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**GCSE (9-1)**

*Examiners' report*

# GATEWAY SCIENCE PHYSICS A

**J249**
For first teaching in 2016

## J249/01 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 J249/01 series overview

There was a small entry for this examination paper, the first Foundation Tier paper for the new Gateway Physics specification. The last two questions on the paper, which were 'overlap' questions also on the Higher Tier paper, had the greatest rate of Nil Responses in the paper, presumably due to a combination of more difficult questions and also the end of a length examination.

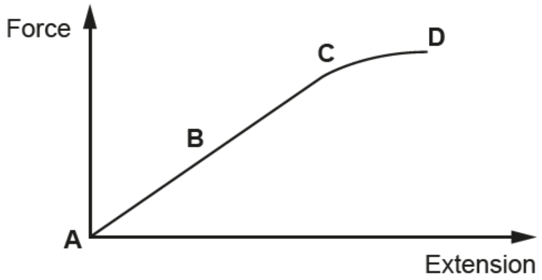
# Section A overview

The mean mark in Section A was 8.5/15. The three questions on the first page of the Section A were deliberately accessible, and candidates scored well on these. Of the remaining questions, the only one where it seemed as if most candidates were just guessing was question 14.

There are comments on 5 of these multiple-choice questions in this report.

## Question 5

**5** The diagram shows the relationship between force and extension for a spring.



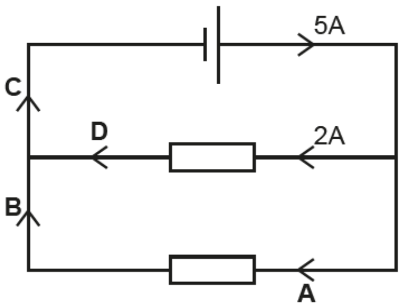

Which letter on the graph shows the **elastic limit** of the spring being stretched?

Your answer ☐ **[1]**

Just over half of all candidates got this correct. The most common wrong answer here was D; candidates need to realise that 'elastic behaviour' for a spring is intended to refer to the straight-line section of the graph.

## Question 6

**6** This is a circuit.




Which letter **A**, **B**, **C** or **D** shows the part of the circuit that carries a current of 2A?

Your answer ☐ **[1]**

About two-thirds of the candidates got this question correct: the commonest wrong answer here was A, presumably looking at the symmetry in the bottom part of the diagram.

## Question 8

**8** An object travelled 800 m in 40 seconds.

Use the equation: distance travelled (m) = speed (m/s) × time (s)

What is the speed of the object?

**A** 0.05 m/s

**B** 20 m/s

**C** 840 m/s

**D** 32 000 m/s

Your answer [ ] **[1]**

This proved to be the easiest question in Section A, with about 85% of all candidates getting it right. The commonest wrong answer was D.

## Question 9

**9** An object moved 20 cm with a force of 20 N.

Use the equation: work done = force × distance

Which is the correct calculation of work done?

**A** 0.4 J

**B** 4.0 J

**C** 40 J

**D** 400 J

Your answer [ ] **[1]**

This was the hardest multiple-choice question, with one in six candidates getting it right. Most candidates did not convert cm into m.

## Question 14

**14** Which distances are the **same**?

**A** $1 \times 10^{-3}$ m and 1 μm

**B** $1 \times 10^{-6}$ m and 1 mm

**C** $1 \times 10^{-9}$ m and 1 nm

**D** $1 \times 10^{-12}$ m and 1 Gm

Your answer **[1]**

Nearly half of the candidates did get the right answer. However most of the other candidates appeared to have been just guessed which response was correct.

**AfL**

Standard form is tricky for Foundation Tier candidates. Try using low stakes pop quizzes and starter exercises to embed concepts of standard form and the metric prefixes. See also the Mathematical Skills Handbook http://www.ocr.org.uk/Images/310651-mathematical-skills-handbook.pdf

# Section B overview

The first two questions (Q16 and Q17) were easier and most candidates did best on these questions. The demand of the questions increased from Q18 to Q21. The final two questions (Q22 and Q23) were overlap questions which were also on the Higher Tier paper (J249/03).

**AfL**

Each structured question is between 6 and 12 marks long and is sub-divided into different parts. Looking at the way each structured questions is sub-divided will help candidates. If, for example, a question has parts (a)(i), (a)(ii), (a)(iii), and then (b)(i) and (b)(ii), it tells the candidate that the question has two separate 'stories' within it. The first story is in in three parts, and the second story in two parts. These stories are designed to support candidates to move from simple to more complex understanding. However less able candidates often miss the way in which the parts develop.

## Question 16(a)(i)

**16** A student uses four electrical appliances for different lengths of time.

Look at the table.

| Appliance | Power (W) | Time used (hours) |
|---|---|---|
| Hair dryer | 1500 | 0.3 |
| TV | 100 | 5 |
| Toaster | 2000 | 0.2 |
| Light bulb | 10 | 12 |

**(a) (i)** Which appliance uses the **most** energy?

.................................................................................................................................... **[1]**

Most candidates multiplied the relevant variables (power and time used) in the data table, and used the units Wh or kWh. This was a good approach for questions of this type.

## Question 16(a)(ii)

**(ii)** Which appliance uses the **least** energy?

.................................................................................................................................... **[1]**

Here the appliance with the lowest power rating (light bulb) was the right answer

**Misconception**

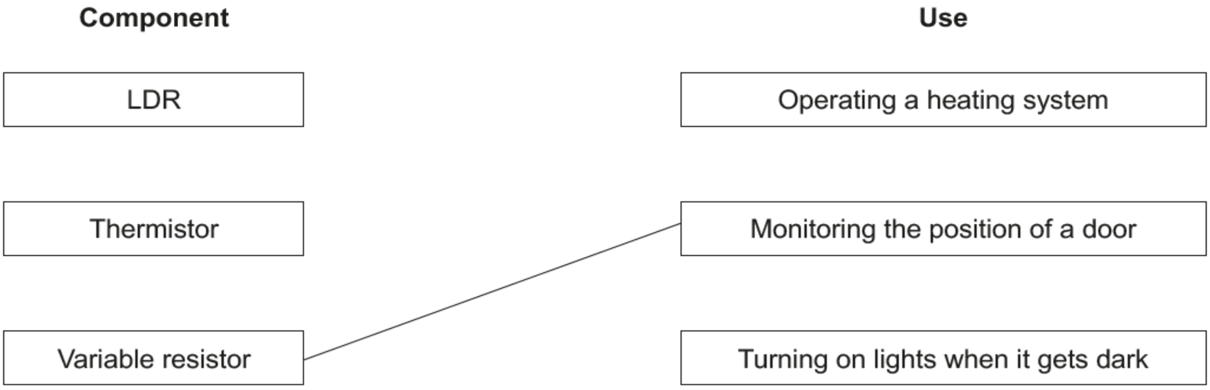
The most common misconception was just to compare the power ratings of the appliances and chose the toaster as the answer. Doing some quick calculations of work done and jotting vales next to the table helps answering these types of question. If the power and time for the TV and light bulb had been slightly different it would have given a different answer.

## Question 16(b)

**(b)** Here are three different components and their use in the home.

Match the component to its correct use.

One has been done for you.




**[2]**

Most candidates were credited full marks on this question. Virtually no candidates got one mark, perhaps because this required two components to be used for the same purpose. It was encouraging to see how candidates across the ability range were aware of the use of specific electrical components around their homes.

## Question 16(c)

**(c)** A charge of 44 000 C flows through a light bulb. The potential difference is 230 V.

Calculate the energy transferred.

Use the equation: Charge = Energy ÷ Potential difference

Record your answer to **2** significant figures.

Answer = ...................................................... C **[4]**

Please note an erratum notice was issued for this question. You can view this at the end of the report

There was an erratum with this question to correct the units to joules. The figures in this question were difficult, and many candidates coped well with the large numbers and also the rearrangement of the equation. Some candidates rearranged the equation before substitution and others after. Fewer candidates were able to round 10 120 000 J to two significant figures (e.g. 10 000 000 J).

**OCR support** Mathematical Skills Handbook

http://www.ocr.org.uk/Images/310651-mathematical-skills-handbook.pdf

## Question 16(d)(i)

**(d) (i)** A student has completed her homework on static electricity.

Look at her homework.

1 Static charge only builds up on insulators.
2 Opposite charges attract.
3 Like charges repel.
4 Only positive charges can move.

Identify the student's mistake and correct it.

.......................................................................................................................................

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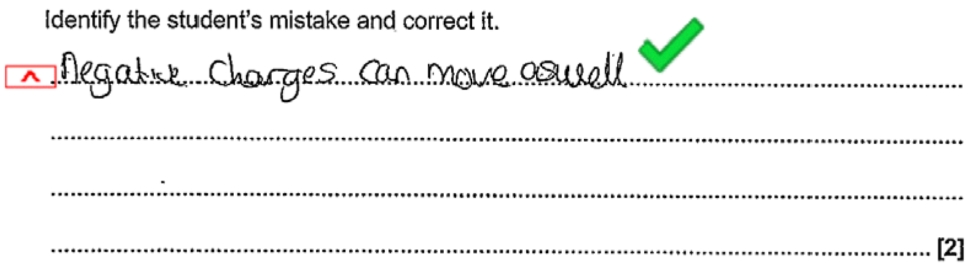
....................................................................................................................................... **[2]**

A number of candidates provided the correct answer (that it is electrons that move) but did not identify that mistake in the student's homework (i.e. only positive charges can move). The two most common ways that candidates identified the student's mistake were: by putting a cross next to it on the homework sheet, or by writing that statement 4 was wrong in their answer. Over a third of candidates omitted to identify the student's mistake in their answer (see Exemplar 1 below). Candidates were instructed to do this in the stem of the question and identifying the error was the marking point for the first mark.

**AfL**

Underlining the command words can ensure that candidates answer the question that is being asked. In this example both 'identify' and 'correct' needed to be answered for both marks. Relying on the reader to assume that what the mistake is from the answer provided is testing the reader's knowledge and understanding not that of the candidate.

## Exemplar 1


Identify the student's mistake and correct it.

Negative Charges can move aswell

[2]

## Exemplar 2

Identify the student's mistake and correct it.

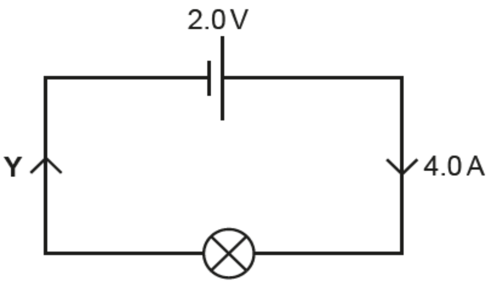
not only positive charges have the ability to move

a negative charge is able to move

[2]

## Question 16 (d)(ii)

**(ii)** When charges move, a current flows.




Write down the current flowing at point **Y** in the circuit.

Answer = ........................................................ A **[1]**

Half of all candidates did know that the current must be the same both sides of the bulb. The most common misconception was attempts to calculate and answer using the data on the circuit diagram.

## Question 17(a)(i)

**17** Atomic models have changed over time.

**Old atomic model** – Atoms are a positive mass with negative electrons fixed in it.

**Current atomic model** – Atoms are made from protons, neutrons and electrons. Protons and neutrons are in a central nucleus surrounded by a cloud of electrons.

**(a)** **(i)** Write down **two** differences between these models.

1 ........................................................................................................................

........................................................................................................................

2 ........................................................................................................................

........................................................................................................................ **[2]**

**Misconception** It is important to be clear which model/view point/thing the candidate is writing about in these type of question. Candidates will not be credited when they expect the examiner to interpret what their answer implies. It is better to state clearly "the old model ." rather than "one of the models …"

A number of candidates read the first statement about the old atomic model as implying that atoms had a positive charge. Several candidates did not achieve both marks because they were not clear about which model they were talking about.

## Question 17(a)(ii)

**(ii)** Why did the atomic model change?

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Most candidates recognised the role of Rutherford/Geiger/Marsden which was expected. Several candidates mentioned Niels Bohr and/or John Dalton, which was unexpected in this context.

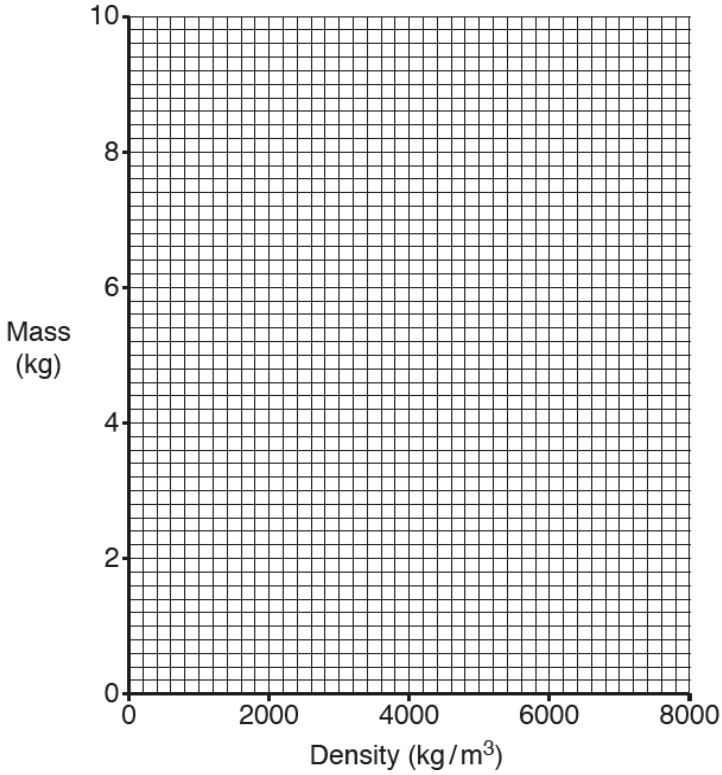
## Question 17(b)(i)

**(b)** A student has data on four blocks of different materials.

Each block has the **same** volume.

| Block | Mass (kg) | Density ($kg/m^3$) |
|---|---|---|
| **A** | 2 | 2000 |
| **B** | 4 | 4000 |
| **C** | 6 | 6000 |
| **D** | 8 | 8000 |

**(i)** Plot this data onto the graph and draw a line of best fit.




**[2]**

Nearly all candidates completed this activity to a high standard.

## Question 17(b)(ii)

**(ii)** Describe the pattern shown on the graph.

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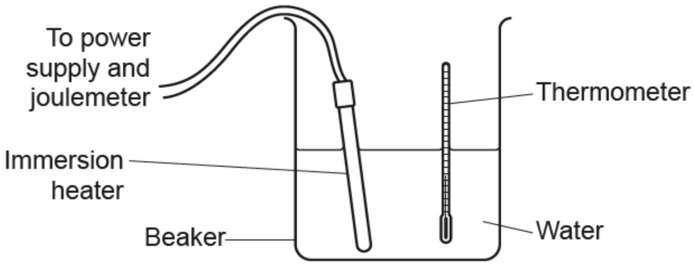
........................................................................................................................................ **[2]**

Most candidates were awarded the first mark for identifying the 'positive correlation' / 'as density goes up, so does the mass'. The second mark required the candidates to recognise the proportional relationship between the variables.

## Question 18(a)(i)

**18** A student completes an experiment to find the specific heat capacity of water.




He heats up 1 kg of water, using an immersion heater. He measures the temperature rise and calculates the specific heat capacity of the water.

| Attempt | Energy supplied (J) | Temperature rise (°C) | Specific heat capacity (J/kg °C) |
|---|---|---|---|
| **1** | 10 000 | 2 | 5000 |
| **2** | 21 000 | 4 | 5250 |
| **3** | 44 000 | 8 | 5500 |

**(a) (i)** Calculate the **mean** specific heat capacity.

Answer = ............................................... J/kg °C **[1]**

Most candidates (≈ 90%) were able to calculate the mean specific heat capacity efficiently.

## Question 18(a)(ii)

**(ii)** Describe the conclusions that can be drawn from the data.

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This question expected the candidate to describe the patterns in the tabulated data and to recognise that the table recorded values from three repeats of the experiment with the control variable changed. There were a number of different marking points to allowed candidates to achieve full marks. However, most candidates' answers were too brief and only described one or two possible conclusions.

**AfL**

For this style of question which is assessing AO3 it is important to encourage candidates to write about a minimum of three different conclusions that could be drawn. The space provided is indicative of the expected answer, so in this example describing four "conclusions" briefly (Exemplar 4) would be a better approach than one "conclusion" described in greater detail (Exemplar 3).

## Exemplar 3

**(ii)** Describe the conclusions that can be drawn from the data.

As the energy supplied increases, the specific heat capacity also increases.

....................................................................................................................................... **[3]**

## Exemplar 4

**(ii)** Describe the conclusions that can be drawn from the data.

As the energy supplied increases so does the temperature. The specific heat capacity increases by an interval of 250 J/kg °c ~~from~~ after each attempt. increased temperature and energy supplied causes the specific heat capacity to increase. **[3]**

## Question 18 (b)(i)

**(b)** The actual value for the specific heat capacity of water is 4200 J/kg °C.

**(i)** Explain why the mean specific heat capacity calculated in **(a)(i)** is higher than the actual value.

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Only a very few candidates answered this question well. These candidates realised that a "higher" calculated value of specific heat capacity meant that more energy had to be transferred to the beaker than was expected. These candidates concluded that much energy had been lost to the environment.

## Question 18(b)(ii)

**(ii)** Write down **two** problems with this experiment **and** suggest how they could be solved.

Use the diagram and results table to help you.

Problem 1 ..........................................................................................................

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Solution ............................................................................................................

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Problem 2 ..........................................................................................................

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Solution ............................................................................................................

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**[4]**

Most candidates appeared not to appreciate how the story of the topic being assessed was developed through Q18 and in particular how their answer to Q18(b)(i) should help them in answering Q18(b)(ii). Most candidates offered random comments unrelated to Q18(b)(i). A popular response was the suggestion that a Bunsen burner should be used rather than an electrical immersion heater.

## Question 19*

**19*** Four students run in different races.

| Student | Race distance (m) | Time (s) |
|---|---|---|
| **A** | 50 | 6 |
| **B** | 100 | 15 |
| **C** | 100 | 14 |
| **D** | 200 | 31 |

Use the information in the table to **describe** and **compare** the motion of the four students.

Use the data in your answer.

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.................................................................................................................................................. **[6]**

There were many excellent answers, with the mean speeds of all four runners calculated with comments about how they had run different races (apart from B and C). Many candidates helped themselves by annotating the calculated speeds next to the table). The most able candidates discussed the effect of running a longer race on the mean speed of the runner (see Exemplar 7 below). Less able candidates compared the times of each runner but did not calculate speeds (see Exemplar 5 below).

**OCR support**

About one in ten candidate did not attempt to answer this question. Level of Response (LoR) questions are designed to open up the potential answers so that candidates at all levels of ability have an opportunity to show their scientific understanding. Every candidate should be encouraged to answer LoR questions as even a weak but relevant answer will be credited. The 'How to answer 6 mark LoR questions' resource can be used to help candidates prepare for this style of question
http://www.ocr.org.uk/Images/374902-how-to-answer-6-mark-lor-activity.doc

## Exemplar 5

Use the information in the table to **describe** and **compare** the motion of the four students.

Use the data in your answer.

L1

^

The less motion the student had compleated the race quicker as to student A the race distance is 50m then did the race in 6s about student D the race resistance was 200 and did the race in 31s However student B and C race resistance was the same 100m and student B did the race in 15s and c did the race in 14s. **[6]**

A Level 1 candidate response. They describe the data in the table with no attempt to process data and calculate the speed of each runner. The information is relevant to the question but there is no real attempt to compare the motion of the four students.

## Exemplar 6

Use the information in the table to **describe** and **compare** the motion of the four students.

Use the data in your answer.

L2

Student A raced 50 m in 6s which means they were racing at roughly 8.3 m/s ~~speed~~ This shows that the motion of this student is very fast. Students B and C ran 100m. However, student B ran 100 m in 15 seconds while student C ran 100m in 14 seconds This shows that student B has a slower motion than student C. Student D races 200m in 31 seconds, which is around 6.5m/S. This shows that the motion of student A is slower than the motion of student D. **[6]**

A Level 2 candidate response. They have calculated and compared the speeds of A and D, but only compared the relative motions of B and C. There is a structured line of reasoning and the reporting of data is linked by sentences that offer some interpretation of the facts.

## Exemplar 7

| Student | Race distance (m) | Time (s) | |
|---|---|---|---|
| A | 50 | 6 | 8·3 m/s |
| B | 100 | 15 | 6·6 m/s |
| C | 100 | 14 | 7·14 m/s 7·1 |
| D | 200 | 31 | 6·45 m/s 6·5 |

Speed = distance / time.

Use the information in the table to **describe** and **compare** the motion of the four students.

Use the data in your answer.

L3

From looking at the table student A covered the smallest distance of 50m in the smallest time of 6s but at the greatest speed of 8.3m/s. Students B and C both covered 100m during the race but student C was one second quicker than student B (C = 14s, B = 15s). Therefore student C had a greater ~~distance~~ speed of 7.1m/s compared to student B at 6.6m/s. Eventhough student D covered the largest overall distance of 200m they moved at the smallest speed of 6.5m/s. This could be due to the fact student D took the overall largest amount of time of 31s. **[6]**

A Level 3 candidate response. They first calculated the speed of each student and then annotated the data table. This allowed them to be more focused and precise in their response. They have offered some explanation of the relative motions of the students. This answer is logical and all the content is relevant. The word counts for all three exemplars are similar and demonstrating that a well thought out answer is better than a very long answer.

## Question 20(a)

**20 (a)** Objects can interact in many ways. Pairs of forces arise when objects interact.

Write down **one** type of force involved when objects interact.

.......................................................................................................

....................................................................................................... **[1]**

Most candidates were able to name an appropriate force. The most common misconception was to name kinetic energy as a type of force.

## Question 20(b)

**(b)** A book rests on a table.

Draw a free body force diagram to show the forces acting on the book.

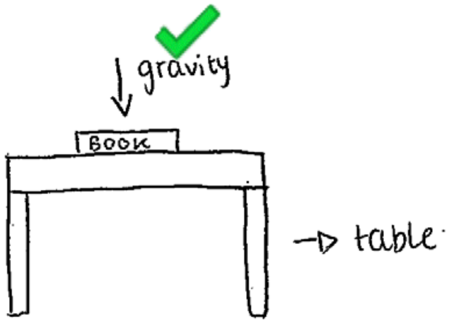
Use arrows to represent the forces.

**[4]**

The best answers were offered by candidates who drew diagrammatic side view of a book on a table with opposing vertical forces shown by arrows pointing outwards from the centre of the book (see exemplar 11 below). Many candidates had drawn vertical arrows of equal length with the downward force labelled 'gravity' (see exemplars 8 and 9), the use of the correct force ''weight' was rare (see exemplars 10 and 11). Fewer candidates labelled the counter-force 'reaction' or 'contact force'. The position of the arrows emanating from a point/box representing the centre of mass of the book was not an enforced marking point.

## Exemplar 8

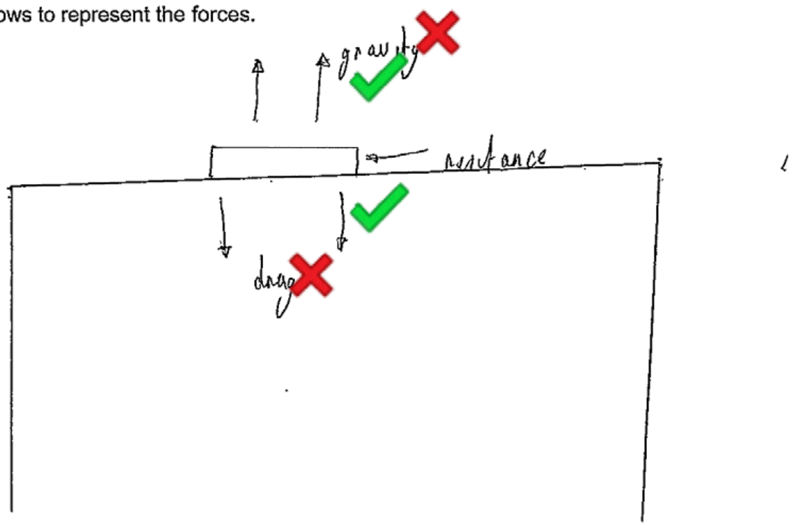
Use arrows to represent the forces.




[4]

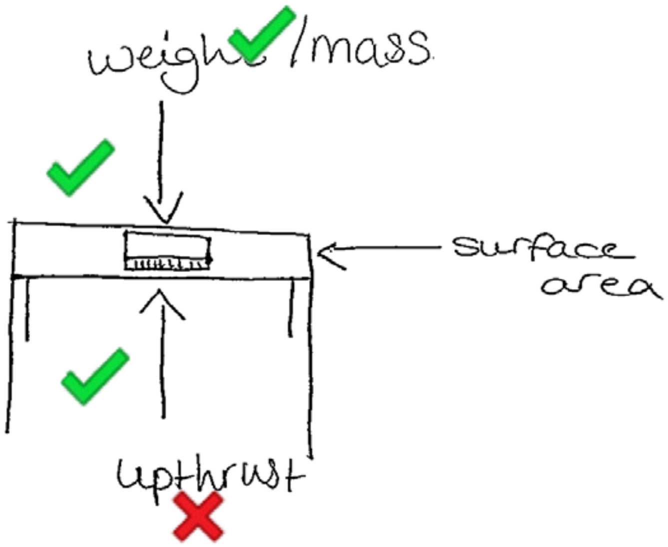
## Exemplar 9

Use arrows to represent the forces.



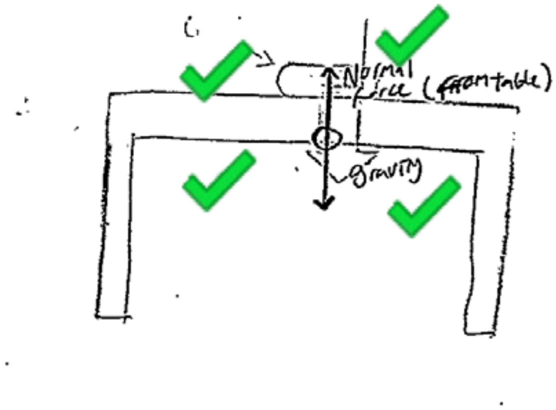

[4]

## Exemplar 10




[4]

## Exemplar 11




[4]

## Question 20(c)

**(c)** A teacher uses an air-track for motion experiments. Using the air-track means that there is no friction between the glider and the air-track.

The teacher places the glider on the horizontal air-track and gives it a small push to start it moving.

Explain the motion of the glider.

........................................................................................................................................

........................................................................................................................................

.................................................................................................................................. **[2]**

Many candidates did not seem to know what an air-track glider was and as a result there answers showed limited understanding of the practical activity. Other candidates had seen an air-track glider and discussed the (relatively) unhindered movement of the glider and the action of air resistance. The most able candidates gained credit for discussing the motion of the glider during the initial push given by the teacher.

## Question 20(d)(i)

**(d)** A presenter on a car TV programme says:

"The car maker has reduced the mass of this car and it now has better acceleration."

**(i)** Explain why the presenter is correct.

........................................................................................................................................

........................................................................................................................................

.................................................................................................................................. **[2]**

Few candidates identified that this question was about the implications of the equation $F = ma$. Candidates did not recognise that the force would be the same for both the heaver and the lighter model of car. Most candidates discussed the effects of friction on the car. For the order of magnitude for changes in mass between different models of a car frictional forces would have no measurable effect on acceleration.

## Exemplar 12

**(i)** Explain why the presenter is correct.

If the car is heavier the ~~to~~ weight on the wheels can affect the acceleration. If the mass is less there will be less weight on the weels so the acceleration will be better **[2]**

This answer only considers the marginal changes in friction caused by a very small increase in the contact area of the tyres but ignores the more significant effect that the same force applied to a smaller mass will have on acceleration.

## Exemplar 13

(i) Explain why the presenter is correct.

As force = mass x acceleration and force ÷ mass = acceleration suggesting a smaller mass will mean faster acceleration as this is less mass to move. **[2]**

BOD

This candidate's answer shows very clearly why using a more mathematical approach in physics saves time and increases understanding. They have identified the appropriate equation (F=ma), changed the subject to acceleration and then drawn the correct conclusion. Using this approach their answer was shorter, clearer and more relevant than exemplar 12.

**AfL**

As a starter exercise show students the question and ask them to select the equation that will answer the question. Helping students to be more comfortable using equations will help them overcome their reluctance to answer physics questions using maths.

## Question 20(d)(ii)

**(ii)** A car accelerates from 5 m/s to 25 m/s in 4 seconds.

Calculate the acceleration of the car.

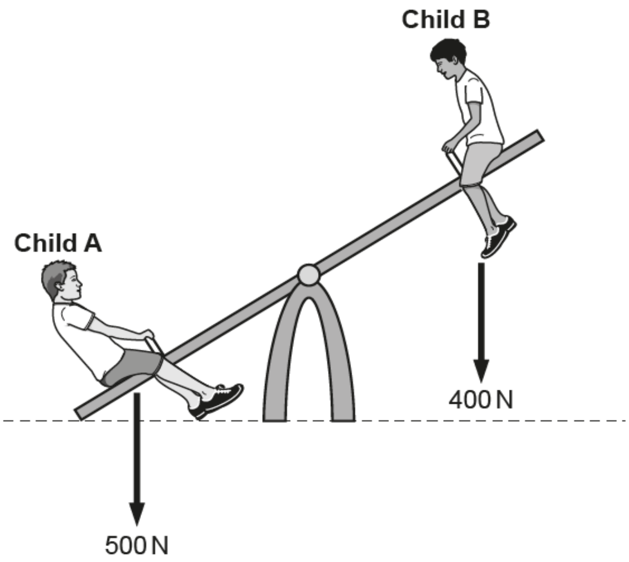
Use the equation: Acceleration = Change in speed ÷ Time taken

Answer = ............................................... $m/s^2$ **[3]**

This calculation was well done with most candidates being credited with all three marks.

## Question 21(a)(i)

**21** Two children play on a seesaw.




Both children sit **2 m** from the pivot.

**(a) (i)** Calculate the clockwise and anti-clockwise moments around the pivot when the seesaw is horizontal.

Clockwise moment = ........................................................ Nm

Anti-clockwise moment = ........................................................ Nm
**[3]**

Some candidates were confused as to the direction of rotation of 'clockwise' and 'anticlockwise', so credit was allowed to those who reversed their sense. Many candidates did not know how to calculate a moment, although this could be deduced from the units provided in the answer line (telling them to multiply the two). The unit Nm is the product of the force (N) and the distance (m) of each child from the pivot point of the seesaw.

## Question 21(a)(ii)

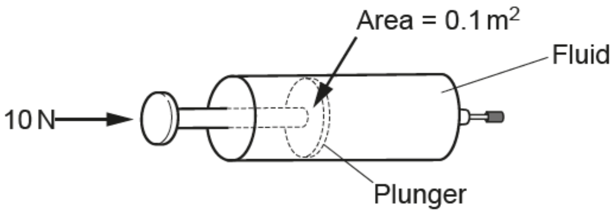
**(ii)** Calculate where **Child A** should sit to balance the seesaw.

Answer = ........................................................ **[3]**

Many candidates did not identify that the command word "calculate" was asking them to provide a mathematical solution rather than a qualitative descriptive of where child A should sit. Several candidates did calculate the correct answer and showed their workings in the space provided.

## Question 21(b)(i)

**(b)** A student tries to compress the fluid in a sealed syringe with a force of 10 N.




The area of the end of the syringe is $0.1\,m^2$.

**(i)** Calculate the pressure in the fluid.

Answer = ................................................ Pa **[3]**

Many candidates were not able to recall the equation $P = F/A$. Some candidates did recall the equation and correctly calculated the pressure in the fluid as 100 Pa. A common misconception was using the equation $P = F \times A$ to calculate the pressure as 1 Pa.

## Question 21(b)(ii)

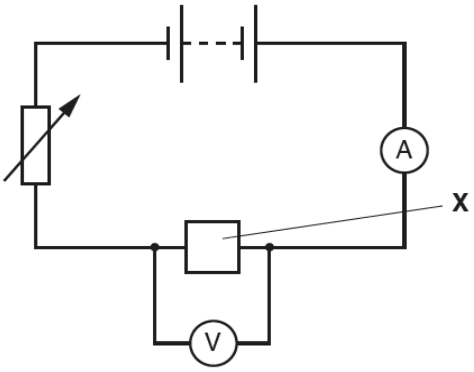
**(ii)** Write down the direction of the force produced by the fluid on the plunger.

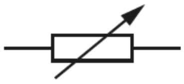
........................................................................................................................................ **[1]**

Many answers here bore no relationship to the diagram: Any clear indication of direction including 'left' or 'at right angles' or 'perpendicular/90° to the plunger' were accepted. Ambiguous and inappropriate directions such as 'to the east' were not credited.

## Question 22(a)(i)

**22** A student builds a circuit to investigate the resistance of component **X**.




**(a) (i)** What is the name of this component? 

........................................................................................................................................ **[1]**

Q22 is an overlap question with J249/03.

Very few candidates recognised that this was a variable resistor. Many thought it was a thermistor.

## Question 22(a)(ii)

**(ii)** Why is this component needed in this circuit?

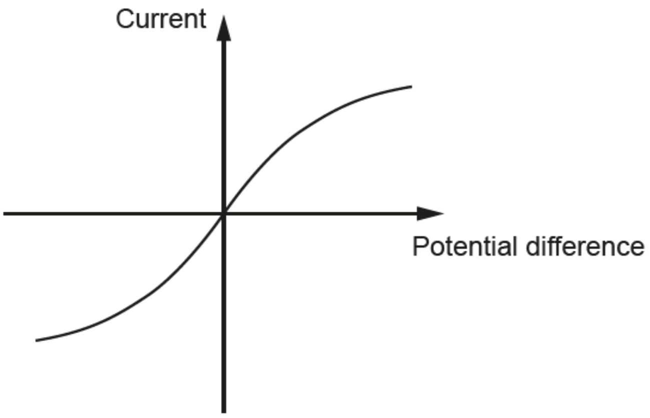
........................................................................................................................................ **[1]**

Candidates who misidentified the variable resistor in Q22(a)(i) were not able to answer this question.

## Question 22(b)(i)

**(b)** The student uses the circuit to take current and potential difference readings.

The student plots a graph of her results.




**(i)** Look at the graph.

What is component **X** in the circuit?

........................................................................................................................ **[1]**

More able candidates were able to recognise the response of a filament lamp.

## Question 22(b)(ii)

**(ii)** The resistance of component **X** varies as the potential difference changes.

Describe **how** the graph shows this and explain **why** this happens.

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........................................................................................................................ **[3]**

This overlap question was challenging for most candidates. Most stated 'as p.d. increases, current increases' which does not address the fact that the *V*/*I* ratio is increasing, due to the graph curving downwards, so *R* must be increasing also.

## Question 22(c)(i)

**(c)** Component **X** has a resistance of 16 Ω when a current of 0.25 A flows.

**(i)** Calculate the potential difference across component **X**.

Use the equation: Potential difference = Current × Resistance

Answer = ...................................................... V **[2]**

Most candidates were successfully completed the calculation.

## Question 22(c)(ii)

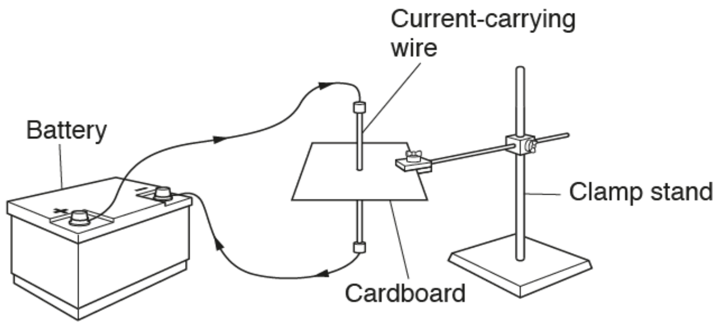
**(ii)** Calculate the power of component **X** when a current of 0.25 A flows.

Answer = ...................................................... W **[3]**

A quarter of all candidates calculated the correct answer here. Very few of the other candidates recognised that Q22(c)(i) and Q22(c)(ii) were a developing story and so did not multiply the answer to the first part of the question (4 V) by 0.25 A to calculate the answer to the second part.

## Question 23(a)(i)

**23** A student sets up an experiment to investigate the magnetic field around a current-carrying wire.




**(a) (i)** Describe how the student could use this experiment and a compass to investigate the magnetic field produced by the wire.

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........................................................................................................................ **[3]**

Q23 is an overlap question with J249/03.

Identifying the command word 'describe' was key to candidates successfully answering this question. Those that did were able to apply their experience of practical activities supporting P4.1 and wrote down what they could do with a plotting compass in this experiment.

## Exemplar 14

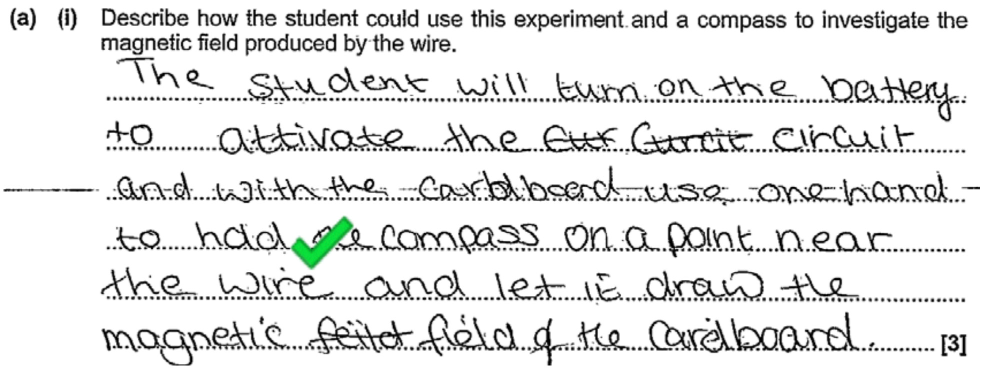
**(a) (i)** Describe how the student could use this experiment and a compass to investigate the magnetic field produced by the wire.

If you place a compass on top of the wire it should in the north direction ✗

........................................................................................................................ **[3]**

This candidate has not understood the question and is answering a different one about predicting how the compass will behave.

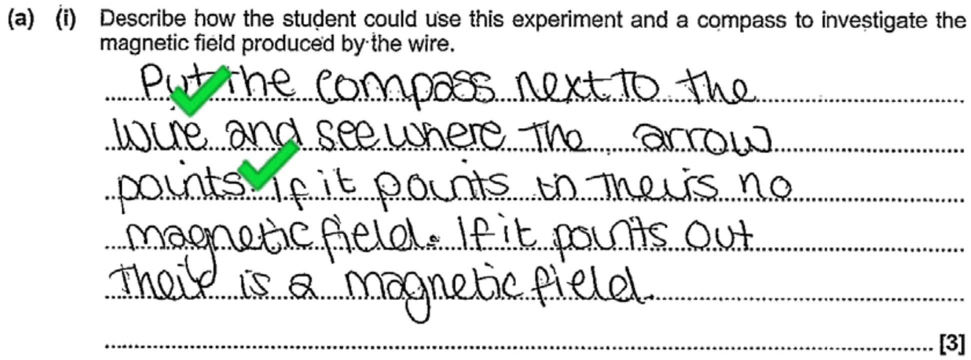
## Exemplar 15


(a) (i) Describe how the student could use this experiment and a compass to investigate the magnetic field produced by the wire.

The student will turn on the battery to attivate the ~~Cur Curcit~~ circuit and with the cardboard use one hand to hold ~~the~~ compass on a point near the wire and let it draw the magnetic ~~feild~~ field of the cardboard. [3]

The candidate has not thought out what they were going to say, so they have only made one relevant point before running out of space.

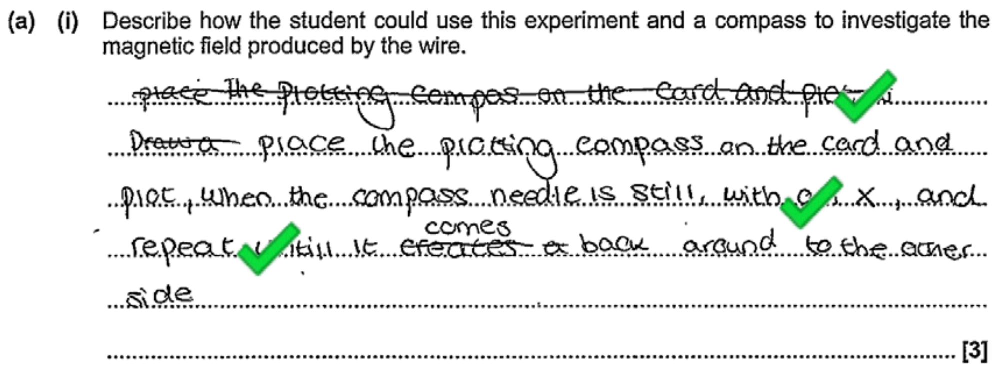
## Exemplar 16


(a) (i) Describe how the student could use this experiment and a compass to investigate the magnetic field produced by the wire.

Put the compass next to the wire and see where the arrow points. if it points in There is no magnetic field. If it points out Their is a magnetic field. [3]

If the candidate had written their answer as bullet points it would have helped them to identify that after the first two clear descriptions they were no longer describing how to investigate a magnetic field.

## Exemplar 17


(a) (i) Describe how the student could use this experiment and a compass to investigate the magnetic field produced by the wire.

~~place The Plotting Compas on the Card and plo~~ ~~Draw a~~ place the plotting compass on the card and plot, when the compass needle is still, with a x, and repeat until it comes ~~crcates or~~ back around to the other side [3]

This candidate's response is a good example of the effective use of short clear instructions when describing experimental procedures . It is much easier to follow this type of scientific writing rather than continuous descriptive prose in longer sentences.

**AfL**

Give the students the instructions for a practical activity as a single descriptive paragraph and ask them to summarise the instructions a fixed number of short bullet points. Alternatively ask them to write down the procedure after they have completed the activity, but keeping to a word limit.

## Question 23(a)(ii)

**(ii)** Draw the shape of the field which would be found around **this** wire.

**[2]**

Some good answers were drawn by candidates. However, the annotated field direction on the drawings were not always correct. The question explicitly asks for the shape of the field around **this** wire. A common misconception was to draw the field around a bar magnet.

## Question 23(b)

**(b)** The behaviour of a magnetic compass is evidence that the core of the Earth is magnetic. Explain why.

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..................................................................................................................................... **[2]**

This was a challenging question for candidates. This question asks about a quite separate behaviour of a magnetic compass in the Earth's magnetic field. Wherever you might happen to be on the surface of the Earth a magnetic (dipping) compass will always point north (or south). There were very few candidates who referred to the angle of dip in the direction of the north (or south) magnetic pole. Or that at the magnetic poles a dipping compass dips vertically downward towards the core of the Earth.

## Erratum notice

Turn to **page 9** of the **question paper** and look at question **16(c)**.

At the end of the answer line, cross out 'C' and replace with 'J'

The answer line should now read:

Answer = ……………………………… J

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