Examiners' Report
Principal Examiner Feedback

Summer 2025

Pearson Edexcel International GCSE in Physics (4WPH1) Unit 1P

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Introduction

This was the first examination series for IGCSE Modular Physics. The examination was written to assess 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. There were also marks available in the examination for candidates' demonstrations 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 substitute data into given formulae then rearrange to obtain the correct answer. Successful candidates also showed evidence of undertaking all the required practicals themselves and could produce detailed, coherent methods 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.

Individual questions

Q1 (a)

Most students were able to choose the correct response here (fuse).

Q1 (b)(i)

Most students were able to choose the correct formula from the formula sheet. Some students gave this in symbols which was acceptable provided the correct symbols were used. Others wrote the formula in a rearranged format which was also acceptable. Where mistakes were made it was normally with the students who had chosen one of these options instead of copying carefully from the formula sheet. Unfortunately, if they rearranged the formula, then they often went on to get part (ii) incorrect as well.

Q1 (b)(ii)

Most students were successful here. Those that did not score the full 3 marks had most often written the incorrect unit as in the example below. Common wrong units included V and N. Very few were unsuccessful with the calculation. Of those that were, the most common error was having used an incorrectly rearranged formula in part (i).

(ii) A current of 10.5 A is in the heating element of a kettle.

Calculate the charge that flows through the heating element in a time of 90 s.

Give a unit for your answer.

(3)

$10.5 \times 90 = 945$

charge = 945 unit ohms

Q1 (c)

Some students could explain this clearly to gain 2 marks, however, many students used vague language, for instance just ‘collisions’ or ‘collisions with the walls/wire’ as in the example below. Many cited collisions with other electrons. Those that used the correct language were able to score well. Language relating to energy transfer was also an issue. Reference to ‘heat’ without using the term ‘energy’ was not credited for this mark point.

Electrons in the wire collide with the wire, so somekinetic energy is converted to thermal energy.

Q1 (d)

Most students understood what an earth wire was, although a minority confused it with a fuse. Of those that understood the concept, many scored from mark points 3, 4 and 5. MP2 was rarely awarded. Students attempting to explain this often spoke about a 'charged' kettle, and the need to 'discharge' it. This was not a successful approach. A minority used the word 'shock' for mark point 3 which was not sufficient.

This is an example of a very good answer from a student.

If the live wire touches the metal case, a surge of current passes through the ~~live~~ earth wire to the ground. This is because, the earth wire provides a low resistance path for the current into the ground. A large amount and surge of current also passes through the live wire which has a fuse attached to it causing the fuse to melt and cutting of the current and breaking the circuit. This prevents ~~a person~~ the user from ~~electrock~~ electrocution if they touch the metal case.

This student did not fully understand the concept of the earth wire, as evidenced by the belief that that kettle could become 'neutral' by removing the charge.

- Earth wire is connected to the metal case of the kettle
- if the kettle has an extra ~~chen~~ charge, the earth wire takes the extra charge to ~~ear~~ ~~earth~~ earths core or takes from the core a charge in order the kettle's charge to be neutral

Q2 (a)

Most students were successful here. Solar was a common wrong answer.

Q2 (b)

Most students were successful here although some found it difficult to rearrange the '× 100'. Less successful students rearranged the formula before substituting the values. If the formula was rearranged incorrectly this resulted in no marks being awarded. Students should be encouraged to substitute values into a formula first, then rearrange the values, to avoid this issue as in the example below.

$$38 = \frac{12000}{x} \times 100$$

total energy output = 32 000 MJ

$$0.38 = \frac{12000}{x} = \frac{12000}{0.38} = x$$

Q2 (c)

Many students did not seem to understand the concept of control variables with many listing the independent and dependent variables given in the stem of the question. Answers such as ‘temperature’ or ‘time’ will rarely be awarded for any question as they are so vague.

This student explained which temperature they were referring to which gained credit.

Give two variables the student should control.

(2)

1 material of pipe

2 temperature of cold water in

Whereas this student was too vague to be awarded any credit.

1 volume of pipe.

2 ~~volume of~~ temperature of water bath.

Q3 (a)(i)

Most students chose to answer this mathematically which was a valid approach and scored well as in the example below. A significant number of students did not state that the components were connected in series.

The total Voltage across the circuit is the same.
The Voltage is divided among circuit compenents in series connection, so by subtracting 3.9V from the total voltage(6), the result would be 2.1 V. (6-3.9=2.1V)

Q3 (a)(ii)

Most students used the correct formula, but many were unable to pick the correct voltage from the three options in the question as in the example below.

$$\frac{6.0}{290} = 0.02 \qquad = 1 \times 290$$

current = 0.02 A

Q3 (a)(iii)

The large majority of students realised that this was the same as their answer to (ii). A minority performed a calculation. Students should be encouraged to read the command words and to understand what they mean. The command word here was 'state', and the item was worth only one mark. Q3 (a)(iv)

More students chose the correct voltage here than in part (ii) as in the example below.

$$V = I \times R$$

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

$$R = \frac{3.9}{0.00\cancel{7}}$$

$$R = 557.1$$

resistance = 557 Ω

Q3 (b)(i)

Students found this explanation tricky. Many failed to realise the significance of the voltmeter being around the resistor and not the thermistor. Many had the right idea but wrote about 'resistance' for example without specifying the component that they were referring to. This student has been clear when referring to the different components.

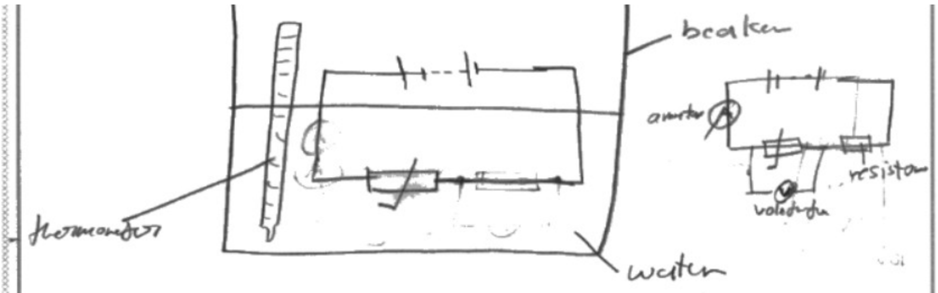
As temperature increases, the resistance of the thermistor decreases, increasing the total current of the circuit, therefore the voltage of the fixed resister increases, because the resistance of the fixed resistor remains constant. $\uparrow V = \uparrow I \times R$

Whereas this student has not gained as much credit as it is not clear which component is being described.

Because as the temperature increased the resistance decreses and due to the formula $V = I \times R$ the voltage should increase because the I won't change

Q3 (b)(ii)

Most students understood what the experiment was about and were able to access the marking points. Some put the 'circuit' in the water which was not credited. Very few mentioned plotting a graph. Marks could be awarded for a clearly drawn diagram such as in the good example below.



- ~~water~~ beakers (water bath) should be stabilised at different temperatures and its measured by thermometer
- current should be measured & it should be constant in all ~~beaker~~ different temperature by ammeter
- voltage ~~[illegible]~~ should be the same at all different temperatures and it is measured by voltmeter

Q4 (a)

Most students gained this mark, with explanations about starting to run early or late, or starting the stopwatch at the wrong time. A significant minority thought that the delay due to the time it would take sound to travel from one to another would be important as in the example below. This was not credited.

Because the shouting from Student A might arrive a bit later due to a long distance the sound needs to travel, so timer starts earlier

Q4 (b)(i)

Most students were able to select the correct formula from the list. Some then missed out ‘g’ or the height of a step in their working. For the students who did not state the formula and started with their substitution this meant they were unable to score. Some students used cm, or tried to convert their mass to g.

This student has substituted correctly and has been able to follow through to a correct answer.

when she runs up the set of steps.

GPE = mgh

67x10x4.56

= 3055.2 J

h= 19x24 = 456cm ÷ 100 (3)

4.56m

Whereas this student incorrectly changed 19cm to m and missed out the factor of 24 from the substitution limiting their success.

gpe = 1.9 x 65 x 10 = 1235 N

Q4 (b)(ii)

This was answered well. A few did not give this to 3 significant figures or omitted one of the data values from the mean calculation.

Q4 (b)(iii)

Most were able to apply this formula to the situation. Some students who had a value that did not round to 3000 in part (i) sensibly decided to use the show that value here, as in the example below. Using the show that value is to be encouraged.

$$\frac{3000}{4.63} = 647.94.$$

(2)

mean power = 648 W

Q4 (c)

This was a high-level question involving evaluation of data from a graph. Students always find questions on AO3 difficult, as they test skills and not knowledge in unfamiliar contexts. Most students simply quoted data from the question without applying it to the question. Very few thought to question the quality of data in terms of the amount of data values and the range, therefore they could not achieve the first few mark points. The student below was more successful than most, noticing that the data points are insufficient and that the range could have been extended.

This conclusion could be incorrect because the power increases between 55 kg and until 69 kg then decreases but in a smaller amount from 69 kg and until 99 kg. The student does not show many masses of people an there are irregular intervals between the measurments and other factors like age and sex may also affect this investigation and the sample size is small and the change between 55 kg and 69 kg is greater than the change between 69 kg and 99 kg. There is no information about heavier or lighter weights.

Q5(a)

Most students recognised that this question was about drag and terminal velocity and many were able to quote the conditions for terminal velocity to occur. The most commonly missed mark was the second mark point due to students just stating that the drag increases without linking it to the velocity of the package.

This is a good example where the student has linked the velocity to the increase in drag and therefore to the onset of terminal velocity.

Before the ~~motion~~ package is dropped it has gravitational potential energy, and as soon as the package is dropped the only force acting on it is weight, therefore resultant force is equal to weight. As the ~~speed~~ velocity of the package increases drag increases until drag and weight are equal meaning the package ~~falls~~ continues falling at a constant speed.

Whereas this student knows the conditions for terminal velocity but has failed to link the velocity and the increasing drag force to explain how this came about.

The package accelerates, until it reaches its ~~the~~ terminal velocity, when the air resistance and weight become equal. then the speed becomes constant

Q5(b)

This was a simple momentum calculation. The large majority of students performed this successfully. Mistakes were occasionally seen and happened mainly when the student did not write out the formula before using it. Below is a good example showing clearly the stages of working. The student has substituted into the formula before rearranging, therefore ensuring that even if the rearrangement had gone wrong, they would have gained the substitution mark.

$$P = mv$$

$$3700 = 58v$$

$$v = \frac{3700}{58}$$

speed = 64 m/s

Q5(c)

Students found this section hard and most failed to link it to momentum. Most were successful in realising that the parachute resulted in a lower speed just prior to landing, and that the time of impact was reduced when using packaging. Students were then rarely able to link this to the decrease in momentum (in the case of the parachute) and the decrease in the rate of change of momentum for the packaging.

This is a good example of a student who realises the question is about momentum and correctly links the changes to force via rate of change of momentum.

student X

Using a parachute would increase air resistance, lowering the terminal velocity. This means that the package will collide with a lower momentum ($p=mv$) so the force will be lower as well ($F=\frac{\Delta p}{\Delta t}$). (force=rate of change of momentum)

student Y

Wrapping the package in padded material will soften the impact. This is because the padding will increase the collision time, and lower the rate of change of momentum. This means that force ($\frac{\Delta p}{\Delta t}$) will be lower.

Whereas this student uses vague language such as 'absorbing the force' which is not creditworthy.

As adding a parachute will increase air resistance, which slows down the speed of the package, so acceleration decrease which reduces the force as $F = ma$, so as acceleration decreases, force decreases.

student Y

Padded material provides more support to the package, so package will be more protected as there is a layer to reduce force acting on the package as the padded material will be able to absorb most of the force, reducing force on package.

Q5(d)

Students always find the concept of Newton's 3rd Law difficult, and this year proved no exception. Most were able to quote the law and therefore gain credit, but few were able to link that to the diagram in any meaningful way. The student below has done well in realising that the forces are on the same object and that this is not the case for the two forces referred to in Newton's 3rd Law.

(3)

This is because both forces are acting on the package whilst in newtons 3rd law two objects must be involved with the same magnitude but opposite in direction

Q6(a)

Most students were successful at this simple substitution. Again, students that wrote the formula down first were more likely to substitute correctly, as with the example below.

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

$= 1.785714286$

$= 1.79 \text{ kg/m}^3$

density = 1.79 kg/m³

Q6(b)

Students were familiar with the concept of pressure reducing as force is applied over a larger area, but many found it difficult to explain this clearly. Frequently students did not have a clear understanding of the difference between force and pressure and so there were often references to pressure spreading over a large area, and to force being reduced. Many also referred simply to 'area' or 'area of the balloon' without making it clear that this was the area where the force was applied.

This is a good example of a student that clearly understands the difference between force and pressure and can use the terms correctly in the explanation.

- pressure = Force / Area
- as the force of pushing the balloon down on the sharp nails is being spread over a larger area
- pressure decreases
- as area is inveresly proportional to pressure, at constant Force.

Whereas this example shows a student who does not clearly state that the relevant area is the area over which the force is applied.

(3)

because using alot of nails increases the area in contact with the ballon which decrease the pressure applied on it because area and pressure are Inversly proportional

Q6(c)(i)

Most students appeared to have experience of this simple practical and therefore were able to describe it well as in the example below.

rub the balloon with a piece of cloth.

Q6(c)(ii)

Most students were able to answer this multiple choice question correctly about the movement of electrons as charge carriers.

Q6(c)(iii)

It was obvious that most students had carried out some of the examples given for this on the mark scheme. Some were not as successful at describing it than others. A common mistake was to state that there was 'attraction' between things instead of focussing on what would be observed.

This is a good example. The student describes the effect on the pieces of paper in terms of what they would see happen.

by placing the balloon closer to the hair hair will move closer to balloon

Whereas this student focuses on the force between the balloon and the paper, 'paper attracts' with no indication of how they know this.

Cut small pieces of papers, then bring the balloon closer the papers, if papers attract this means the balloon is charged.

Q6(d)

Students need to be precise with their language even on these short answers.

For example this studetn gained credit for an inkjet printer.

inkjet printers

Whereas this student did not as all printers do not use electrostatic charge.

~~Printer~~ Printer

Q7

A six mark extended answer is always a challenge. Most students opted to discuss Jacket X (black padded) and then Jacket Y (white thin). This proved to be the most successful approach generally. Better candidates realised that in a cold environment, the energy transfer would be from the students out through the jacket to the environment. They were then able to discuss conduction, convection and radiation in turn using appropriate language for each. Less successful candidates assumed that energy would be transferred in through the jackets to the students. This then confused them and often led to contradictory statements being made in different places within the text. A mixture of language, for example referring to ‘conduction being radiated’ rarely led to successful outcomes.

This is a good example of an answer where the student has worked through the three transfer mechanisms in turn for each jacket, and has used the appropriate vocabulary to describe each situation.

The black Jacket is a good absorber of infra-red radiation and a good emitter. This will make him lose heat by radiation since it's a good emitter too. But the black jacket has air pockets. Air is a poor conductor of heat energy and is an insulator so it keeps the heat energy inside. Since the black jacket is thick, it also slows down conduction and convection because air particles can't heat up to expand and rise to form a convection current due to the thickness of the jacket. The white jacket loses heat energy by conduction and convection since it's thin. The air expands around him and rises forming a convection current. But white is a poor emitter and absorber of infra-red radiation so the white jacket reduces heat loss by radiation by making the infrared rays bounce/reflect back inside.

Whereas this student sticks mainly to the transfer of energy by radiation, with only passing references to conduction and convection.

(6)

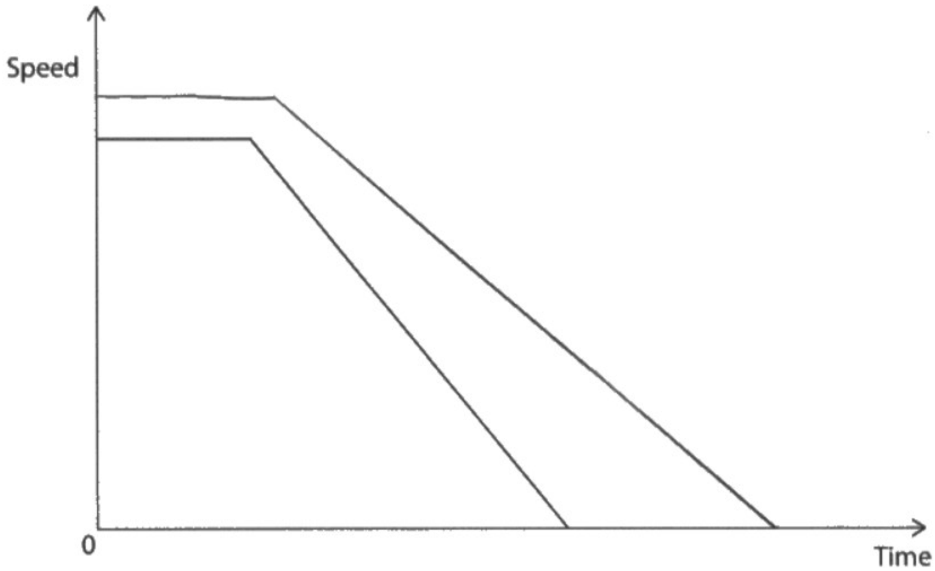
when he wears the black Jacket his body temperature will be lower because black is the best absorber of heat by radiation, convection and conduction and it is also the (conduct) best emitter and the black jacket would emit the students body heat to surroundings by radiation and convection to the air and on white jacket the radiation will be reflected because white color is a good reflector and the students body ~~still~~ temperature temperature will drop less than black jacket because white color is a poor emitter there will be still a loss of heat by convection and radiation but less than black Jacket

Q8(a)

Most students were successful at this multiple-choice question.

Q8(b)(i)

Most students realised that the gradient of the second part of the graph should be shallower. However, many students did not realise that the motion whilst thinking would not be affected by an icy road, and therefore increased the initial speed, or extended the line to show a longer thinking time. This example shows a student making both of these errors.



Q8b(ii)

Successful students were able to manipulate this formula to calculate v. Mostly, those who were successful substituted straight into the formula, simplified by calculating ½ x mass, then rearranged. Some at this point forgot that the result was a value of v^2 and therefore failed to take the square root to get the final answer. A few students omitted the 'square' from v right from the start which limited their progression through the question.

This student chose to rearrange the formula first and then substitute into their rearrangement. On this occasion the student gets full marks but this is a risky strategy as an incorrect rearrangement could cost the student all of the marks.

[4]

$$ke = \frac{1}{2} \times m \times v^2$$

$$\frac{ke}{\frac{1}{2} \times m} = v^2 \qquad \frac{6.3 \times 10^5}{0.5 \times 7.5 \times 10^3} = 168$$

$$168 = v^2$$

$$v = \sqrt{168} = 12.96 \approx 13$$

speed = 13 m/s

This student also rearranged correctly but forgot that their evaluation was for v^2 and therefore did not take the square root of the value to get the final evaluation.

$$v^2 = \frac{ke}{m} \times 2$$

$$= \frac{6.3 \times 10^5}{7.5 \times 10^3} \times 2 = 168 \text{ m/s}$$

speed = 168 m/s

Q8(b)(iii)

Students found this very hard to explain. Most treated 'work done' as an energy store which was not a successful approach.

This student successfully describes the energy transfer that takes place and realises that all of the kinetic energy must be transferred if the truck is to come to rest.

Because the energy is conserved therefur when the truck comes to rest ~~the~~ all the Kinetic energy is transfered to thermal (heat) energy and sound.

Whereas this student treats the work done as if it is an energy store.

kinetic energy is transferred to the work done when the ~~[illegible]~~ brakes are hit.

Q8(b)(iv)

This part of the question required students to use the kinetic energy value from earlier in the question as the work done. The previous part of the question gave a large clue that this was the case but some students failed to realise this and then tried to find the answer by other unsuccessful means.

This example shows very clear working by substituting into the quoted formula first, followed by the rearrangement and the evaluation. This will always be the most successful way of working for these types of questions.

(2)

work done = force × distance moved

6.3×10^5 = force × ~~distance moved~~ 14m

force = $\frac{6.3 \times 10^5}{14}$ = 45000 N

braking force = 45000 N

Q8(c)

Most students were aware that they needed to manipulate the data here. Some just quoted data to show that as speed increased so did stopping distance. This was not creditworthy. Some students interpreted 'directly proportional' as 'linear' and commented on the lack of linear intervals between the stopping distance values when compared with the speed values. Although this did not fully answer the question, they gained credit for this attempt. More successful students calculated ratios although it was clear that not all of these could then interpret their results and come to a valid conclusion.

This example shows a good answer where the student has not only calculated stopping distance/speed for many sets of data but can clearly explain the significance of this and come to a valid conclusion.

~~14 ÷ 10 = 14~~ 14 ÷ 10 = 1.4, 45 ÷ 20 = 2.25, 100 ÷ 30 = 3.333

Stopping distance is not directly proportional to speed

As stopping distance ÷ speed for three different pairs do not give a constant

But vastly different amounts

Whereas this student has a limited understanding of the proof necessary for direct proportionality and instead has shown that the relationship is not linear.

The stopping distance and speed increase proportionally, however while the speed increases by only 5 m/s the distance increases by 13 m difference at first and 35 m difference the greatest, meaning they both increase, but distance increases at a greater rate compared to the change and ~~b~~ increase in the speed. At a speed 10 the distance is 14, while at 30 m/s it is a 100, showing that speed affects stopping distance and both increase.

(Total for Question 8 = 15 marks)

Paper Summary

Based on their performance on this paper, candidates should:

- Take note of the command work for each question to make sure that answers fully encompass the necessary Physics.
- Ensure that for each specification point the appropriate language is learnt to ensure explanations are clear and relevant.
- Show clear working for calculations including substitution, rearrangement and evaluation of an answer.
- Understand the advantage, particularly in descriptions of experimental methods, of drawing clear diagrams as part of their answer.
- Take note of how many marks the question is worth and use this as a guide as to how detailed and extensive an answer may need to be.

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