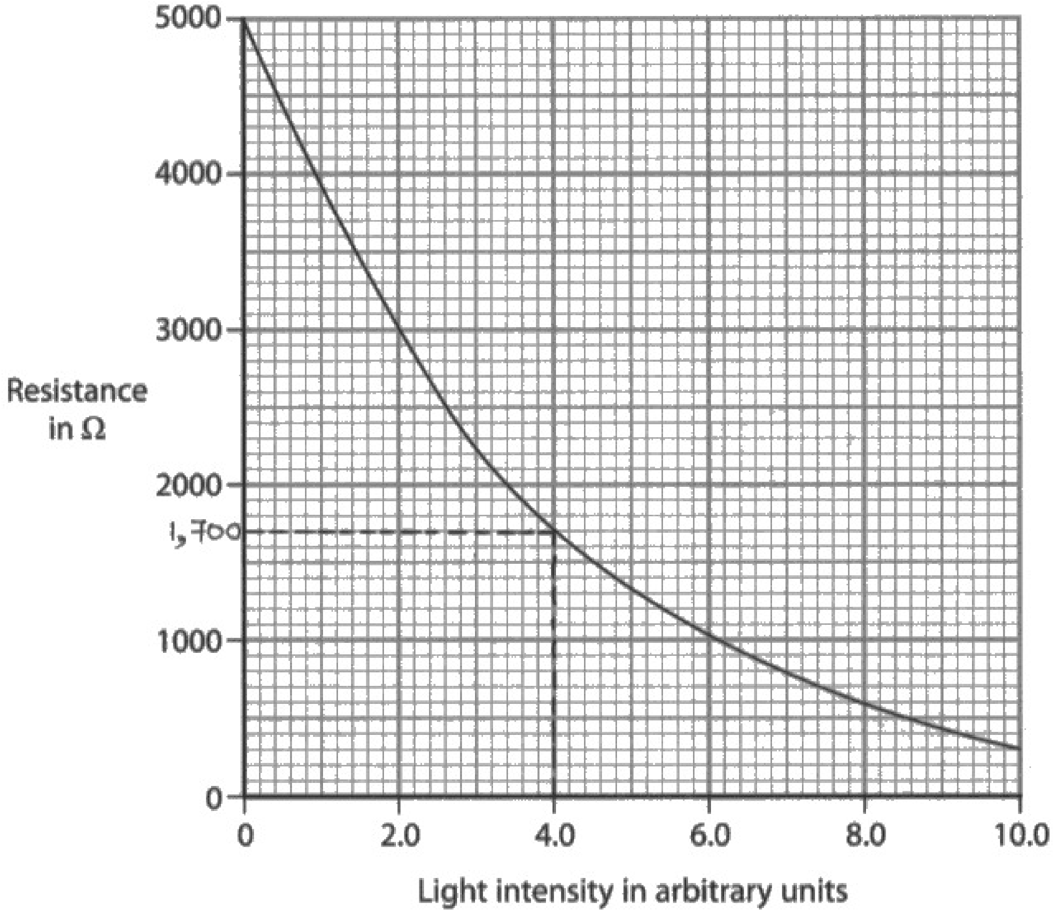
(b) The graph shows how the resistance of component X changes with light intensity.



(i) Use the graph to determine the resistance of component X when the light intensity is 4.0 arbitrary units.

(2)

resistance = 1,700 Ω

(ii) The current in the circuit is 0.0018 A.

Calculate the voltage across component X at a light intensity of 4.0 arbitrary units.

(3)

I = 0.0018 A , R = 1,700 Ω , V = ?

V = I × R

V = 0.0018 A × 1,700 Ω

V = 3.06 V

voltage = 3.06 V

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Examiner Comments

The candidate has got both parts of this item correct. The construction lines are clear on the graph. The working for Q03(b)(ii) is carefully laid out which makes the candidate's thinking obvious.

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Examiner Tip

Questions that instruct the candidate to 'use the graph' are invariably worth 2 marks. Full marks can be awarded for a correct answer on the answer line. If the candidate misreads the graph and gives an incorrect answer, drawing construction lines as in the clip can secure a mark for the correct method.

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Question 4 (a)

Virtually all candidates recognised that for the object to be at rest, the resultant force must be zero newtons.

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Question 4 (b)(i)

This equation was given on the equation insert.

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Question 4 (b)(ii-iv)

The calculation in part (b)(ii) was performed accurately by the majority of candidates although a small number forgot to include the value of 10 N/kg for the gravitational field strength.

The formula in part (b)(iii) was given on the formula insert.

Assuming the candidate transcribed the formula correctly, most candidates could substitute the values in the correct places and complete the calculation in part (b)(iv) accurately.

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Question 4 (b)(v)

A significant number of candidates made no reference to the ice cube's weight on this item or thought that there no forces at all. These are both misconceptions.

A minority, though, remembered that the ice cube has weight and deduced that there must be a larger upwards force acting also. The name of that force was not required.

(v) Explain why the ice cube will accelerate upwards when force X is removed.

(2)

There is a floating force which is upwards. The upwards floating force is larger than downwards weight. The resultant force is upwards.

ResultsPlus Examiner Comments

This candidate has identified that there are two forces still acting on the ice cube after force X has been removed. The name of that upwards force is not required (since upthrust is not on the specification). The candidate has appreciated that this force must also be greater than the weight for there to be an upwards resultant and hence upwards acceleration.

ResultsPlus Examiner Tip

Remember that acceleration can only occur if there is a resultant force. Identify which forces may contribute to that resultant. In vertical motion one of those forces is almost certainly the weight force, unless you have been told to neglect it.

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(v) Explain why the ice cube will accelerate upwards when force X is removed.

(2)

when no force is applied the cube will rise back up because ~~it will~~ it has a low density, meaning with no force it will float (water has a higher density than the ice cub)

ResultsPlus
Examiner Comments

This candidate has taken an alternative route and decided to refer to differences in density that cause objects to float. Without mention of a resultant force, this answer could not score both marks.

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Question 5 (a)

A large proportion of candidates correctly remembered the effect on colour of stellar surface temperature.

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Question 5 (b)

A large number of candidates misread the question and described the formation of a star from the nebula stage through to the main sequence. The question, however, requires the evolution of the star after this stage. Other candidates described the evolution of a star similar in mass to the Sun, for which there was no credit.

(b) A star has a much larger mass than the Sun.

Describe the evolution of this star after it has left the main sequence.

(3)

It turns into a large red supergiant, then it contracts and explodes, turning into a supernova. The supernova may then form a neutron star or a ~~black hole~~ blackhole.

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Examiner Comments

This candidate has correctly and concisely described the stages of a star with a much larger mass than the Sun.

ResultsPlus
Examiner Tip

Make sure you read through the whole item to ensure you are answering the correct question.

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Question 5 (c)

Questions which ask the candidate to challenge a proposed relationship have been asked before on this specification. Well-prepared candidates have seen these by working through past papers.

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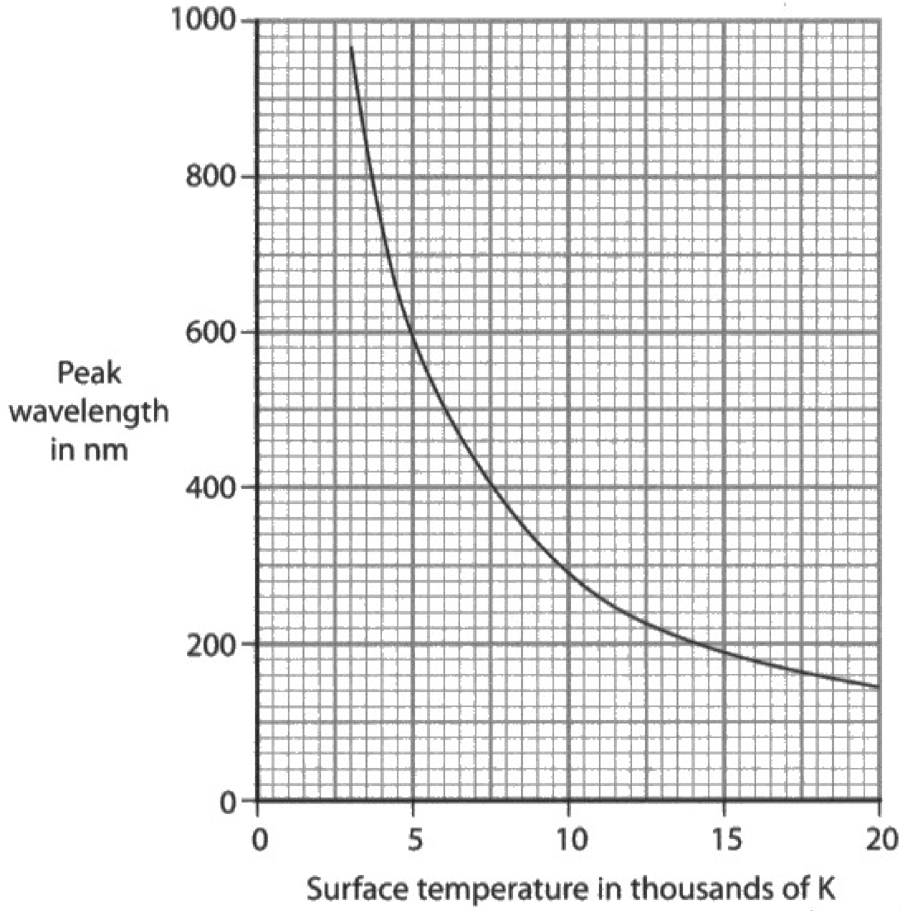
(c) The graph shows the relationship between the peak wavelength of light emitted by a star and the surface temperature of the star.



A scientist suggests that the two variables are linked by this formula.

peak wavelength × surface temperature = constant

Use data from the graph to justify this formula.

(4)

This is justified because when the surface temperature in Kelvin increases, this causes the peak wavelength to decrease. The relationship is therefore so inversely proportional. Therefore, because one falls when the other increases, this produces a constant when the two values are multiplied. $\frac{x}{1} \times \frac{1}{x} = \frac{x}{x} = x$

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ResultsPlus
Examiner Comments

This candidate has not used any data from the graph and so cannot score any marks.

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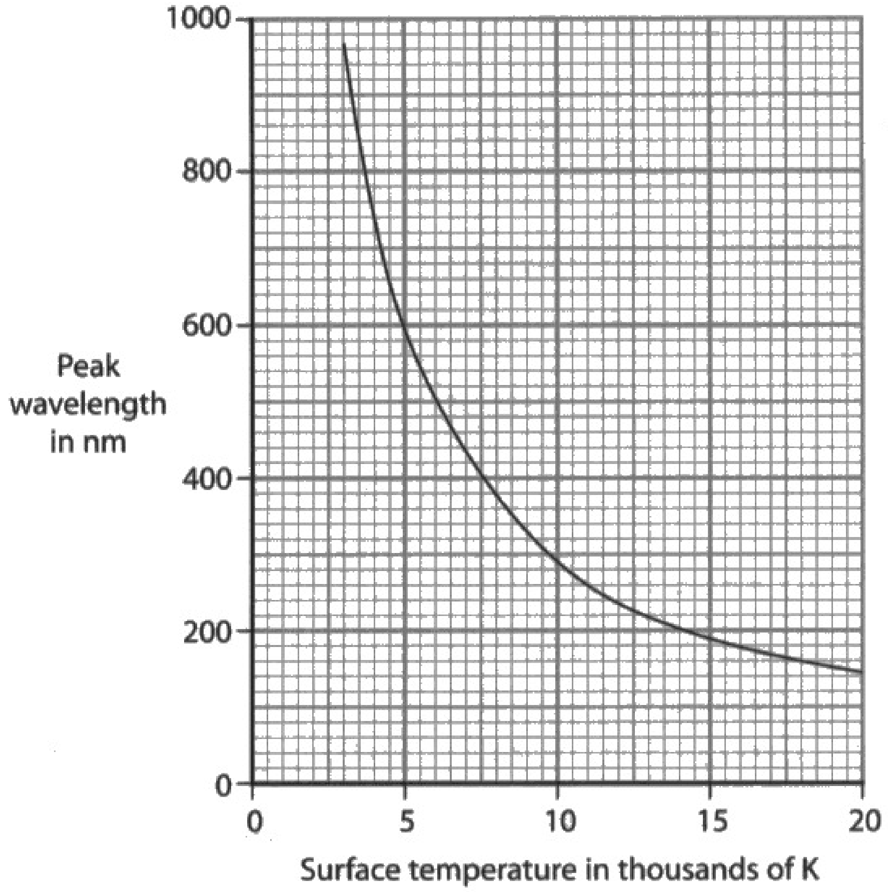
(c) The graph shows the relationship between the peak wavelength of light emitted by a star and the surface temperature of the star.



A scientist suggests that the two variables are linked by this formula.

peak wavelength × surface temperature = constant

Use data from the graph to justify this formula.

(4)

The formula is correct as 5x600 is 3,000, 10 x 300 = 3,000, 15 x 200 = 3,000, 20 x 150 = 3,000. This means that, by multiplying the peak wave length and surface temperature, the outcome will always be a constant: 3000. The data on the graph fully correlates with the formula.

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Examiner Comments

This candidate, in contrast, has read off a pair of values from the graph and calculated the value of the constant. By repeating this with a different pair of values from the graph and making a suitable comment comparing the two constants, this candidate has scored maximum marks.

ResultsPlus
Examiner Tip

The question asks for the candidate to use data from the graph, which means reading at least two pairs of values from the graph.

The formula should then be used to calculate a value of the constant for the given relationship, followed by a suitable comparison comment.

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Question 6 (a)

Candidates that understood that vibrations are responsible for sound did well here. Identifying what part of the loudspeaker vibrates and then explaining why it did so in terms of the motor effect scored highly.

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Question 6 (b)(i)

Almost all candidates correctly multiplied the given current and voltage to find the power of the loudspeakers.

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Question 6 (b)(ii)

Candidates generally demonstrate very good graph-plotting skills. Graphs are usually clear, well-labelled and have uniform scales.

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(ii) A student varies the resistance of the variable resistor.

The table shows the power of the loudspeakers for different resistance values of the variable resistor.

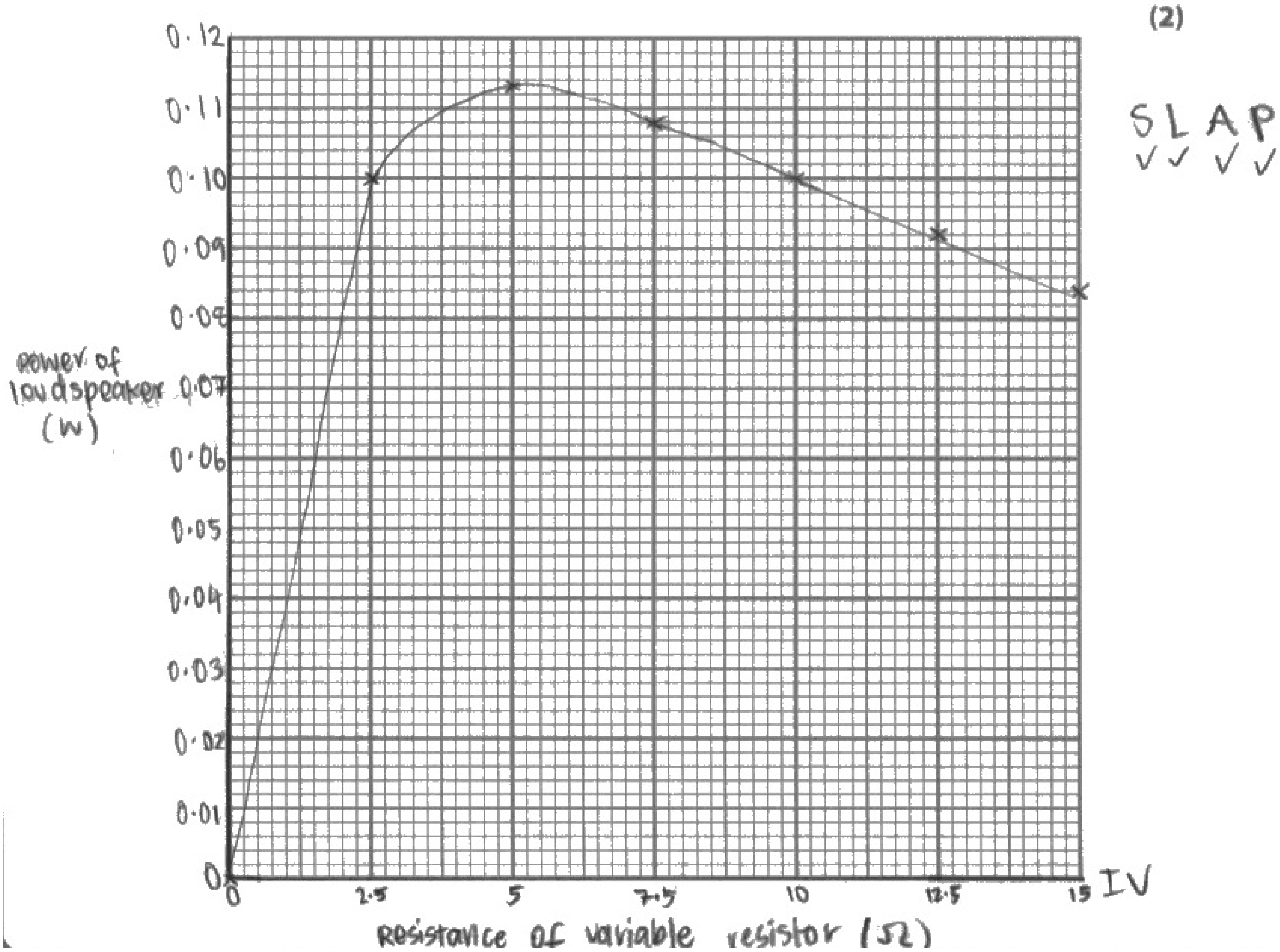
Resistance of variable resistor in Ω	Power of loudspeakers in W
0.0	0.000
2.5	0.100
5.0	0.113
7.5	0.108
10.0	0.100
12.5	0.092
15.0	0.084

Plot the student's results on the grid.

(3)

(iii) Draw a curve of best fit.

(2)



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Examiner Comments

The candidate has written an acronym to help them remember the important stages in constructing a successful graph. In doing so they have labelled both axes with appropriate units, filled the space appropriately and plotted the points correctly.

Note the y-axis has been scaled to include the region between power values of 0.09 and 0.00.

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Examiner Tip

Scales on graphs in IGCSE exams need to be linear i.e. each square corresponds to the same amount. In this case, each square corresponds to 0.01 W on the y-axis.

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Question 6 (b)(iii)

Candidates did their best to fit curves to the points they had plotted. This was almost always successful.

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Question 6 (c)

Candidates found this question challenging. This is because misconceptions on these types of circuits are commonplace.

In circuits, it is the voltage and the circuit resistance that determine the current supplied by the cell, in this question.

The best way of exploring these circuits is to either build them using real components or using virtual components in one of the excellent online simulations. PHeT works particularly well for this topic.

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(c) Diagram 3 shows the loudspeakers connected in series to a cell.

Diagram 4 shows the loudspeakers connected in parallel to the same cell.

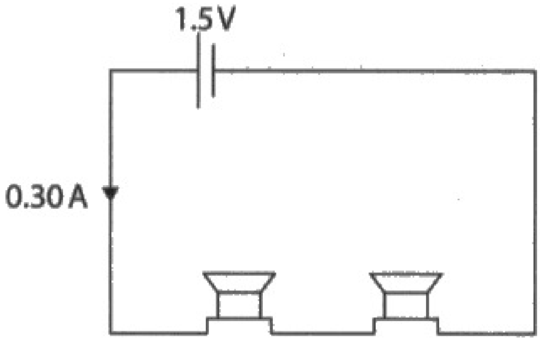

Diagram 3

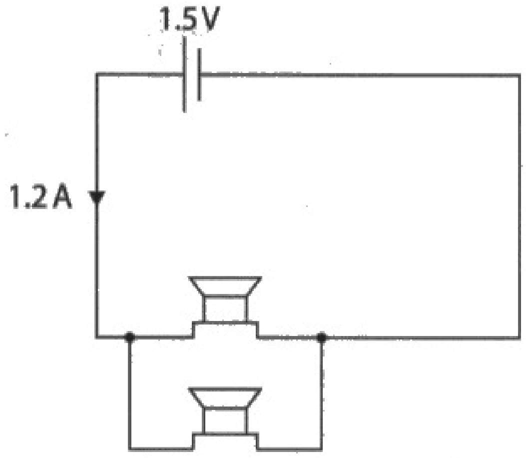

Diagram 4

Comment on how the total resistance of the loudspeakers in diagram 3 compares with the total resistance of the loudspeakers in diagram 4.

(4)

① $R = \frac{V}{I}$

② 1.5 ÷ 0.3 = 5   1.5 ÷ 1.2 = 1.25   5 ÷ 1.25 = 4

③ The total resistance in diagram 3 is 4 time more than that in diagram 4.

④ This is because of diagram 3 is in series, so the total resistance is sum of two loud speaker.

⑤ In diagram 4, it is parall, so the voltage across each circuit is equally.

⑥ So voltage double, and resistance drop to halve.

(Total for Question 6 = 15 marks)

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Examiner Comments

This candidate has started with basic ideas. The diagrams give the voltage of the cell and the current in the circuit. Using "V=IR" means that the total resistance of each circuit can be calculated and compared. By the third line, the candidate has scored most of the marks available.

ResultsPlus
Examiner Tip

On difficult questions, start with what you know to be true and work from there.

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Question 7 (a)

Many candidates could give one feature of background radiation, although few could successfully describe enough to gain the second mark.

7 Radon is a radioactive gas that contributes to background radiation.

(a) Describe what is meant by the term **background radiation**.

(2)

It is the radiation that is always around us but the amount is so small it is not harmful to us. Examples of background radiation include radon gas, cosmic rays, etc...

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Examiner Comments

This candidate concisely expresses the ever-present nature of background radiation whilst providing examples of where that background radiation may come from.

ResultsPlus
Examiner Tip

Pay particular attention to the number of marks available for description of terms in bold. This item was worth 2 marks and so two distinct ideas were necessary for full marks.

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Question 7 (b)(i)

By far the easiest way of defining half life is to discuss the time taken for the activity of a sample to halve. Candidates found defining the half life in terms of other quantities often did not make their meaning clear.

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Question 7 (b)(ii)

As in question Q03(b)(i), candidates that drew construction lines and then read off from the axes were guaranteed one mark even if they then misread that graph.

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Question 7 (c)

Most candidates remembered that the nucleon or 'top number' for the alpha particle is 4 and that the proton or 'bottom number' is 2. If a candidate misremembered the proton number for the alpha but then calculated the proton number for radon correctly then they were still given credit.

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Question 7 (d)

Many candidates made reference the effect of radiation on the body. Somewhat fewer referred to the highly ionising nature of the alpha particle. Very few mentioned the idea that there was no dead skin to protect living cells as there would be if the alpha source was outside the body.

(d) Radon-222 also emits alpha radiation.

Explain the hazard to humans of breathing in air contaminated with radon-222.

(2)

Alpha radiation is highly ionising ~~and~~ ~~so can~~ and can cause mutations, leading to cancer ~~as~~ if we breathe in contaminated air.

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Examiner Comments

This candidate explained why alpha particles in particular are so dangerous (highly ionising) and what the consequences of that were (mutations that could lead to cancer).

ResultsPlus
Examiner Tip

Candidates can attempt questions that at first may appear challenging by making reference to points of fact on the specification.

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Question 8 (a)(i)

Candidates completed this item very well indeed. Many responses would have scored 5 or 6 marks had this item been worth that many.

8 Hailstones are small pieces of ice that sometimes fall to the ground during storms.

(a) (i) Describe how to determine the density of a hailstone.

Assume that hailstones are spherical.

(4)

Density = mass / volume (Precaution : Do quickly (In cold environment) to avoid melting.)
① Using tongs, and a weighing balance, pick up the hailstone and take its mass in grams. Repeat mass measurement 3 times and take average, avoiding zero error. ② Measure volume using $v = \frac{4}{3}\pi r^3$, measure radius by taking the diameter of hailstone using an instrument called capilator?? and divide by 2 to get radius (repeat & average). Use formula to find volume after taking average length of radius in cm. Use density formula and value of mass / volume to find density in g/cm^3.

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Examiner Comments

This candidate has sensibly started with the formula linking density, mass and volume. This is a good idea because it suggests what raw data is required to complete the investigation.

Once the required raw data is identified, the candidate has to describe how to acquire that data. This example is a clear description and scores full marks, even though the name of the diameter-measuring device is misnamed (capilator rather then calipers).

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Examiner Tip

There are 13 experiments mentioned explicitly in the specification. Make sure you know them all, along with the method and equipment required to perform them. Furthermore, remembering what analysis to complete after taking the data is very helpful.

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Question 8 (a)(ii)

Candidates selected the correct formula from the accompanying sheet. A large proportion of those that answered this question substituted the values into the formula correctly and gave the appropriate unit.

There was no need to convert the mass into kilograms or the volume into any other units. Completing the density in g/cm^3 was perfectly acceptable and much more reliable in terms of successful completion.

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Question 8 (b)

This item tested a familiar idea in a slightly different context and candidates were given the idea of convection to work with. Many candidates correctly identified that it was the air that was carrying the hailstones and hence explained the movement in terms of convection currents and their formation.

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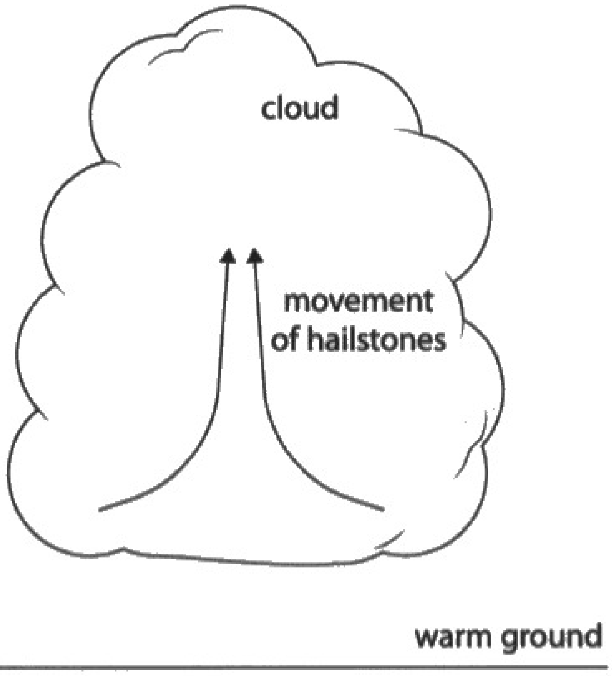
(b) Hailstones can be lifted to the top of clouds.

The diagram shows the movement of some hailstones in a cloud.



Suggest how hailstones are lifted to the top of the cloud by convection.

(2)

The hail stones near the warm ground get heated and so they expand and become less dense, this causes them to rise so the more dense, colder hailstones replace them, a convection current is produced which is continuous.

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Examiner Comments

This candidate makes no reference to the air either as a whole or in terms of particles. The hailstones themselves do not change volume in comparison to the air surrounding the hailstones.

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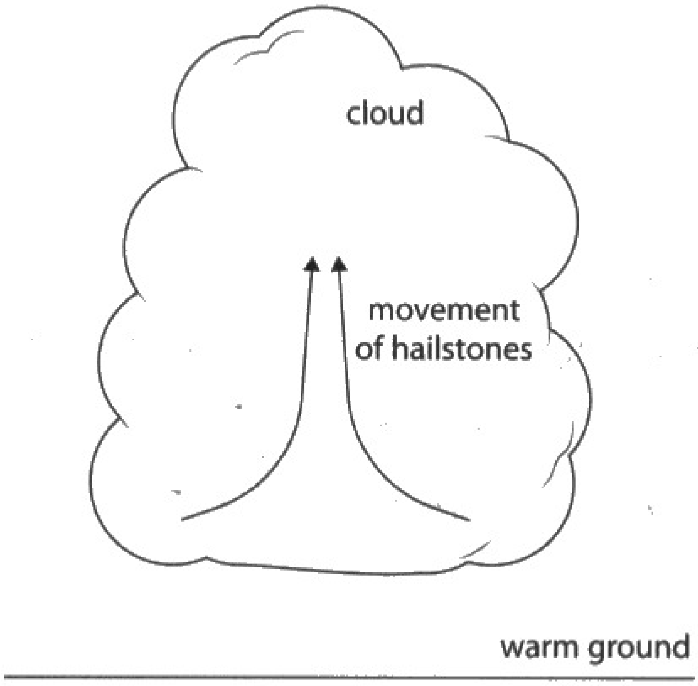
(b) Hailstones can be lifted to the top of clouds.

The diagram shows the movement of some hailstones in a cloud.



Suggest how hailstones are lifted to the top of the cloud by convection.

(2)

Warm ground heats up the air molecule near it, causing it to be less denser than cooler air above. This causes denser, cooler air to fall, and less dense, hotter air to rise up. As the hot air rises, it carries the hailstones along with it. This is called convection current.

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Examiner Comments

This candidate, on the other hand, has specifically mentioned the air, which gets warmer, expands and then rises.

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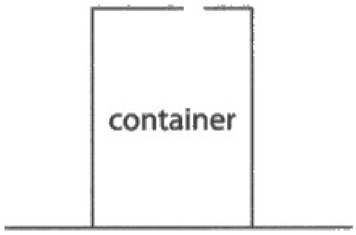
Question 9 (a)

Many candidates linked the ideas of particles colliding with the walls of the container and hence a force being exerted on the walls. Some made the final link to a force per unit area. Simply quoting the formula was insufficient to do this.

9 The diagram shows an empty metal container that has a hole in the top.



(a) Describe how the air molecules in the container exert a pressure on its inner walls.

(3)

The air molecules not finding the way to escape the container will collide ~~with~~ one another. The collision will also ~~cause~~ be caused to the container. This causes the force per area ~~of~~ exerted on the container and the pressure is exerted.

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Examiner Comments

This candidate starts off by mentioning air molecules colliding into each other which is irrelevant. They go on to mention about colliding with the walls of the container which is the first marking point. Linking this to a force and hence to a force per unit area secured full marks.

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Question 9 (b)

This item was answered well by nearly all of the candidates that attempted it.

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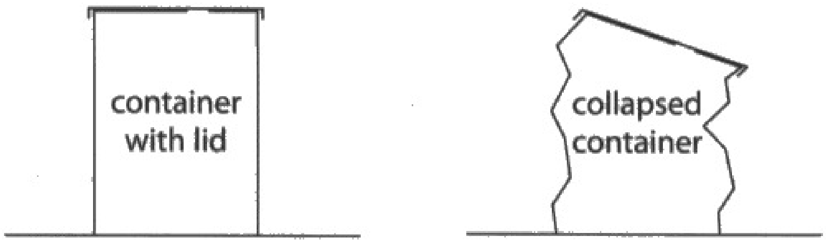
Question 9 (c)

This question links ideas of changing pressures caused by temperature changes as well as forces caused by a pressure difference. Many candidates made the first link yet fewer made the second.

(c) A lid is placed on the hot container.

The lid seals the hole and the container is allowed to cool.

As the container cools, it collapses.



Explain why the container collapses.

(2)

- Because the pressure inside the container decreases
- Thus outside pressure is larger than ~~[scribbled out]~~ pressure inside the container
- And therefore volume of the container decreases.
- pressure decreases because kinetic energy of the particles decrease causing less frequent ~~collisions~~ collisions

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Examiner Comments

This candidate used bullet points to explain what happened to the can. This made the discussion very clear and easy to follow.

ResultsPlus
Examiner Tip

Using bullet points is a perfectly acceptable way of clarifying what it is you're trying to say.

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Question 10 (a)(i)

Electromagnetic induction can be a challenging topic. Many candidates had good ideas about induction yet few linked them to the changes in the voltmeter reading.

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10 Diagram 1 shows a trolley seen from above.

A copper rod is attached to the front of the trolley.

The rod is connected to a voltmeter fixed to the trolley.

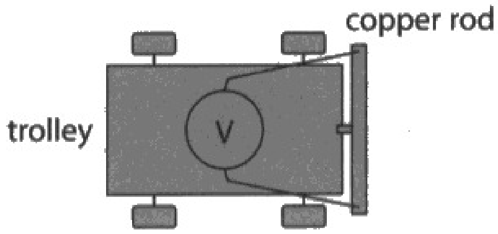

Diagram 1

(a) Diagram 2 shows the path of the trolley, backwards and forwards through a very strong magnetic field directed into the page.

The shaded area shows the magnetic field.

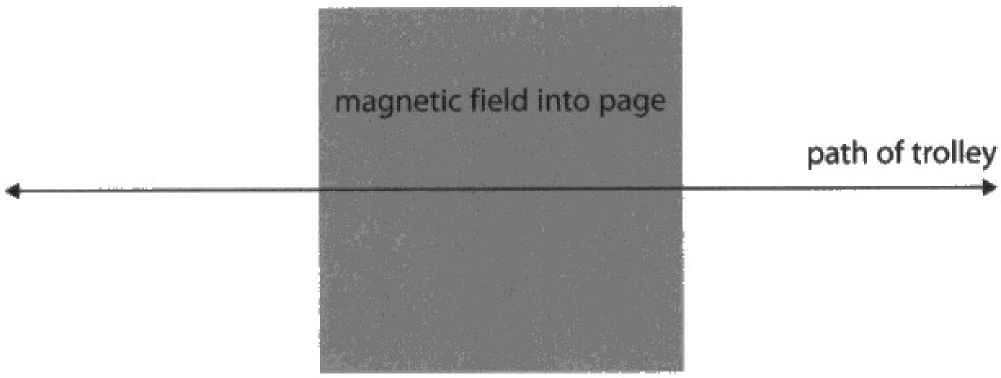

Diagram 2

B+F→I

(i) A voltage is induced in the copper rod as the trolley moves through the magnetic field.

Explain why the sign of the voltmeter reading changes as the trolley moves backwards and forwards.

(3)

The moving ~~to~~ copper rod cuts the magnetic field lines and induces a voltage. This is detected by voltmeter. When path of trolley changes in direction, the voltage follows and changes as magnetic field lines are cut at different direction.

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ResultsPlus
Examiner Comments

This candidate has described this very well. They have made clear that they know the link between direction of motion and direction of field line cutting and hence direction of induced voltage.

ResultsPlus
Examiner Tip

This candidate used precise scientific language to great effect. Practise your scientific language.

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Question 10 (b)(i)

Candidates completed this calculation very well by substituting the correct values into the formula given on the insert. The only complexity other than re-arranging the formula was in the introduction of scientific notation.

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Question 10 (b)(ii)

Candidates completed this calculation very well by substituting the correct values into the formula given on the insert. The only complexity other than re-arranging the formula was in the introduction of scientific notation.

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Question 11 (a)

11 (a) Diagram 1 shows water waves just before they reflect off the side of a stationary boat.

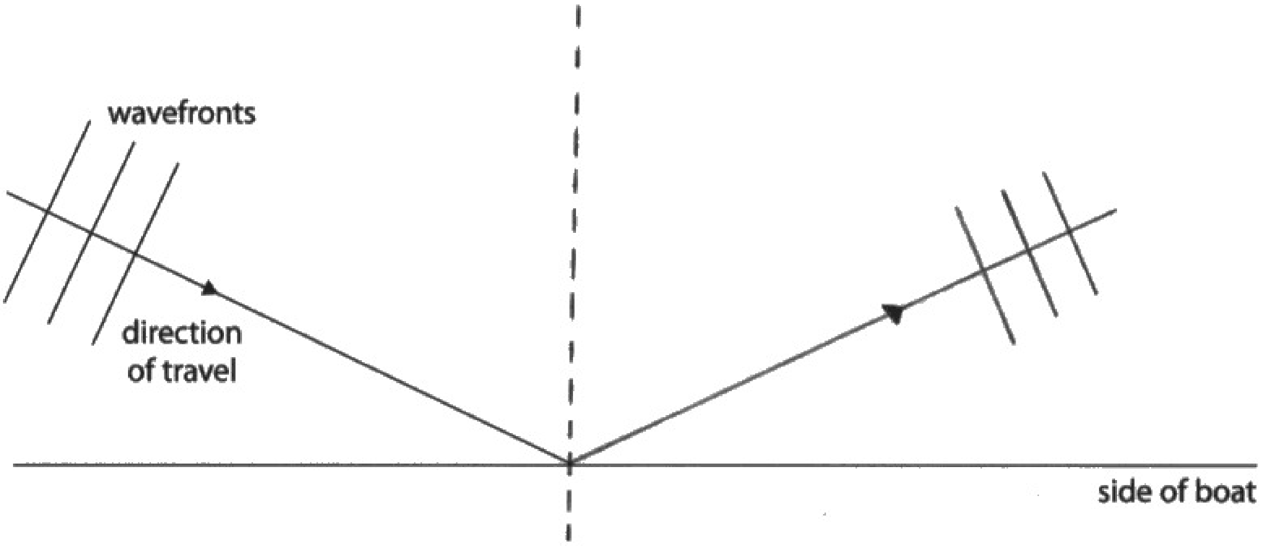

Diagram 1

(i) Draw the normal at the point where the direction of travel of the waves meets the side of the boat.

(1)

(ii) Measure the angle of incidence of the water waves.

(1)

angle of incidence = ...65........ degrees

This candidate has constructed the normal correctly and measured the angle of incidence accordingly.

They have used the idea that the direction of travel behaves like a ray and drawn in 'reflected ray'.

After this, they have drawn three parallel lines perpendicular to the 'ray' to complete the diagram.

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Question 11 (b)(i)

This item can be answered in a number of different ways yet all have a common thread. The candidate needs to be clear about the directions of vibration and the direction of wave motion or energy transfer. Many candidates were successful yet those that were not used imprecise language.

(b) The boat starts to move, creating its own waves on the surface of the water.

(i) Surface water waves are transverse.

Describe the difference between transverse waves and longitudinal waves.

(2)

The vibration of transverse wave is perpendicular to the direction of wave travelling, while the vibration of longitudinal wave is ~~paper~~ parallel to the direction of wave travelling.

ResultsPlus
Examiner Comments

This candidate has got the correct ideas relating direction of vibration and direction of wave travel.

(b) The boat starts to move, creating its own waves on the surface of the water.

(i) Surface water waves are transverse.

Describe the difference between transverse waves and longitudinal waves.

(2)

in transverse waves the direction of energy transfer is perpendicular to the direction of travel while in a longitudinal wave the direction of energy transfer is parallel to the direction of travel.

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Examiner Comments

Direction of travel and direction of energy transfer are the same thing. There is nothing here about direction of vibration.

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(b) The boat starts to move, creating its own waves on the surface of the water.

(i) Surface water waves are transverse.

Describe the difference between transverse waves and longitudinal waves.

(2)

longitu wave movement of transverse wave is perpendicular to the direction of travel. longitudinal waves moments are parallel to the direction of travel

ResultsPlus
Examiner Comments

Movement of the wave here is insufficient for 'vibration'.

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Question 11 (b)(ii)

Most candidates who attempted this question spotted that the wavefronts were closer together which implied that the wavelength had decreased. From there very few candidates made reference to the formula linking speed, wavelength and frequency, or that the speed of the water waves is constant. There was a mark available for recognition that the Doppler Effect was present here if no other marks had been scored.

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(ii) Diagram 2 shows the boat moving towards an observer.

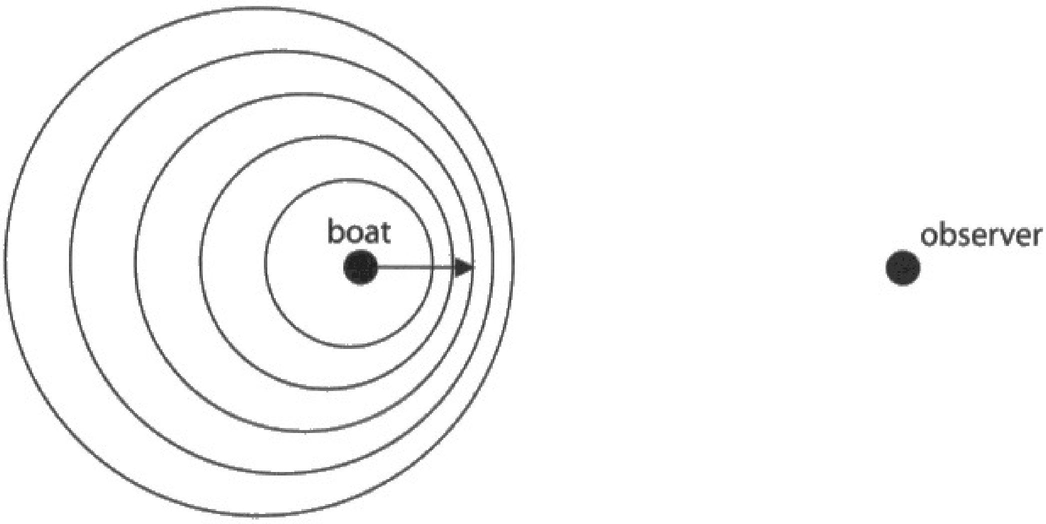

Diagram 2

Explain why the frequency of the water waves measured by the observer is larger than the frequency of the water waves created by the boat.

(3)

wave speed = frequency × wavelength.

wavespeed remains constant but the distance between the wavefronts get smaller / wavelength decreases as (wavefronts get bunched up) due to the fast movement, This is called the doppler effect.

↳ (wavefronts can't catch up)

→ so as wavelength decreases frequency increases, (even though the frequency created by the boat

(Total for Question 11 = 10 marks)

(when the boat is stationary and wavefronts are not bunched up are smaller.)

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Examiner Comments

This candidate has organised their thoughts into short sentences each of which tie in neatly with the mark scheme.

ResultsPlus
Examiner Tip

Looking through past paper mark schemes can be very helpful for explanations that are not fully outlined in the specification.

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Question 12 (a)

This question uses another formula from the given sheet. The first two marks are for the correct substitution which a reasonable fraction of the candidature completed. From this point some candidates completed the rest of the item whereas a few stopped at this point.

12 This question is about a parachutist.

(a) A parachutist leaves a helicopter that is hovering above the ground.

The parachutist is initially at rest and falls vertically downwards.

Calculate the speed of the parachutist after they have fallen through a distance of 1300 m.

Ignore the effect of air resistance.

(4)

Speed = $\frac{\text{distance}}{\text{time}}$ $\quad$ $v^2 = 0^2 + (2 \times a \times 1300)$

Speed = $\frac{1300}{\text{time}}$ $\quad$ $v^2 = 2600 \times a$

speed = ... m/s

ResultsPlus
Examiner Comments

Although this candidate did not complete the substitution and arrive at a final answer, they did recognise that the initial velocity was zero. This scored the first marking point.

ResultsPlus
Examiner Tip

Even if the question seems impossible to complete, making a start may often be creditworthy.

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12 This question is about a parachutist.

(a) A parachutist leaves a helicopter that is hovering above the ground.

The parachutist is initially at rest and falls vertically downwards.

Calculate the speed of the parachutist after they have fallen through a distance of 1300 m.

Ignore the effect of air resistance.

(4)

$v^2 = u^2 + 2as$

$v^2 = 0^2 + 2 \times 10 \times 1300$

$v^2 = 26000$

$v = 161 \cdot 25$

speed = 161 · 25 m/s

ResultsPlus
Examiner Comments

This candidate has made all the correct substitutions and followed through with the evaluation of v^2 and finally v.

The working is very clear and set out well for ease of reading.

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Question 12 (b)(i)

Many candidates gave a well-rehearsed answer for terminal velocity here. This question is not about terminal velocity, however, and focuses on the region of the motion where the parachutist is decelerating.

(b) When the parachutist is much nearer to the ground, they open their parachute.

The parachutist slows down.

(i) Explain the change in speed of the parachutist.

Use ideas about forces in your answer.

(3)

~~when the parachute opening increases the air resistance on the~~

when the parachute opens, it increases the air resistance on the parachuter, causing them to decellarate, as they decelerate, their ~~velocity~~ speed decreases, thus in turn decreasing the air resistance until the parachuter's weight is equal to the air resistance and they travel at a lower constant speed having reached a lower terminal velocity.

ResultsPlus
Examiner Comments

This candidate has gone on to talk about the condition for terminal velocity, which is not required. The question asks for an explanation of the change in speed and ideas about forces.

Since the phrase 'slows down' is in the question, there is no credit for stating that the parachutist slows down or decelerates. There would have been credit for referring to an upwards acceleration.

The discussion of forces is correct. The air resistance increases at first, because of the parachute opening. There is mention of both air resistance and weight. Finally there is a reference to the air resistance decreasing as the parachutist slows down.

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ResultsPlus
Examiner Tip

Words or phrases given in the question will not get credit by themselves. Check to see whether specific ideas are required in your answer.

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Question 12 (b)(ii)

Many candidates scored two marks because they correctly identified why the KE and GPE stores both decreased. The third mark could be scored in a number of ways which was achieved by a small proportion of candidates.

(ii) It is observed that from when the parachute opens to just before the parachutist touches the ground, the GPE store and the KE store of the parachutist both decrease, yet energy is still conserved.

Justify these observations.

(3)

GPE = mass × g × height. when the parachutist goes down, the height decreases while the mass and g remain constant. So GPE decreases. KE = ½ × mass × velocity². When the parachutist opens the parachute, ~~t~~ he slows down, and the velocity decreases. While the mass remains ~~constant~~ constant. ~~Ignore the~~ So KE decreases. The energy ~~tn~~ is transferred to the surroundings. It is absorbed by the air. Some is also transferred to heat and sound.

Therefore, both GPE and KE decrease but energy is still conversed.

ResultsPlus
Examiner Comments

This candidate scored the first two marking points with a clear and full description of why both the KE and GPE stores decreased.

To answer the question fully, they have gone on to describe which stores may have increased and how that has been achieved.

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Examiner Tip

When describing energy stores and transfers, be clear about which object and which stores for that object have changed.

For example here, the thermal store of both the air and the parachutist have been increased.

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Paper Summary

Based on the performance shown in this paper, candidates should:

- Take care when drawing diagrams to add labels and draw accurately.
- Either build or simulate circuits in which the number of components changes and noting the effect on the currents and voltages in or across those components.
- Ensure that they have either seen or performed the practicals named in the specification where possible.
- Take note of the number of marks given for each question and use this as a guide as to 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 instance whether to give a description or an explanation.
- Be familiar with the equations listed in the specification and be able to use them confidently.
- Structure multi-step calculations as simply as possible to facilitate checking at each stage.
- Recall the units given in the specification and use them appropriately, for instance density.
- Be familiar with the names of standard apparatus used in different branches of physics.
- Practise structuring and sequencing longer extended writing questions.
- Show all working so that some credit can still be given for answers that are only partly correct.
- Signposting working with words may help with structuring calculations clearly.
- Be ready to comment on data and suggest improvements to experimental methods.
- Take care to follow the instructions in the question, for instance when requested to use particular ideas in the answer.
- Take advantage of opportunities to draw labelled diagrams as well as or instead of written answers.
- Allow time at the end of the examination to check answers carefully and correct basic slips in wording or calculation.

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Grade boundaries

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