Pearson Edexcel

Examiners' Report
Principal Examiner Feedback

Summer 2025

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

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Introduction

This was the first examination 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)

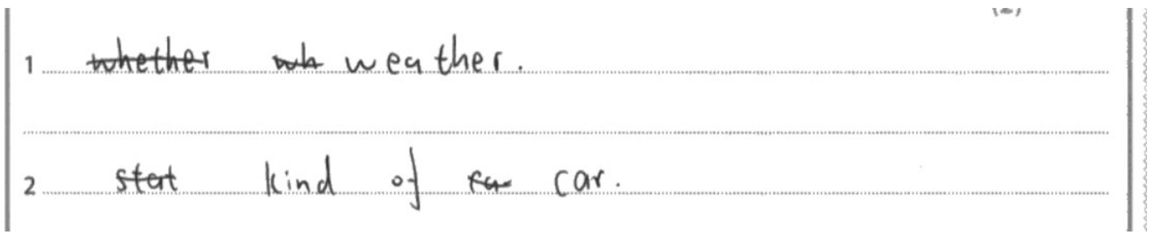
Most students were successful in this question. Those who were not tended to have combined the correct numbers by adding them, failing to note that they were in opposite directions.

Q1 (b)(i)

Most students were successful in this question. Those who were not tended to have combined the correct numbers by dividing them or subtracting them.

Q1 (b)(ii)

Most students were able to access this question. More successful students gave some detail which enabled them to hit mark points. Students who gave vague answers like the ones below, were less successful.


1 ~~whether~~ weather.

2 ~~stat~~ kind of car.

Q2 (a)

The students were not told, for this objective question, how many correct answers there were. It was encouraging to see that most students took the mark for the question (3) as their guide. Bulb and ammeter were common answers, but conversely so were voltmeter and variable resistor.

Q2 (b)(i)

Most students were successful on this question, although there was a wide variety of incorrect answers. A few chose a thermometer, having realised that the graph involved temperature, and the term 'thermomistor' was reasonably popular.

Q2 (b)(ii)

Most were able to read the graph scale correctly.

Q2 (b)(iii)

Most students correctly calculated the current. Students who substituted into the given formula guaranteed themselves a mark, whereas those that rearranged first, risked doing this incorrectly and limiting the marks they could then achieve.

This student substituted first, then rearranged to get a correct answer.

voltage = current × resistance

9 V ~~9v~~ = current × 80 Ω (3)

current = 0.1125 A

current = 0.1125 A

This student substituted as a rearrangement, getting it incorrect and consequently scoring no marks.

(3)

80 ÷ 9.0 = 8.88

current = 8.88 A

Q2 (b)(iv)

Successful candidates for this question realised that adding another component, and changing the temperature, would both affect the circuit resistance. Not all students however, could express their ideas clearly. ‘The resistance’ for example, could refer to a component or the circuit, and therefore was not clear enough to gain many marks.

This student refers to ‘the resistance of the circuit’ and ‘the resistance of the components’ making it clear what is happening and gaining credit.

The resistance of the circuit increases. Firstly, when adding the second component X in series with the other components, the resistance ~~its~~ of the circuit equals the sum of the resistance of these component. ~~Therefore~~ Also the temperature of these components are ~~resistance~~ both reduced to 26°C. according to the graph, as resistance ~~in~~ decreases when temperature increases, both the resistance in components are increased to 160 Ω, so the new resistance in circuit is 320 Ω, and it's bigger than the origin of 80 Ω.

This student starts well but fails to mention that the graph shows the resistance for component X and therefore the second part of the answer does not gain credit.

(4)

The resistance of the circuit is increased. As seen from the graph, lower the temperature higher the ressitance

Q3 (a)

Many students found this a difficult concept. When explaining a concept such as this, using a rule hanging from springs is very useful as the length of the springs give students a visual picture of the size of the forces involved.

Q3 (b)

Most students understood that the forces must be in equilibrium and that the two upward forces must equal 7.2 N. They were also able to show this clearly as the example below shows.

$7.2 - 4.7 = 2.5$

The upward force at position 2 is 2.5

force = 2.5 N

Q3 (c)(i)

Most students were able to place a vertically downwards arrow approximately at the centre of the rule. Some did not have the arrow starting on the rule. This was not necessary for the mark to be awarded but is good practice.

Q3 (c)(ii)

Most were able to gain full credit here as in the example below.

(3)

$120 \times 10^{-3} \times 10 = 1.2N$

weight = 1.2 N

Whereas this student made the most common error of failing to convert g to kg.

Weight = 120 × 10

weight = 1200 N

(Total for Question 3 = 7 marks)

Q4 (a)(i)

This formula was to be found on the formula sheet and therefore made this mark accessible to nearly all.

Q4 (a)(ii)

Most were able to substitute and rearrange this correctly. Again, substituting first ensured that at least one mark would be gained. On this occasion, a significant number of students were unable to rearrange the formula correctly. Another benefit to substituting into the original formula is the ability to simplify it before rearranging. Those who calculated 55x10 to get 4750 = 550 x h, were more successful at then rearranging this, than those, like the student below, who rearranged before simplifying the calculation.

(3)

$4750 = 55 \times 10 \times h$

$h = \frac{4750}{55 \times 10} = 8.63$

vertical height = 8.63 m

Q4 (a)(iii)

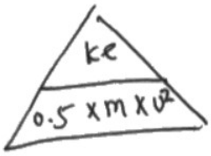
Most understood the command word 'state', but some students tried to carry out a calculation. One line, one mark and the command word 'state' gave big clues here about what was required.

Q4 (a)(iv)

Lots of students selected the correct formula and then substituted and rearranged correctly. The most common error was forgetting to take the square root. Those who kept the 'v^2=' as in the example below, were more successful in remembering to square root and therefore gain the final mark.

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

$v^2 = \frac{ke}{\frac{1}{2} \times m} \longrightarrow \frac{4750}{55 \times 0.5} = 172.72$ (3)



$ke = 4700$

$m = 55$

$v^2 =$

$v2 = 172.72$

$v = \sqrt{172.72} = 13.1422\,9812$

speed = 13.14 m/s

Q4 (b)

Most students gave a general description of how the bag may fall down the tube using vague language such as 'hitting the sides'. Those who realised that the question concerned energy transfer did better, although some referred to just 'losing energy' or 'releasing heat' This student used must better language and this was therefore a good answer.

The speed will be less because the kinetic energy of the bag will be less. Not all of the GPE energy will have transferred to the KE energy store. Some of the energy ~~must~~ is transferred mechanically to the thermal energy store of the surroundings because work is done against the friction of the sides of the tube to overcome the frictional force.

Whereas this student focused on air resistance instead of friction, limiting the marks available.

Because there's air resistance force existing during the falling process, a part of gravitational potential energy is being used to against the air resistance force. Therefore, the energy transferred into kinetic energy ~~is~~ ~~decreased~~ decreases, leading to a smaller speed of the bag as ~~it~~ the mass of the bag remains constant.

Q5 (a)(i)

Students found it challenging to understand this practical. Those who were not sure what was happening, tended to just state pieces of the practical equipment from the stem of the question. Students should be encouraged to use words that are not in the stem for questions such as this, as it rarely leads to creditworthy answers.

Those who scored well such as the student below, were clear in their language.

(i) Give three control variables in the student's investigation.

(3)

1 thickness of metal ~~bar~~ bar ~~temperature of water~~

2 length of metal bars.

3 length of metal bar submerged in water

Whereas this student did not understand the experiment and therefore repeated words mainly from the stem.

(3)

1 The hot water

2 The temperature -sensitive ~~stk~~ Strips

3 ~~The hot~~ ~~hotte~~ water The hot water's temperature

Q5 (a)(ii)

Many students had not understood the nature of the practical apparatus used and described a practical using each bar separately. This did not prohibit any marks but made it harder to achieve some as extra detail was needed. Most students failed to understand the significance of the temperature sensitive strip and the fact that the colour would change gradually up the length of the strip. There was some confusion over the language with some referring to the heat apparatus as the 'clamp stand' and dipping this into the beaker of water.

This student clearly understood the task and was able to describe the method using correct terminology.

~~ensure~~

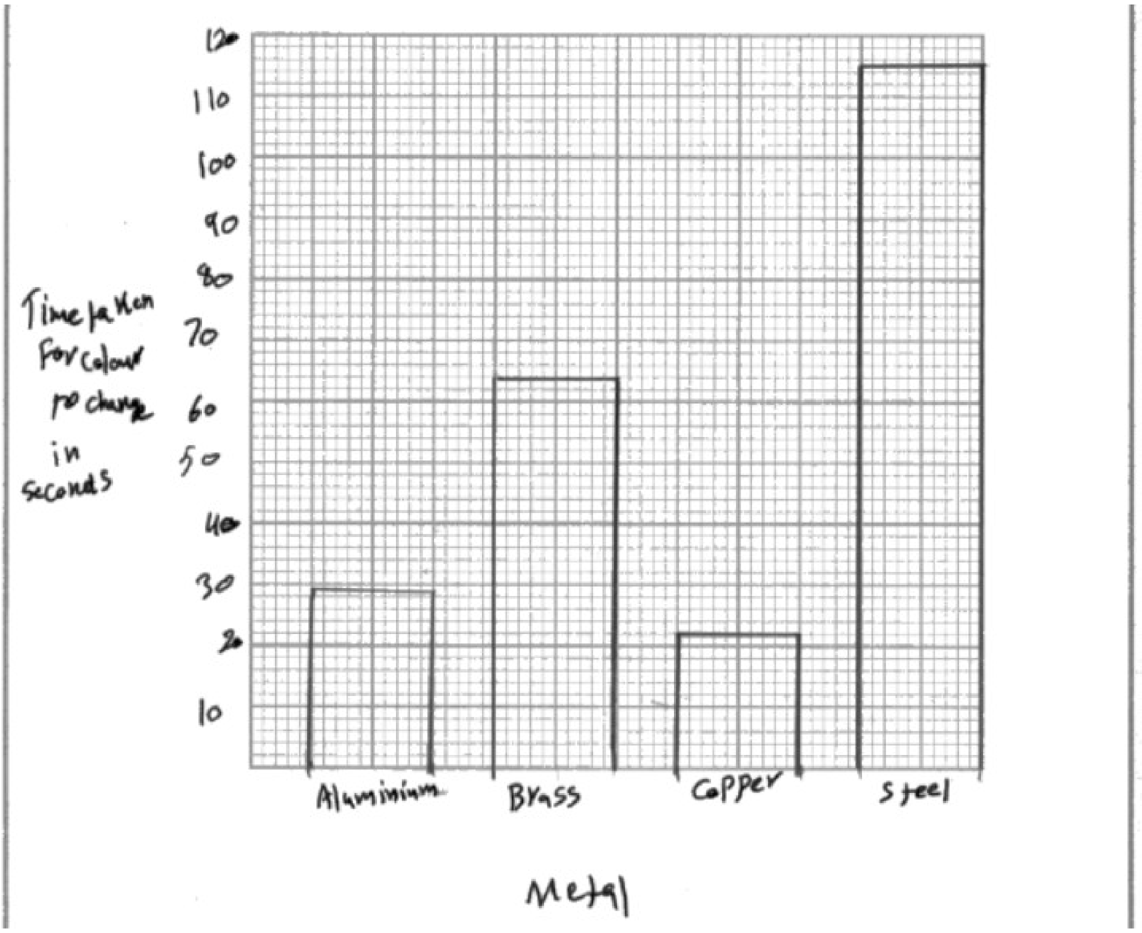
Ensure length and position of temperature sensitive strips are the same for each metal bar. Place hot water in beaker.
Use clamp stand and clamp to ~~hold~~ hold and lower metal bars into the ~~water~~ hot water in the beaker.
Immediately start the stopwatch.
Observe and record time taken for each temperature sensitive strip on each metal bar ~~to change colour at the top.~~ to have colour change at the top.
Repeat the experiment and obtain a mean result for each metal.
~~Compare and~~
If time taken for top of strip to change colour is small, metal is more effective at ~~transfering~~ transferring energy by conduction.

Whereas this student started well but didn't understand the significance of the temperature sensitive strip.

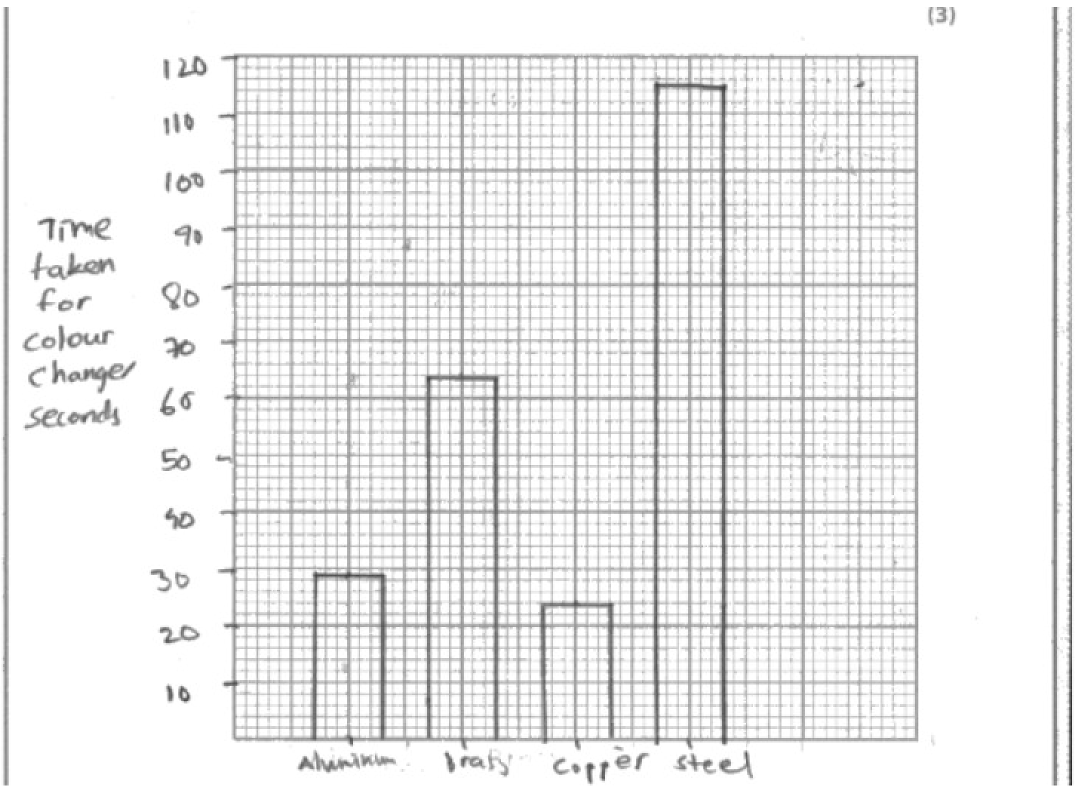
The student can take pour hot water into a beaker and ~~clamp~~ clamp two metal materials together and place the end of ~~th~~ one of the material in the hot water. Once the student does that they can then start the stopwatch & measure the time it takes for the second metal material to get hot.

Q5 (b)(i)

Most students successfully drew the graph. Common errors were forgetting 'seconds' on the time axis and forgetting the other axis label of 'metal'. Some students misread their scale and mis plotting one of the bars. Copper was commonly mis plotted. Students who chose awkward scales were credited if it produced plots over 50% of the grid, but these students often lost the plotting mark as the challenge of reading an awkward scale is so much higher. This student labelled their axes correctly, and was able to plot all the bars correctly on their sensible scale.



Whereas this student forgot the x axis label and despite their sensible scale mis plotted the copper bar.



Q5 (b)(ii)

Most students were successful on this questions, although some did not use evidence from the graph and instead wasted time explaining the mechanism of conduction, and some stated copper without giving a reason. Students should be taught to understand the expectations for different command words.

This student answered well including an explanation.

(2)

Copper is the most affective at transferring energy, since it takes the least amount of time to change colour.

Whereas this student, after correctly stating copper, simply repeated the stem of the question. This will not gain further credit.

(2)

~~Steel~~ copper is most effective at transfering energy by conduction

Q6 (a)(i)

Nearly all students were able to find the relevant formula from the sheet and write it down. A few students tried, unnecessarily, to write it in a rearranged format and did this incorrectly. These students often went on to be unsuccessful in the subsequent calculation as well.

Q6 (a)(ii)

Most students successfully calculated the momentum although a significant percentage of them did not gain the unit mark, with a variety of other units shown.

$p = mv$

$= 9\times10^4 kg \times 0.72 m/s$

$= 64800$ kg·m/s

momentum = 64800

unit = J

Q6 (a)(iii)

Most students were able to apply the conservation of momentum to this situation; however, many did not think to add the mass of the engine to the mass of the carriages and therefore did not gain full credit.

This student carried out the calculation perfectly.

(3)

$(m_1+m_2)v' = m_1 v$

$v' = \dfrac{9\times10^4 kg \times 0.72 \text{ m/s}}{6\times10^4 kg + 9\times10^4 kg}$

$= 0.432$ m/s

velocity = 0.432 . m/s

Whereas this student used just the mass fo the carriages for the momentum after the collision.

$$m_1 v_1 = m_2 v_2$$

$$64800 = 6.0 \times 10^4 \times v_2.$$

$$v_2 = 1.08 \text{ m/s}$$

velocity = 1.08. m/s

Q6 (b)

Most students realised that that ‘comfort’ was affected by the force of the collision and linked this to the time of impact increasing. Some linked these without mentioning the rate of change of momentum. Weaker students used vague language like ‘absorbing force’ and ‘absorbing impact’ which did not gain credit.

This student linked time, momentum and force well using clear language.

The spring compresses, increasing the time ~~taken~~ of collision, decreasing the rate of change of momentum, hence, decreasing the force which is felt by passengers.

Whereas this student did not think to link the time increase to the force decrease using rate of change of momentum.

As the springs increase the time taken during the collision This decreases the force of the collision as an increase in time decreases the force of the collision, therefore making the collision more comfortable, as time taken is inversly proportional to the force of the collision.

Q7 (a)(i)

Most students realised that the ball was accelerating, but not all realised or were able to explain that this was constant. There were many students who contradicted themselves by mentioning acceleration but then explaining it as constant velocity.

This student has explained clearly without contradiction.

The ball falls at an increasing velocity and constant acceleration.

Q7 (a)(ii)

Not many students linked the distance travelled with the area under the graph line. Most chose to use distance = speed x time, without realising that the velocity changed throughout the relevant time.

This student answered well. It is useful to state that the area represents the distance as this is often worth a mark in itself.

the height of the ball = the area of v-t graph

$= 5 \, m/s \times 0.5 \, s \times \frac{1}{2}$

$= 1.25 \, m$

height = 1.25 m

This was the most common response seen, using an invalid formula for this situation.

(3)

speed = $\frac{\text{distance}}{\text{time}}$

distance = speed x time

distance = 5.0 x 0.5

= 2.5 m

height = 2.5 m

Q7 (b)

This question was extremely challenging for students and only higher level students were able to access most of the mark points. The unfamiliar context of something entering water at speed confused most students with many answering in terms of the ball speeding up to terminal velocity. This approach did allow for some marks to be credited. Many students were unsure what to call the resistive force here. It was apparent that students were used to using the term air resistance for this type of question and were unable to make the jump to water resistance. Those students who called the force 'drag' were more successful. Some students did not realise that the question was about terminal velocity and described energy changes or the increase of pressure with depth. These were not creditworthy responses.

This student realised that the drag force was greater than the weight (the least awarded mark) and explained the motion as it fell clearly.

> Initially when the ball hits the water, drag is increased drastically because water is more dense than air and the speed of the ball is high. This means the ball decelerates because the resultant force is upward (drag force is greater than weight). ~~As a result, the ball decreases speed~~ It is a decreasing curve As a result, the ~~velo~~ speed of the ball decreases, due to drag. This reduction in speed results in drag also decreasing (resultant force dereasing). At around 1.5 s, terminal velocity is reached, the forces are balanced, leading to the line being straight. Resultant forces ~~are~~ is zero.

Whereas this student understood that this question was about terminal velocity but simply described the motion that it normally attributed to terminal velocity but without applying it properly to this context. Learning mark schemes can only get a student so far. To reach higher level marks students need to be able to relate the knowledge they know to the context of the question.

> When the ball enters the water, the main force is it's weight with a small ~~air~~ water resistance. This has an unbalanced force downwards. After some time, water resistance gradually increasing until it equals the weight. Once equaled, the net force is 0, so no acceleration, so a constant velocity.

Q7 (c)

Most students successfully calculated the answer, as did the student below.

Give your answer to two significant figures.

(3)

1000 x10 x2.85 = 28500

= 28.5 KPa

= 29 KPa

= 29000 Pa

pressure difference = 29000 Pa

Whereas many did not attempt to round to 2 significant figures.

P = ρgh

P = 1000x10x2.85

= 28500

pressure difference = 28500 Pa

Q8 (a)

Most students were able to name a thermometer correctly.

Q8 (b)

Few students stated ‘electrically’ for the energy transfer. Many used vague language such as electricity and electric.

Q8 (c)

Most students used the E=VIt method, although a few tried to use a different method involving using the specific heat capacity of a known substance. This could be successful, but most students did not state clearly that they would use a substance that they knew the specific heat capacity of.

This student was successful using the first method.

devices: ammeter, voltmeter, stopclock.

all ammeter into the ~~ct~~ circuit and is in series with power suppy. voltmeter is ~~powell~~ parallel to the power supply, use stopclock to determine the time that the power supply is power on. And the energy is equal to IxVxt.

Whereas this student did not list all the apparatus needed to measure the different quantities.

Measure the change of temperature of the solid metal block. Then use the ~~stopclast~~ stopclock to measure the time taken. Use the equation : energy transferred = current x voltage x time to find the energy transferred.

Q8 (d)

Most students opted to add insulation around their metal block, but few explained the reasoning for this by mentioning conduction or convection.

This student explained their choice clearly.

(2)

Place a lid on top to prevent heat loss by radiation OR wrap metal block in Insulation / in plastic because insulators prevent heat loss by conduction hence more accurate heat value achieved

Whereas this student has the right idea but failed to explain it clearly.

(2)

Cover it around with polystyreen which will reduce thermal energy to surroundings.

Q8 (e)

Most students used the correct formula here and got the correct answer. Common errors involved omitting the conversion of kJ and rearranging the formula incorrectly. Students should be encouraged to substitute directly into the formula as given on the formula sheet to ensure that at least one mark can be credited, even if it then followed by an incorrect rearrangement.

This student converted and rearranged correctly, getting the correct answer.

$$16\,kJ \xrightarrow{\times 1000} 16000\,J$$

$$16000 = C \times 54 \times 0.70$$

$$\frac{16000}{54 \times 0.7} = C \Rightarrow 423.28 = C$$

specific heat capacity = 423.3 J/kg °C

Whereas this student did not convert from kJ. This student rearranged the formula before substituting values. On this occasion the rearrangement was correct, so credit could be given.

$$C = \frac{\Delta Q}{m \times \Delta t}$$

$$= \frac{16}{0.7 \times 54} \approx 0.4233$$

specific heat capacity = 0.4233 J/kg °C

Q8 (f)

Many students found it hard to explain clearly what was happening here. Some mixed up temperature and heat which led to a lot of confusion. A great many discussed the temperature of the metals but not the change in temperature. The choice of metal B as the answer was a mark dependent on the first mark point being awarded. A significant number of students correctly compared the temperature change, but were unable to correctly link this to the specific heat capacity, giving an answer of B.

This student gave a clear correct answer.

(3)

Metal B. because at a ~~consta~~ same time, which means that there is a same amount of energy tranferred by circuie to the block, the temperature of metal A is bigger than that of metal B. So the difference of the temperature of metal A is bigger than metal B. besides. A and B have same mass. According to $C=\frac{Q}{m\Delta t}$. Q and m is ~~th~~ same, metal A has a bigger Δt. so metal B has a bigger c.

Whereas this answer refers only to temperature.

Metal A because it's temp. is more at the end

Q9 (a)(i)

Most students were able to access this question. Some referred only to heater 1 or heater 2 in their answer and therefore were not successful. Some also used the work 'break' which was in the stem of the question. Credit is rarely given for using phrases from the stem.

This student stated clearly what would happen.

Circuit wont work since current wont flow

Whereas this student has only mentioned heater 1 and therefore cannot be credited.

Power will not Reach heater 1 So it will stop working

Q9 (a)(ii)

Students found this concept confusing. The mention of the wire having low resistance made some students concentrate entirely on the resistance of the heaters which did not earn them any credit. Many realised that the current would be shared between heater 1 and the wire but did not go further and realise that the wire would take most of the current due to its low resistance. The majority of students thought that heater 2 would be unaffected by this change.

This student understood the result of the addition of the wire and was able to express it clearly.

Heater 1 is in a short circuit because the wire has a low resistance. So heater 1 can not work.
Heater 2 will work in a greater power, because the current is bigger.

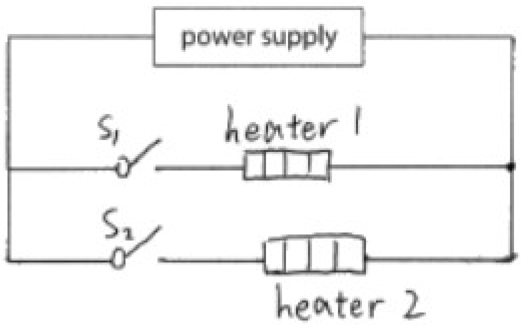
Whereas this student did not realise that heater 1 would hardly get any current and, like many others, did not think heater 2 would change.

(3)
When the ~~parallet~~ parallel circuit is connected the current flowing from the power supply will split at the junctions. This causes the current flowing through heater 1 to decrease; However, the current flowing through heater 2 will stay the same because the current comes back at the second junction. This causes the heating effect of heater 1 to be less ~~effecting~~ than heater 2 because of the decrease in current flowing through heater 1.

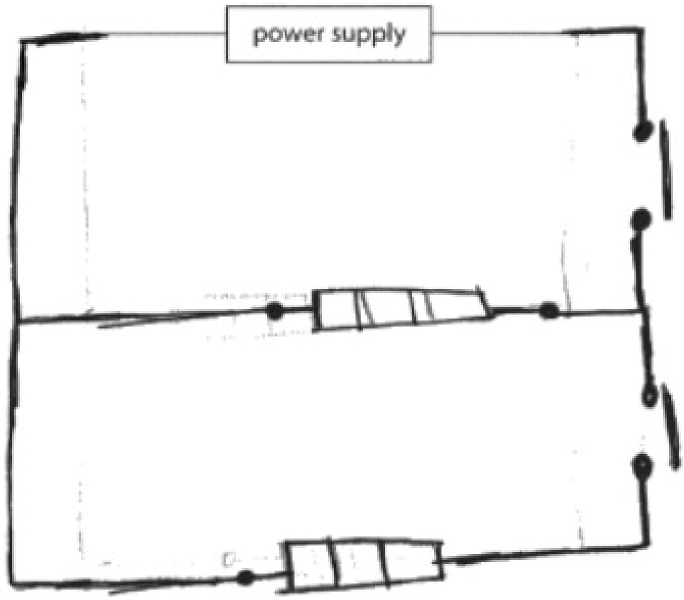
Q9 (b)

Many were able to draw a circuit that fulfilled the criteria described in the question. Many others however, were distracted by the wire in the previous part of the question and simply drew the series circuit that they had already been given with the addition of a wire with a switch around each heater. This would not work.

This student drew the correct circuit clearly using the correct switch symbol.



Whereas this student picked a parallel circuit which was correct but failed to put their switches in the correct places. This symbol is not standard for this specification but is a recognised symbol and if the switches had been correctly placed, credit would have been given.



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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