Qualification Accredited

Oxford Cambridge and RSA

GCSE (9-1)

Examiners' report

TWENTY FIRST CENTURY SCIENCE PHYSICS B

J259
For first teaching in 2016

J259/02 Summer 2018 series

Version 1

Contents

Introduction

Our examiners' reports are produced to offer constructive feedback on candidates' performance in the examinations. They provide useful guidance for future candidates. The reports will include a general commentary on candidates' performance, identify technical aspects examined in the questions and highlight good performance and where performance could be improved. The reports will also explain aspects which caused difficulty and why the difficulties arose, whether through a lack of knowledge, poor examination technique, or any other identifiable and explainable reason.

Where overall performance on a question/question part was considered good, with no particular areas to highlight, these questions have not been included in the report. A full copy of the question paper can be downloaded from OCR.

Paper J259/02 series overview

J259/02 is the foundation tier of one of the two examination components for the GCSE (9-1) Physics B specification (21st Century Science.) Candidates will have already sat the examination for the Breadth in Physics component and this is the examination for the Depth in Physics component. The last two questions, questions 8 and 9, are also on the higher tier and are marked with the same mark scheme as the higher tier. These are the most challenging questions on this paper.

This component accesses content from across the whole specification. It allows candidates to demonstrate their depth of understanding of specific aspects of the content. To do well on this component, candidates need to be able to apply their knowledge and understanding to new contexts and to be able to analyse the information and ideas presented by the questions. In calculations they should write down the equation they are going to use and show their working

Candidate performance overview

Candidates who did well on this paper generally did the following:

- Used the information given in the question and their own knowledge in their answers.
- Could do required calculations and showed their method clearly.
- Were able to apply their knowledge and understanding to new situations.
- Attempted all the questions.

Candidates who did less well generally did the following:

- Did not show the steps in their calculations.
- Remembered equations incorrectly.
- Gave no response to a number of questions.
- Did not understand some of the unfamiliar situations and either did not have the knowledge or could not apply it.

Candidates had the skills to do well on most parts of questions 2, 4 and 6. They could answer the multiple choice questions and do simple calculations, especially where the equation was given.

Candidates generally attempted the last question, so appeared to have enough time to answer all the questions that they could do.

They did less well on question 3 and on questions 8 and 9. They did not have the knowledge or reasoning skills to understand some parts and were unable to write the explanations required. In calculations candidates sometimes remembered the equation incorrectly. Other candidates did not write down the equation. The mark will be credited if they substitute the numbers correctly, but, in some cases, candidates lost both equation and substitution mark, as they substituted incorrectly.

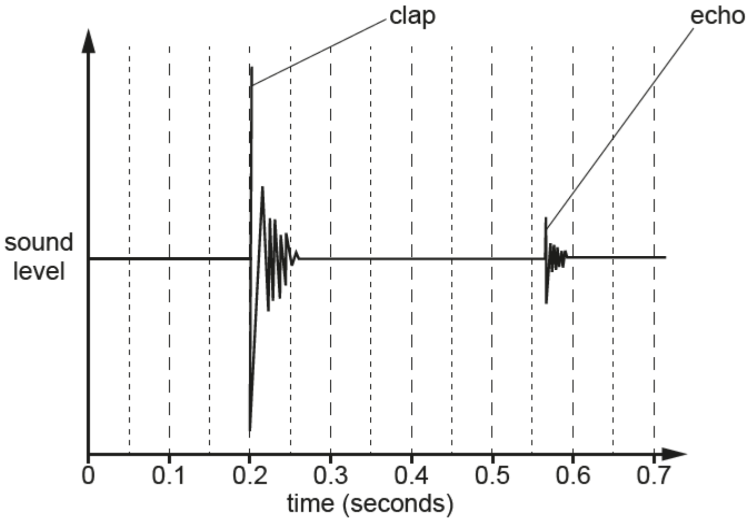
Question 1(a)

1 Over 300 years ago, Isaac Newton measured the speed of sound in air in a long outdoor corridor.

Eve and Ali repeated this experiment by measuring the time between a clap and its echo.

(a) Eve clapped her hands, and Ali timed with a tablet computer.

The computer recorded the sound of the clap and its echo and produced the graph below.



(i) What time was the sound of the **clap** recorded?

Time = ... seconds **[1]**

Question 1(a)(ii)

(ii) What time was the sound of the **echo** recorded?

Time = ... seconds **[1]**

Question 1(a)(iii)

(iii) Calculate the time of travel for the sound wave to go from Eve to the wall and to return to the computer.

Time of travel = ... seconds **[1]**

Most candidates where able to answer part (i) but some of the lower ability candidates were outside the range for part (ii). Part (iii) proved more challenging for some lower ability candidates.

Question 1(b)

(b) The distance from Eve to the reflecting wall is 64 m.

Explain how you can use the distance, together with a time from part **(a)**, to calculate the speed of sound.
You do not have to include the calculation.

....

....

....

.... **[2]**

Many candidates correctly gave the equation speed = distance ÷ time. Some lower ability candidates thought it was distance × time, and a few thought that they were being asked to describe an experiment. Hardly any candidates said that the distance was twice the distance from Eve to the wall.

Question 1(c)

(c) Isaac Newton's value for the speed of sound was less accurate than the one given by this method.

Suggest and explain why Newton could not get an accurate answer.

....

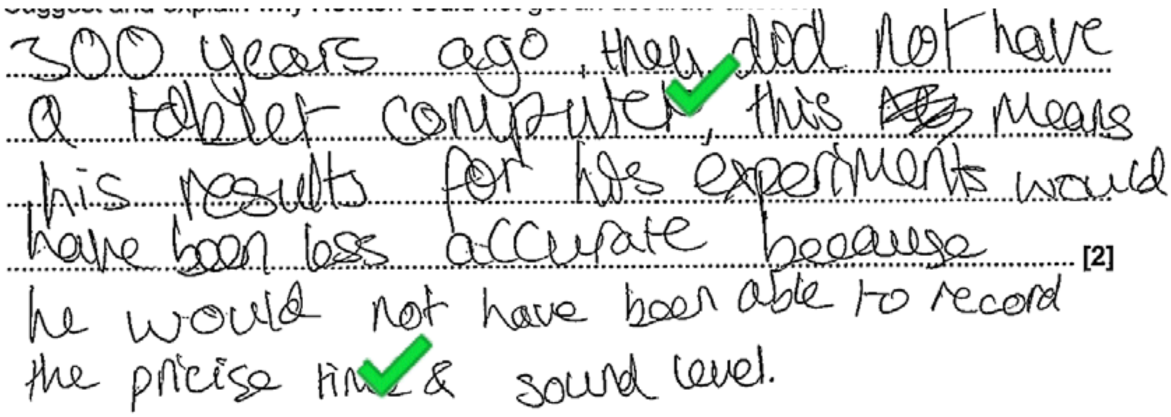
....

....

.... **[2]**

Most candidates realised that Newton would not have had a computer, but very few said that this would make his value of time inaccurate. Most repeated that not using a computer would make his value for the speed inaccurate. Some lower ability candidates thought he might have had difficulty doing the calculation 'in his head' or 'without a calculator' or that he might have 'timesed (sic) instead of divided'. Exemplar 1 shows one of the few responses that scored both marks.

Exemplar 1


300 years ago, they did not have a tablet computer, this means his results for his experiments would have been less accurate because [2]
he would not have been able to record the precise time & sound level.

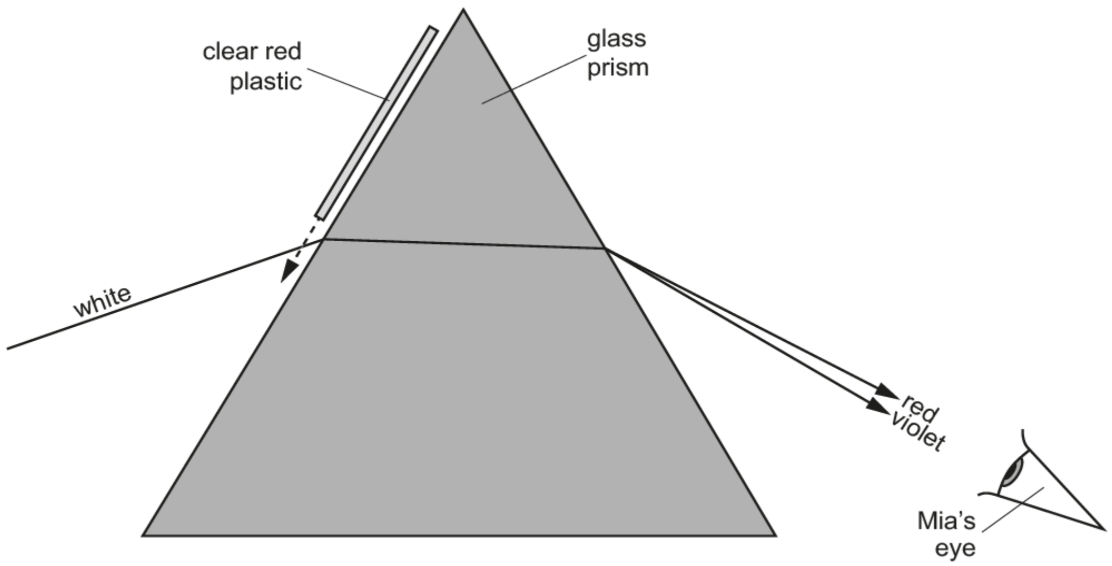
Question 2

2 This question is about light moving from one medium to another.

Mia uses a ray-box to send a ray of white light into a triangular glass prism. She sees a spectrum of colours coming out.

She slides a sheet of clear red plastic into the path of the light as shown in the diagram.

When the red plastic is in place, she sees that most of the colours in the spectrum have vanished.



(a) Complete the following sentences using the words below.

absorption **frequency** **reflection** **refraction** **speed** **transmission**

When light goes from air into glass, it changes direction.

This change of direction is called ....

This happens because the light changes its .... when it enters the glass.

The red plastic removes all colours except red. This is called ....

[3]

The majority of candidates were credited with at least two of the three marks.

Question 2(b)(ii)

(ii) Explain how the ripple tank diagram helps to explain the behaviour of light shown in part **(a)**.

....

....

....

....

.... **[2]**

Candidates found it difficult to explain how the ripple tank observation linked to the prism observation. , It was important to for candidates to make this link as the mark scheme gave credit for describing the linked observations. In Exemplar 2 (below) the candidate has made the link, but has only referred to the change of direction.

Exemplar 2

Because when their is the cross between deep and shallow water, the direction bends and alters direction and that correlates massively to the idea of looking at light through a glass prism, it alters and changes direction. **[2]**

Turn over

OCR support Topic Exploration Pack

What happens when light and sound meet different materials?

http://www.ocr.org.uk/Images/298838-what-happens-when-light-and-sound-meet-different-materials-topic-exploration-pack.doc

Question 3(a)

3 The generator in a power station is connected to the National Grid through a transformer.

Near a town, other transformers are used to transfer power into homes.

Fig. 3.1 is a simplified diagram showing just one transformer near the homes.

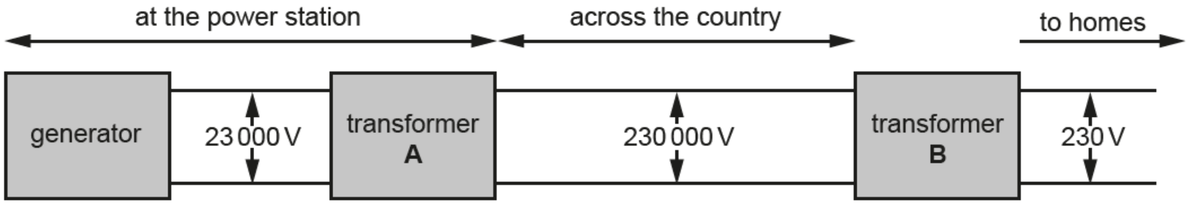


Fig. 3.1

(a) The generator produces an alternating voltage, not a direct voltage.

Explain the difference between these two types of voltage.

....

....

....

.... **[2]**

Many candidates, including higher ability candidates did not know that alternating voltage changes direction and direct voltage does not. Many guessed that direct voltage went straight to homes while alternating voltage was distributed to many homes or went through transformers. In addition, a few candidates referred to the voltage changing without referring to the changing direction.

Question 3(b)(i)

(b) (i) Using **Table 3.1** calculate the output current for transformer **B**.

Use the equation:
Input potential difference × Input current = Output potential difference × Output current

Transformer **A** has already been completed.

Transformer	Input potential difference (V)	Input current (A)	Output potential difference (V)	Output current (A)
A	23 000	3000	230 000	300
B	230 000	300	230	

Table 3.1

[3]

Most high ability candidates were able to calculate the output current as were some lower ability candidates. A few wrote 69 000 000, but made no further progress. A fifth of candidates did not attempt the question and there were many table entries with no calculations shown. Over 95% of the candidates were credited with either 0 or 3 marks.

Question 3(b)(ii)

(ii) Use the input data for transformer **A** to show that the output power of the generator is more than 60 megawatts (MW).

1 MW = 1 000 000 W

Output power = ... MW **[3]**

Many got an answer of 69 MW but some had used the output data for the transformer, instead of the input data.

Question 3(b)(iii)

(iii) A typical home needs a power of 10 kilowatts (kW).

1 kW = 1000 W.

Calculate the number of homes that this power station could supply.
Use your answer to **(b)(ii)**.

Number of homes = ... **[2]**

Many candidates did not apply the conversion factor correctly and stated that the power station could supply 69 000 homes. They possibly confused 10 kW with 1 kW = 1000 W and divided by 1000 instead of 10 000.

Question 3(c)

(c) All power stations use step-up transformers like transformer **A** between the generator and the National Grid power cables.

Explain how using 230 000 V instead of 23 000 V for the cables across the country makes energy transfer more efficient.

....

....

....

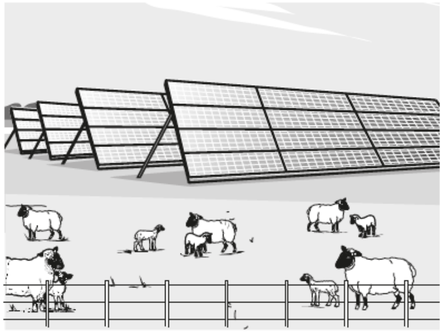
.... **[2]**

Almost 70% of candidates could not answer this question. A few referred to lower voltage being safer, many said more energy would be transferred or that it would be transferred faster. Many candidates merely rephrased the stem of the question and stated that it would be more efficient.

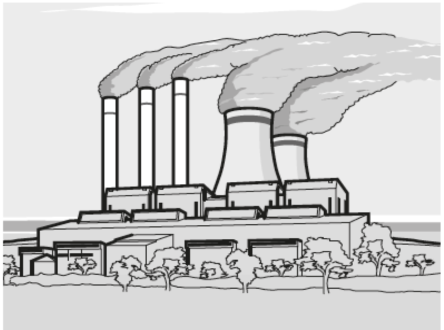
AfL Circling the command words and underlining the important parts of the stem of the question can help candidates to focus their answer. The marks available and the number of answer lines should guide the candidate on the number of points to be made and the depth of explanation required.

Question 4

4 Solar farms are large power stations made up from many photovoltaic (PV) panels. Even though they are now very common, most of Britain's electricity is generated by burning gas.



A solar farm



A gas-burning power station

(a) Here are some data about these two types of power station.

Type of power station	Solar farm	Gas-burning
Power output (MW)	35	1400

(i) Calculate the number of solar farms that would be needed to give the output power of this gas-burning power station.

Number of solar farms = ... **[2]**

This question was notable for being straightforward for all but the lowest ability candidates.

Question 4(a)(ii)

(ii) In the table, the 35 MW power of the solar farm is the **maximum** power it can produce.

Give **two** reasons why the output power is often less than 35 MW.

1 ....

....

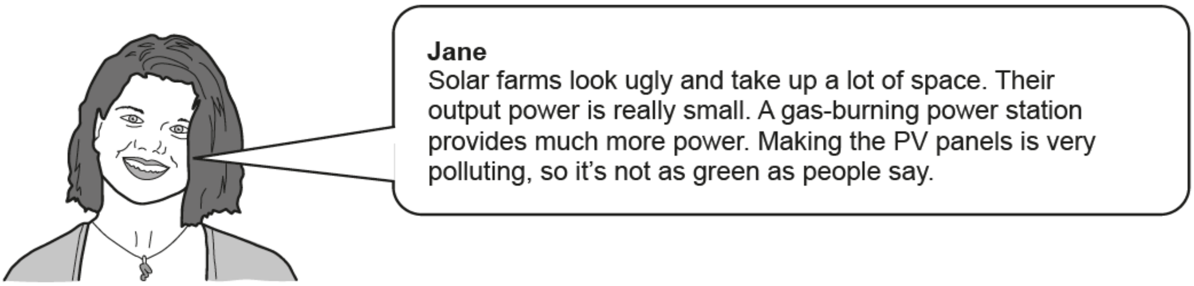
2 ....

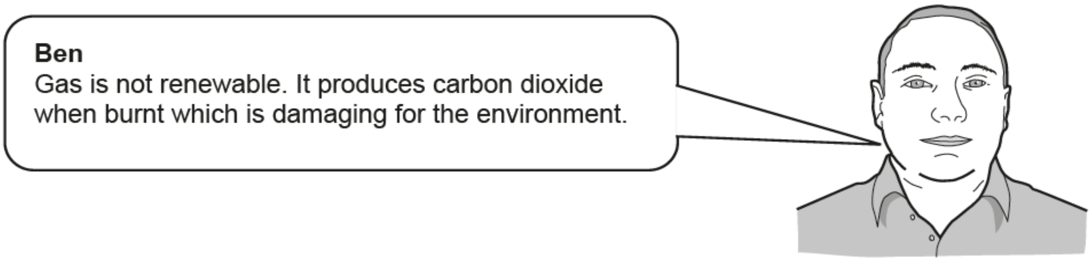
.... **[2]**

Candidates' answers to this question were very good and showed a well-founded understanding of solar panels and how they should be sited for best effect. A minority of candidates overthought the question, missed the obvious answers, and struggled to find more technical reasons.

Question 4(b)*

(b)* Jane and Ben have different views about these power stations.





Describe the **advantages** and **disadvantages** of both power stations using Jane and Ben's views.

.... **[6]**

Candidates were well prepared for this type of Level of Response (LoR) question. They had clearly spent time learning how to answer them and these efforts paid off. Many candidates wrote excellent well-balanced responses considering advantages and disadvantages of gas-fired power stations and solar farms. Lower ability candidates generally considered several of the factors in their answers. Most candidates made good use of the information they were given.

Exemplar 3

L3

Describe the **advantages** and **disadvantages** of both power stations using Jane and Ben's views.

Solar farms have a small output power which can be hard for people to sustain. whereas gas-burning power stations provide a lot of power for people to use. But Gas is not renewable and can pollute the environment with CO_2 unlike Solar farms. If looking into future, Solar would be better as the environment would not be damaged in any way and the energy source would not run out. **[6]**

Exemplar 3 is a Level 3 response covering advantages and disadvantages, including the fact that gas is not renewable.

Exemplar 4

Describe the **advantages** and **disadvantages** of both power stations using Jane and Ben's views.

L2

Using gas burning power stations it produces carbon dioxide which causes the green house affect which then leads to an increase in global warming, however they do produce more energy quicker. solar pannels are good because it ~~doesn'~~ does not cause harm to the environment, But they do take up a lot of space unless they are put on the roof of houses, however they do not provide as much energy as gas burning stations, and there isn't always sunlight to provide us that energy **[6]**

Exemplar 4 is a Level 2 response which gives a well-reasoned balance of advantages and disadvantages. However exemplar 4 does not mention the central issue that gas is non-renewable, or that solar panels use a renewable energy resource. This important factor was included in Ben's comment and at Level 3 candidates were expected to show an understanding of non-renewable and renewable energy resources

Exemplar 5

Describe the **advantages** and **disadvantages** of both power stations using Jane and Ben's views. L1

A gas burning powerstation provides more power. It makes PV pannels very polluted. However, it is not renewable and it produces carbon dioxide when burnt. Although it takes up a lot of space, it is providing 1400MW of power.

Exemplar 5 is a Level 1 answer. The candidate considers only gas burning power stations. They clearly did not understand Jane's comment about making photovoltaic panels.

Question 5(b)(i)

(b) To be rescued, Watney needs to travel 3200 km across Mars to a rocket.

He drives there using a battery-powered vehicle. The battery is recharged using solar panels.

The Sankey diagram in **Fig. 5.1** shows the energy transferred in one hour by the solar panels.

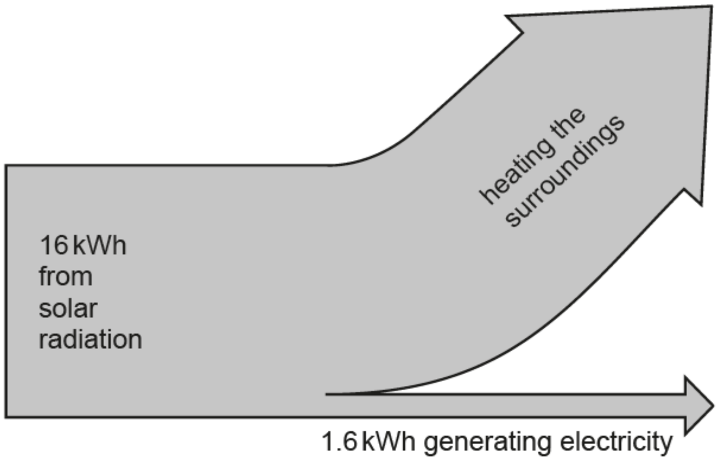


Fig. 5.1

(i) Calculate, as a percentage, the efficiency of the solar panels.

Use the equation: efficiency = (useful energy transferred ÷ total energy transferred) × 100

Efficiency = ... % **[3]**

The majority of candidates scored full marks here. There was a small minority who worked out the percentage of wasted energy instead of useful energy.

Question 5(b)(ii)

(ii) The rechargeable battery stores 18 kWh of energy.

Use data from **Fig. 5.1** to show that the solar panels need more than 10 hours to recharge the battery.

[2]

Many candidates chose a neat way to show this by calculating that in 10 hours 16kWh of energy would have been transferred, which was less than the 18 kWh required. Some went on to show that 11 hours was not enough. A few successfully calculated that 11.25 hours would be needed.

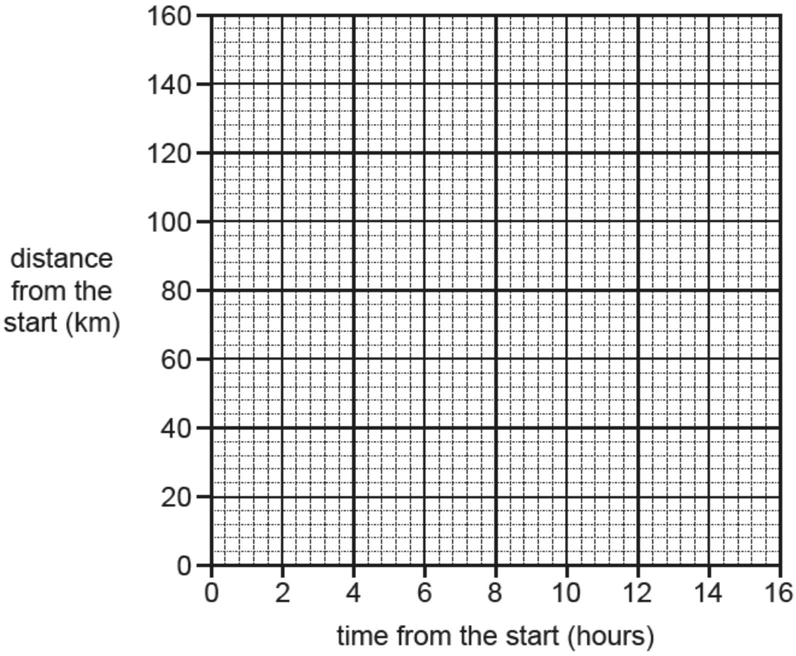
Question 5(c)

(c) Watney sets off on his journey to the rocket.

He drives for 4 hours at a steady speed of 25 km/hour.

He then stops to let the battery re-charge for 10 hours.

Complete this distance-time graph.



[4]

Some candidates plotted (4, 25) instead of (4, 100). Another common mistake was to continue the graph after (14,100) with a diagonal line either up or down.

Question 6(a)(i)

6 Alex is investigating the forces acting on a trolley to slow it down on different surfaces.

Fig. 6.1 shows his apparatus. Each time, he starts the trolley at the same marked point and measures how far it goes along the test surface before it stops. The centre of the trolley is marked with a dot.

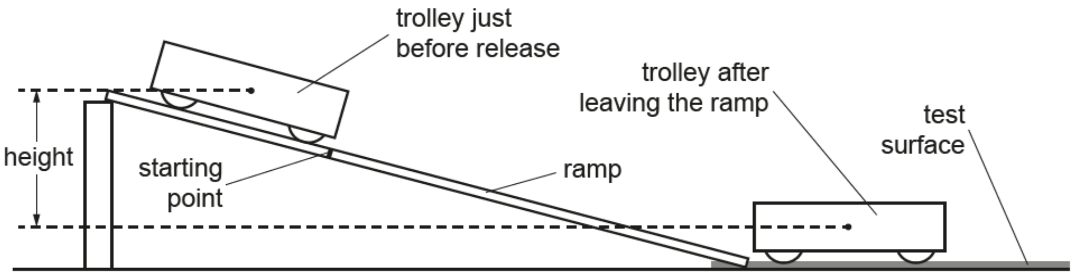


Fig. 6.1

(a) (i) Here are measurements that Alex takes.
Mass of trolley = 0.80 kg
Height = 0.20 m

Assume gravitational field strength = 10 N/kg

Calculate the gravitational potential energy transferred when the trolley leaves the ramp.

Gravitational potential energy transferred = ... J **[3]**

Candidates generally did very well on this question. There were a few across the ability range who could not remember the equation correctly and divided by the height. Lower ability candidates were more likely not show their working and unfortunately if they had not calculated the answer correctly they could not be credited for their prior working. The mark distribution for this question was extreme, there was a 50:50 split between full marks and no marks, with only a few candidates receiving intermediate marks for their workings.

Misconception Candidates know that if they get a calculation correct in a physics examination they will usually get full marks and so choose to 'save time' by not showing their workings. This is a high risk strategy as most marks can still be credited for correct working even if the final calculation wrong.

Question 6(a)(ii)

(ii) Alex says that the kinetic energy of the trolley when it leaves the ramp is the same as the gravitational potential energy transferred.

Which of the following statements must be true if Alex is to assume this?

Tick (✓) **two** boxes.

Air resistance is very small.	☐
Gravity acts downwards on the trolley.	☐
The ramp is very flat.	☐
The trolley is very light.	☐
There is not much friction acting on the trolley.	☐

[2]

Many candidates did not identify that this question was about efficiency, and chose answers that may have been true but were not relevant. The most common incorrect answer given was 'Gravity acts downwards on the trolley.'

Question 6(a)(iii)

(iii) Alex repeats the experiment five times. He measures the distance the trolley travels along the test surface each time.

Table 6.1 shows his results.

Reading	1	2	3	4	5
Distance travelled (m)	1.2	1.4	1.2	0.6	1.4

Table 6.1

Calculate the mean distance the trolley travelled along the test surface.

Tick (✓) **one** box.

1.1 m ☐

1.2 m ☐

1.3 m ☐

1.4 m ☐

[1]

Candidates were expected to evaluate the data in terms of precision and repeatability and then consider whether the anomalous observation should have been discarded. Although variance of reading 4 was 7 × larger than the variance of the other observations most chose to retain this anomalous reading and calculated a mean value of 1.16. Many then correctly rounded to give 1.2 m. while others truncated the answer to 1.1 m.

OCR support

Candidates should be aware that they are expected to evaluate whether to retain or discard anomalous readings in data sets. In this instance the reading was an extreme outlier outside the expected variation and should have been discarded when calculating the mean. Further guidance is available in the Mathematical Skills Handbook http://www.ocr.org.uk/Images/310651-mathematical-skills-handbook.pdf

Question 6(b)(i)

(b) Alex carries out this experiment for a range of kinetic energy values.

Table 6.2 shows his results.

Initial kinetic energy (J)	0.8	1.6	2.4	3.2	3.9	4.8
Mean distance travelled (m)	0.80	1.35	1.60	1.85	1.90	1.95

Table 6.2

These data are plotted on the graph in **Fig. 6.2**. Three points have been left off.

(i) State the reason why Alex was right to plot a point at the origin, (0,0).

....

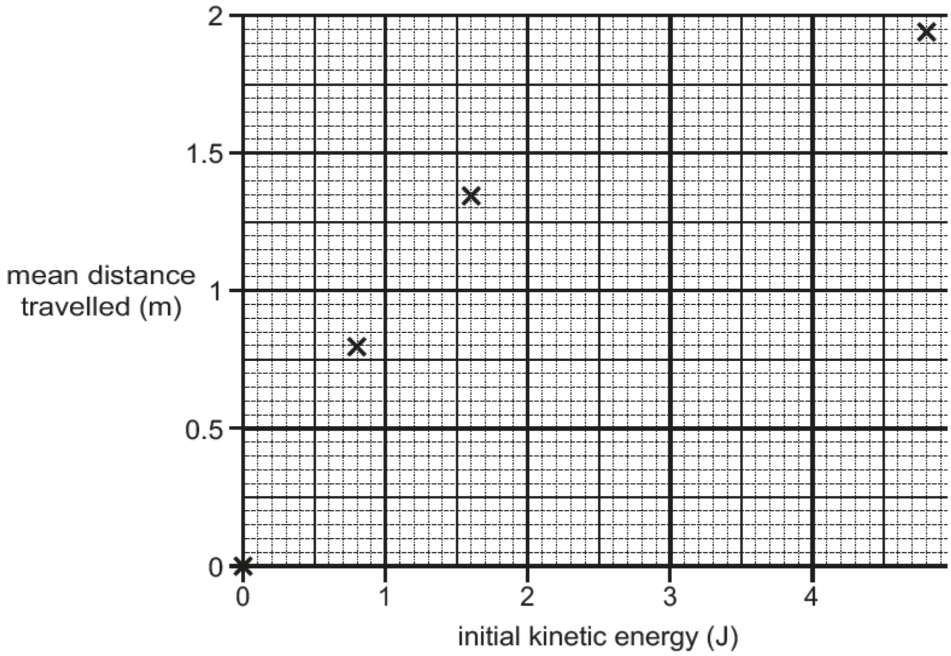
....

.... **[1]**

Many candidates responded that 'graphs start at (0,0)', or 'it was the starting point' or other similar responses The most common creditworthy answer to this question was that when the trolley was not moving it would have no kinetic energy. Although this was not the expected answer it did demonstrate a sensible application of physics knowledge by candidates.

Question 6(b)(ii)

(ii) Plot the three remaining points on the graph in **Fig. 6.2** and draw an appropriate best fit curve.



[2]

Fig. 6.2

Many candidates were successful in plotting the points to within a square. However, many candidates less precise in their plotting and outside the allowed tolerance of ±half a square. Some candidates only plotted two of the three data points. The curves drawn were generally a good attempt at a line of best fit through their own plotted points. Some candidates plotted the points but did not attempt to draw a line of best fit.

Question 6(c)

(c) Describe the pattern shown by these results.

....

....

....

.... **[2]**

Most candidates were credited with the first mark very few descriptions were clear enough for the second mark. Only a few attempted to describe how the increase in distance became smaller for the same increase in initial kinetic energy at higher kinetic energies and fewer still were able to describe rather than imply the pattern..

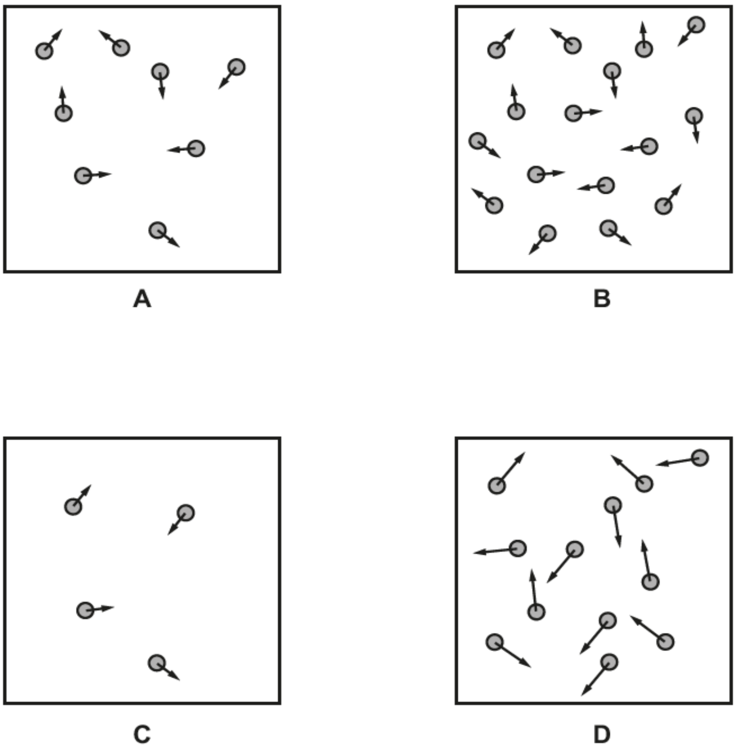
Question 7(a)(i)

7 This question is about the particles in a gas and the pressure they exert on a container.

(a) The diagram below shows four samples of the same gas in containers of the same size.

Each particle is shown as a circle.

The arrow on each particle shows its velocity.



Answer each question with one of the letters **A**, **B**, **C** or **D**.

(i) Which sample has the **fastest** particles?

.... **[1]**

Question 7(a)(ii)

(ii) Which sample has the **greatest** density?

.... **[1]**

Question 7(a)(iii)

(iii) Which sample is at the **highest** temperature?

.... **[1]**

Question 7(iv)

(iv) Which sample has the **smallest** pressure?

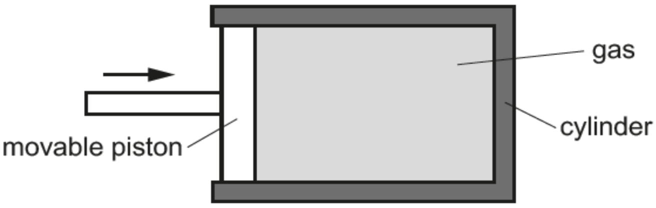
.... **[1]**

Candidates did well with these multiple choice questions. They found Q7(a)(iii) the most difficult. Some candidates may have thought they could not choose D again for Q7(a)(iii) having used it for Q7(a)(i). However, this is unlikely as most of these candidates had chosen two of same letter for other parts of Q7(a). Q7(a)(i) was also challenging for some candidates and it may have been that they over thought the question and attempted to assess whether B or D had the greater vector sum rather than the average speed of the individual particles.

Question 7(b)

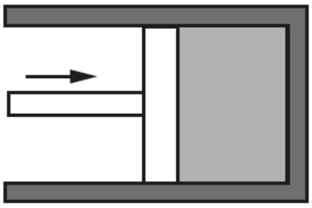
(b) A tight-fitting moveable piston traps gas in a cylinder as shown in the diagram.

The gas has volume 300 cm^3 and pressure of 100 kilopascals (kPa).



The piston is now pushed in and changes the volume of the gas to 150 cm^3.

The temperature of the gas has not changed.



Calculate the new pressure of the gas.

Use the equation: old pressure × old volume = new pressure × new volume

New pressure = ... kPa **[2]**

The majority of candidates could do this question. There were also a number who were credited with one mark for multiplying the original pressure by the original volume and then stopped. Others calculated the original product but then made an error with the next stage. Fortunately more candidates did write down there workings for this question and so they could be credited for the correct stages of their process.

Question 7(c)

(c) The piston is moved to a new position.

The force with which the gas pushes out on the piston is now 300 N.

The area of the piston is 0.002 m^2.

Calculate the pressure of the gas in pascals (Pa).

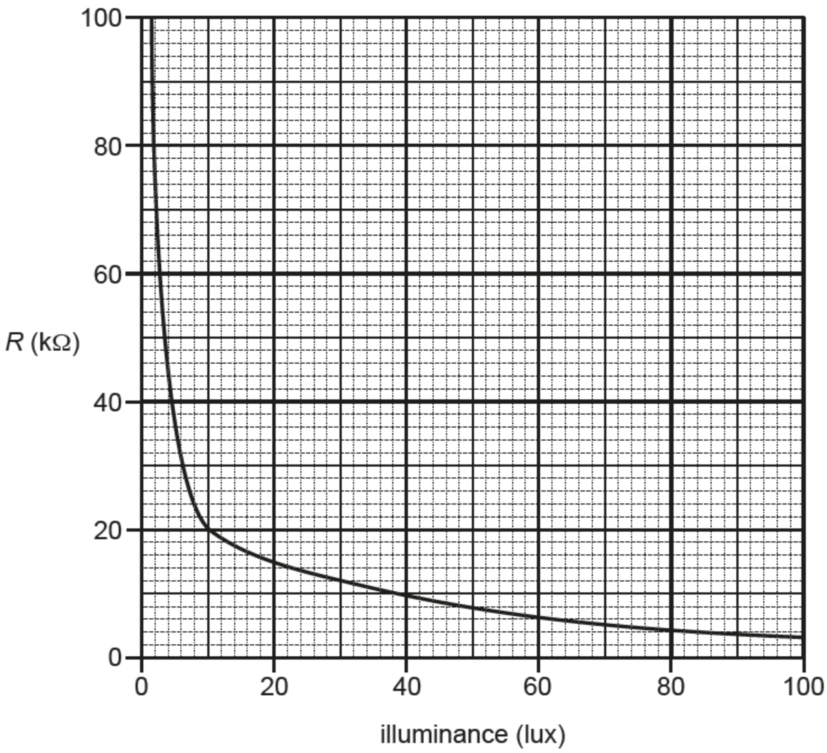
Pressure = ... Pa **[3]**

In contrast to part (b), the majority of candidates did not successfully complete this question. A common misconception was candidates who thought that pressure = force x area. Other candidates squared the given value for the area of the piston, 300 ÷ 0.000 004 = 75 000 000 Pa.

Question 8(a)(i)

8 This question is about using an LDR (light-dependent resistor) to measure light intensity.

(a) The resistance *R* of an LDR varies with illuminance (the amount of light energy per unit area hitting a surface) as shown in the graph.



(i) Which of the following statements correctly describes this variation?

Tick (✓) **one** box.

The resistance is directly proportional to the illuminance. ☐

The resistance and the illuminance have a positive correlation. ☐

As the illuminance increases, the change in resistance becomes less and less. ☐

The resistance is greater at 80 lux than at 20 lux. ☐

[1]

Higher ability candidates did well on this question. A few candidates across the ability range ticked two boxes here rather than one; the first and the third responses.

Question 8(a)(ii)

(ii) Use the graph to estimate the change in resistance of the LDR when the illuminance increases from 10 lux to 70 lux.

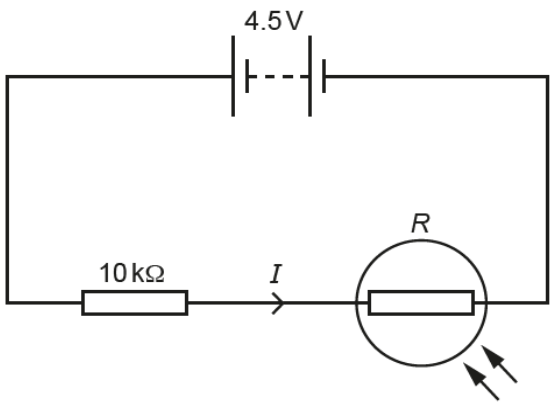
Change in resistance = ... kΩ **[2]**

This was well answered by higher ability candidates and many others scored 1 mark for recognising that the resistance at 10 lux was 20 kΩ. Some lower ability candidates did not realise that the change was the difference in the values and some calculated the difference between the lux values.

Question (b)(i)

(b) The LDR is connected in series with a fixed resistor of resistance 10 kΩ and a 4.5 V battery.

The **total** resistance at 30 lux is 22 000 Ω.

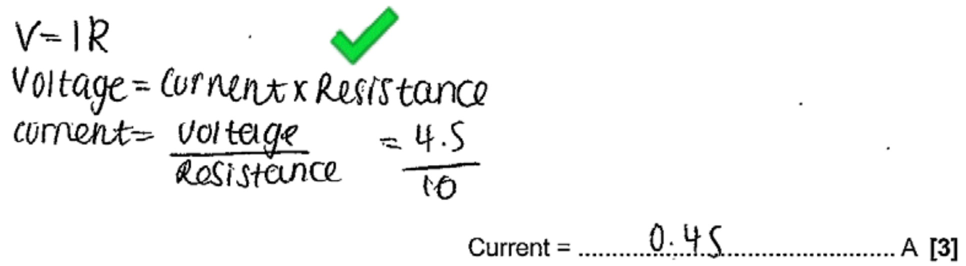


(i) Calculate the current in the circuit.

Current = ... A **[3]**

Only the most able candidates were able to complete this question. There was a mark for recalling the equation. Some candidates successfully recalled $V = I \times R$ but did not substitute in the correct values.

Exemplar 6



Exemplar 6 shows how by setting out the answer enabled they were credited for recall of the equation even though they used a value of 10 Ω rather than 22 000 Ω for resistance.

Question 8(b)(iii)

(iii) Describe, without any calculations, how the potential difference across the fixed resistor will change when the illuminance increases from 30 lux to 100 lux.

....

....

....

....

....

.... **[3]**

No candidates were credited with full marks for this question and the majority did not provide any creditworthy response. Some candidates correctly stated that the resistance of the LDR or the total resistance of the circuit would decrease and were credited with one mark. A few also stated that the potential difference across the fixed resistor would increase. Some candidates thought the fixed resistor was the light-dependent resistor.

Question 9

9 Sarah carries out an experiment to measure the specific latent heat of vaporisation of water. She does this by finding the energy needed to evaporate a known mass of water.

The apparatus she uses is shown in **Fig. 9.1**.

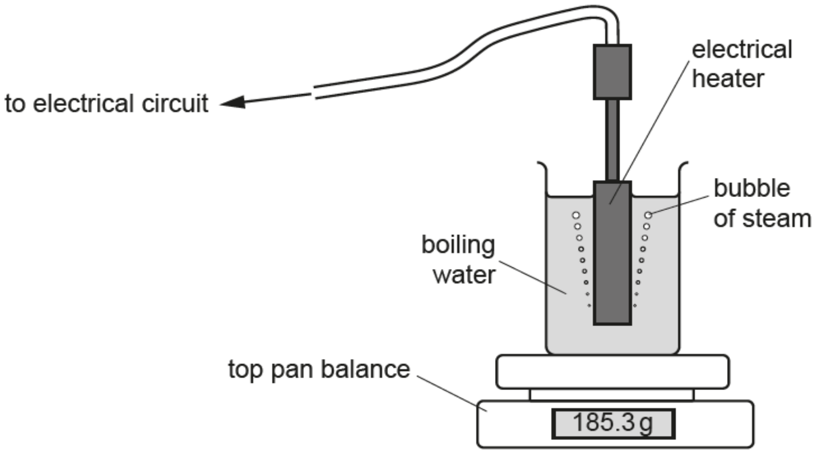


Fig. 9.1

Using this apparatus, Sarah takes these readings.

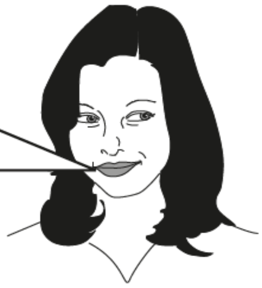
	Measured value
current	3.0 A
potential difference	12 V
time	150 s
balance reading at start	185.3 g
balance reading at the end	184.3 g

Table 9.1

Question 9(a)*

(a)* Sarah is not happy with her results.

> **Sarah**
> The book says the specific latent heat of vaporisation of water should be 2300 J for every gram evaporated. The readings in **Table 9.1** give an answer that's far too big.



Is Sarah right?

What could Sarah do to get an accurate value of the specific latent heat of vaporisation of water from her experiment?

.... **[6]**

Candidates who did well on this question used the data to calculate the specific latent heat. They considered whether a reason for Sarah's value being so high might be because of energy transfers to the surroundings environment and not just to the water. Finally they suggested how Sarah might minimise the unwanted energy transfers.

Only a very few candidates calculated the specific latent heat, although some wrote that Sarah should have calculated the value for it. Level 3 responses were expected to compare Sarah's calculated vale with the expected value. Candidates were expected to know that this quantitative comparison would be required in order to find how accurate Sarah's value for latent heat of vaporisation was.

Many candidates thought as the value for latent heat was too large it could be reduced by heating for a shorter time, with a lower powered heater, or with less water. Improvements such as repeating the experiment, checking for anomalous observations, and calculating a mean, were common suggestions. These should be standard scientific practice and these suggestions allowed lower ability candidates to be credited at the top of the Level 2 band.

Exemplar 7

	Measured value
current	3.0A
potential difference	12V
time	150s
balance reading at start	185.3g
balance reading at the end	184.3g

Table 9.1

V X A X time

= 5400 J

SEEN

L3 ^

Yes Sarah used 5400 J to evaporate 1g of water.

Sarah could be more accurate if she emmersed the heater fully. Increase the efficiency of the heater by ~~insultg~~ insulating the beaker and fitting a top

[6]

Exemplar 7 is a top of band Level 3 response. At first sight the answer may seem very brief. However the candidate has demonstrated all the criteria for a full mark response:

- calculates the specific latent heat
- suggests three improvements:
    - ensuring the heater is immersed in the water
    - insulating the beaker
    - putting a top on the beaker.

Exemplar 8

water from her experiment? L2

2300J x 185.3 = 426,190

She could make the experiment more accurate by increasing the voltage or current. This would increase the heat of the electrical heater, boiling water at a faster rate. She could also change the amount of time she does the experiment for. Another thing she could do is repeating the experiment multiple times in case a mistake was made. I agree with Sarah's statement and think there is a mistake made in the testing process. **[6]**

Exemplar 8 is a top of band Level 2 response. The candidate's attempted calculation is not helpful, but the suggestion to increase the heater output so the water heats at a faster rate would improve the accuracy. Changing the time confirms Level 2, but it would not be specific enough on its own.

Question 9(b)

(b) Sarah's book has this information about vaporisation of two liquids.

Liquid	Specific latent heat of vaporisation (J per gram)
water	2300
alcohol	950

Suggest why it takes more energy to evaporate 1 gram of water than it does to evaporate 1 gram of alcohol.

....

....

....

....

.... **[3]**

A few higher ability candidates referred to the intermolecular forces or to bonds being broken. Most candidates could not offer any scientifically plausible suggestion. The most commonly creditworthy answer was that the density of water is higher than the density of alcohol.

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