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Examiners' Report
March 2013

GCSE Physics 5PH2F 01

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March 2013

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Introduction

This examination sets out to allow candidates to demonstrate that they can accurately recall concepts and phenomena in physics and can communicate their understanding using both qualitative and quantitative models. The broad base of ideas used in the specification relates the understanding of significant concepts to important uses for today and in the future.

The assessment is through multiple choice questions, short answers, extended writing, calculations and analysis. Candidates need to be familiar with the use of equations, be able to express their ideas clearly and concisely and interpret scientific data which is presented in a variety of ways.

The work produced for the examination showed that candidates have gained confidence in answering the six-mark questions. Generally they have become better able to assimilate information and present it in the form required to answer the question. However, when considering nuclear waste and the effects of electrostatic charge many candidates still presented a series of facts and did not link these to make a coherent explanation. There was also a lack of understanding of nuclear fission and how the heat from the nuclear reaction is used in the same way to generate electricity, as in any other power station.

Candidates also need to understand the importance of the correct use of scientific terms, for example, ‘atom’ and ‘nucleus’ are not interchangeable, and to mention what happens to the momentum, force or deceleration when considering the comfort of passengers when a plane is landing.

It is important that candidates learn to produce labelled diagrams to help with descriptions and are able to put a line of best fit on a graph. They also need to appreciate that this line may be a curve rather than a straight line.

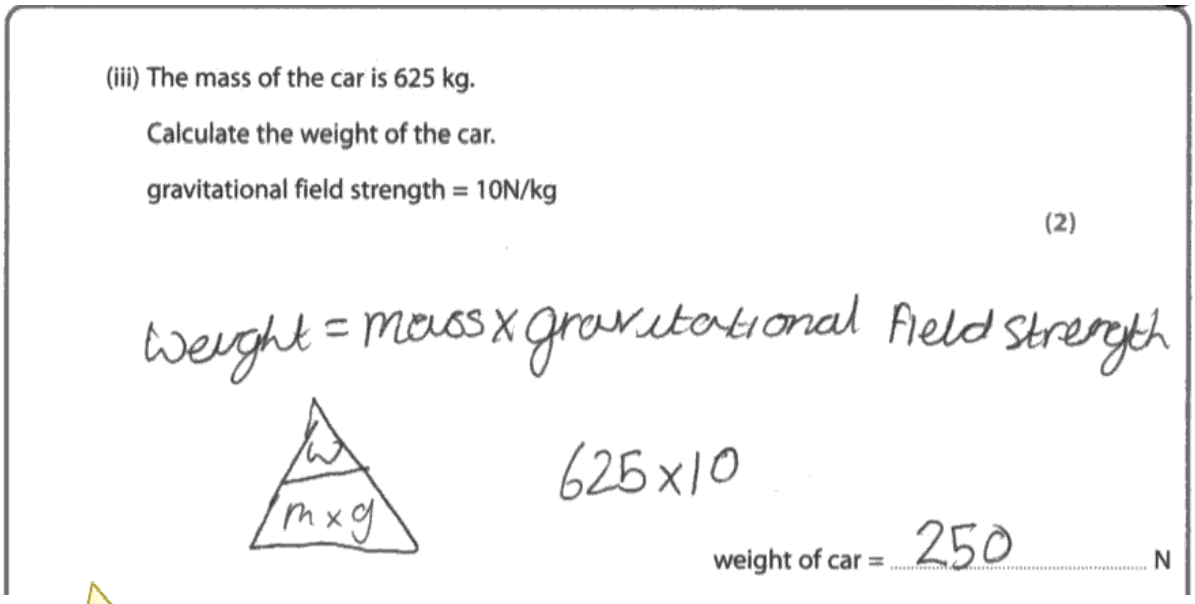
The formulae sheet at the front of the examination paper should be familiar to candidates and should be used on a regular basis throughout the course. Full marks are given for correct answers to calculations, with or without working. Writing down the correct formula enables candidates to substitute in an equation even if they are unable to make further progress. As many candidates do not have the use of a calculator, even though it is a prerequisite for this paper, then this would mitigate against them losing all of the marks for a calculation. It was also noticeable that even with the use of a calculator a significant number of candidates having substituted correctly were unable to use a calculator to divide accurately due to confusion between the divisor and the dividend.

This report will provide exemplification of candidates’ work, together with tips and/or comments, for a selection of questions. The exemplification will come mainly from questions which required more complex responses from candidates.

Motion and forces

Question 1(a)(iii)

Most candidates were able to give the correct answer to this question. Some quoted the equation, showed a substitution and then produced the correct answer. A few decided that the numbers must be divided or subtracted. Repeated use of the formulae sheet throughout the course may prevent this error.



(iii) The mass of the car is 625 kg.

Calculate the weight of the car.

gravitational field strength = 10N/kg

(2)

Weight = mass x gravitational field strength

W

m x g

625 x 10

weight of car = 250 N

ResultsPlus
examiner comment

Although the answer is incorrect, 1 mark was awarded for the correct substitution.

ResultsPlus
examiner tip

Use the formulae sheet and find the correct equation.

(iii) The mass of the car is 625 kg.

Calculate the weight of the car.

gravitational field strength = 10N/kg

(2)

625 ÷ 10 = 62.5 N

weight of car = 62.5 N

ResultsPlus
examiner comment

This answer was not awarded any marks.

The candidate has not looked at the formulae sheet to find the correct equation and has divided by 10 instead of multiplying.

ResultsPlus
examiner tip

Use the formulae sheet to write down the correct equation then substitute.

(iii) The mass of the car is 625 kg.

Calculate the weight of the car.

gravitational field strength = 10N/kg

(2)

weight of car = 62·5 N

ResultsPlus
examiner comment

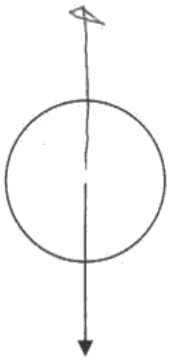
This is another answer that was not awarded any marks.
The candidate has obviously divided by 10 instead of multiplying.

ResultsPlus
examiner tip

As before, use the formulae sheet to write down the correct equation then substitute.

Question 1(b)(i)

The majority of candidates showed the other force acting on the ball by an arrow pointing upwards. A mark was given for the arrow being placed anywhere on the diagram but it should be vertical from the same point as the weight. The labelling should be 'air resistance', 'upthrust' or 'drag'. 'Reaction' was not accepted as both of the forces are acting on the same object.



(i) Draw and label an arrow on the diagram to show the other force acting on the ball.

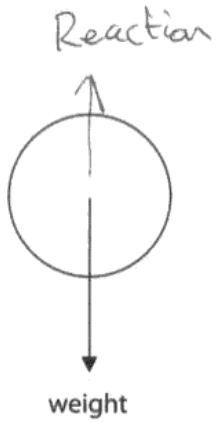
(2)

ResultsPlus
examiner comment

1 mark was awarded, the arrow was not labelled.

ResultsPlus
examiner tip

Read the question carefully and make sure that all parts of the question are completed.



(i) Draw and label an arrow on the diagram to show the other force acting on the ball.

(2)

ResultsPlus
examiner comment

The arrow is correct so 1 mark was awarded but 'reaction' is not an acceptable alternative to air resistance so this answer could not achieve both marks.

Question 1(b)(ii)

Candidates must read the whole question to establish that the ball is moving at a steady speed. As it is not accelerating or decelerating the forces are balanced.

Since the forces are balanced, there is no acceleration, ie the acceleration is zero.

Power from the nucleus

Question 2(a)(ii)

The particles in the nucleus are neutrons and protons. Some candidates gave the answer ‘electrons’. Although electrons are emitted from the nucleus in the form of beta particles, electrons on their own do not exist in the nucleus.

Question 2(b)

This question was generally poorly answered. Some candidates confused fission with fusion and described particles joining; other candidates did not know that it was a nucleus that was split by absorbing a neutron. However, a large number of candidates did know that a product of nuclear fission was 'daughter nuclei' or that the splitting of nuclei was the start of a chain reaction.

(b) Nuclear fission is the reaction that happens in a nuclear power station.

Explain what happens when nuclear fission occurs.

(2)

When nuclear fission occurs ~~an~~ energy is given off and a chain reaction begins.

ResultsPlus
examiner comment

This answer gained 1 mark for ‘chain reaction’.

(b) Nuclear fission is the reaction that happens in a nuclear power station.

Explain what happens when nuclear fission occurs.

(2)

NUCLEAR FISSION OCCURS WHEN U235 get hit by a atom and Splits it into U236 and 2 daughter nuclei's at 3 nuetrons

ResultsPlus
examiner comment

This answer was awarded both marks.

'Uranium 235 splits' was allowed instead of 'nucleus' and the second mark was given for either '2 daughter nuclei' or '3 neutrons'.

'U236' and 'hit by an atom' were ignored.

ResultsPlus
examiner tip

Always write as full an answer as possible; in many cases incorrect parts will be ignored.

(b) Nuclear fission is the reaction that happens in a nuclear power station.

Explain what happens when nuclear fission occurs.

(2)

its Where a neutron colides with a uranium 235 and it splits the uranium releasing lots of energy and three neutrons which gone on to do the same thing

ResultsPlus
examiner comment

This answer included 4 possible marking points but the maximum mark available was 2, so these were awarded.

ResultsPlus
examiner tip

You should be able to answer the question to get full marks in the space provided. If you need more space, reread the question and make sure you are giving just the answer required.

Question 2(c)

Candidates generally did not understand that control rods are used to control the rate of reaction in a nuclear reactor. Some confused the control rods with the moderator; others knew that something was absorbed but did not know that it was neutrons.

(c) Control rods are used in the nuclear reactor.

Explain how these rods stop the nuclear reaction from getting out of control.

(2)

Control rods absorb neutrons and stop them from being fired

ResultsPlus
examiner comment

This answer states that neutrons are absorbed and was awarded 2 marks.

(c) Control rods are used in the nuclear reactor.

Explain how these rods stop the nuclear reaction from getting out of control.

(2)

When Control rods are used they absorb 2 of the protons slowly slowing down reaction rates by doing this it reduces thermal-nedde.

ResultsPlus
examiner comment

1 mark was awarded for 'absorbed' and a mark was also awarded for 'slows down the reaction'. The use of 'proton' is ignored.

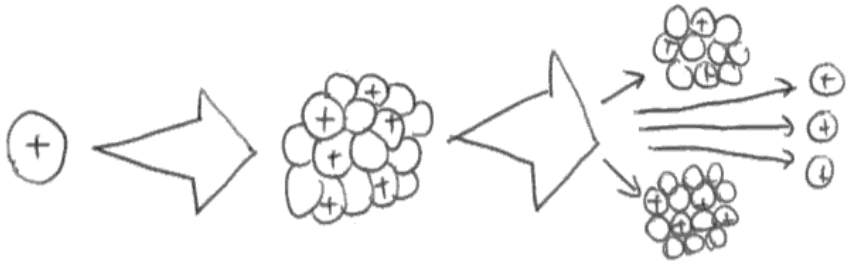
Question 2(d)

It was disappointing that so few of the candidates realised that, once the nuclear reactor had been used to generate heat, the process of generating electricity using the heat was exactly the same as for any other power station.

(d) Describe how the thermal energy produced by the nuclear reaction is used to produce electricity.

You may draw a diagram to help with your answer.

(2)



a proton travels looking for an atom, when it finds the atom, it attaches to the nucleus making it positive / unstable. It then explodes letting out three protons as it parts. The whole cycle starts again with each of those protons

(Total for Question 2 = 8 marks)

ResultsPlus
examiner comment

This response was not awarded any marks as it does not answer the question.

ResultsPlus
examiner tip

Read the whole question carefully.

This question does not ask candidates to 'describe how thermal energy is produced in a nuclear reaction' but it does ask them to 'describe how the thermal energy produced by a nuclear reaction is used to produce electricity'.

(d) Describe how the thermal energy produced by the nuclear reaction is used to produce electricity.

You may draw a diagram to help with your answer.

(2)

the heat from a nuclear reactor heats water and forms steam. The steam then rises and turns a turbine as the turbine spins electrical energy will be produced in a generator and get transferred to the Pylons and then to a city

(Total for Question 2 = 8 marks)

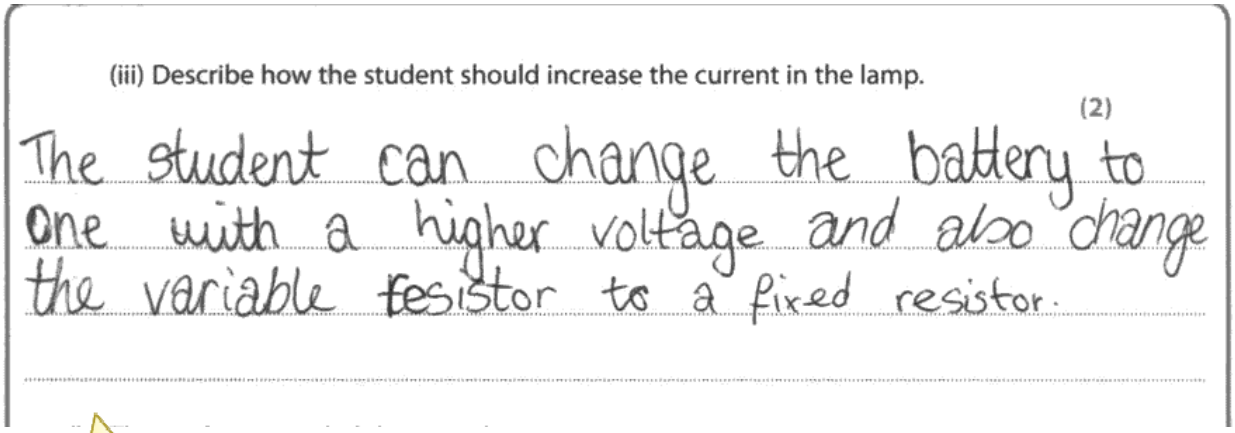
ResultsPlus
examiner comment

This response gives more than enough correct information to be awarded 2 marks.

Filament lamps

Question 3(a)(iii)

This question showed that candidates do have an understanding of how the current in a circuit can be controlled. Increasing the voltage or decreasing the resistance were both equally popular answers.



(iii) Describe how the student should increase the current in the lamp. (2)

The student can change the battery to one with a higher voltage and also change the variable resistor to a fixed resistor.

ResultsPlus
examiner comment

This answer was awarded 2 marks for 'higher voltage'.

Either 'change the battery' or 'change the variable resistor to a fixed resistor' would qualify for 1 mark.

ResultsPlus
examiner tip

When stating as an answer that a quantity will change, remember to explain what the change will be, ie bigger or smaller, increase or decrease.

Question 3(b)

Most candidates could score at least 1 mark in their answers to this question. Marks were lost by candidates not reading the question carefully and so not realising that not only have points to be plotted but the line of best fit also has to be drawn.

(b) The student recorded these readings.

current / A	potential difference / V
0.00	0.0
0.20	2.0
0.31	4.0
0.37	6.0
0.42	8.0
0.44	10.0

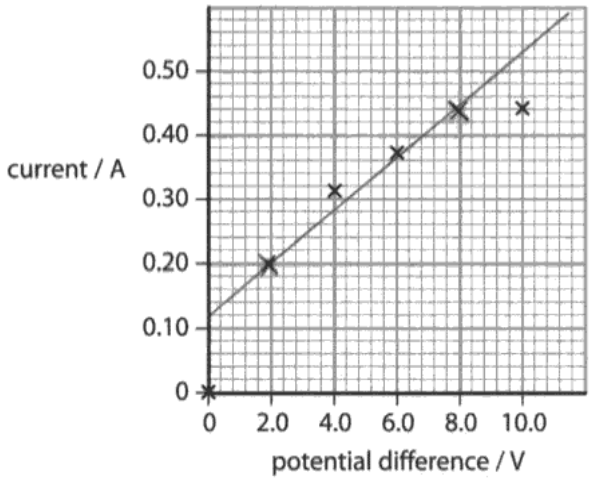
Four points are plotted on the graph.

(i) Plot the points for 2.0 V and 8.0 V.

(1)

(ii) Draw the line of best fit.

(1)



ResultsPlus
examiner comment

The point (8.0,0.42) has been plotted incorrectly and the point at the origin has been ignored in attempting to draw the line of best fit. No marks were awarded.

ResultsPlus
examiner tip

Check the graph scale before plotting points. Consider all the points when drawing a line of best fit.

(b) The student recorded these readings.

current / A	potential difference / V
0.00	0.0
0.20	2.0
0.31	4.0
0.37	6.0
0.42	8.0
0.44	10.0

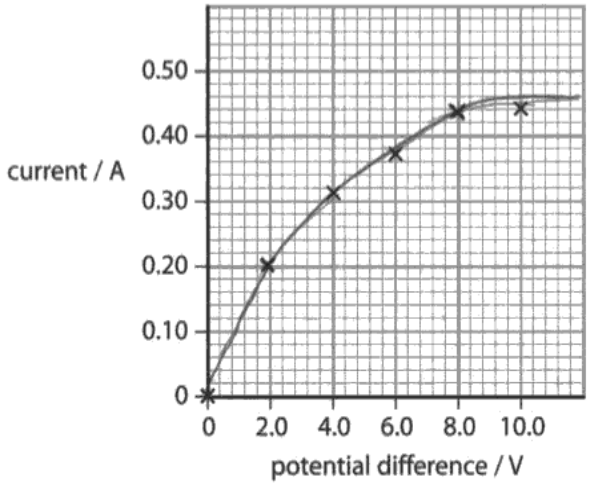
Four points are plotted on the graph.

(i) Plot the points for 2.0 V and 8.0 V.

(1)

(ii) Draw the line of best fit.

(1)



ResultsPlus
examiner comment

An incorrect point has been plotted but there is a reasonable line of best fit although it does not go through the top point. 1 mark was awarded.

ResultsPlus
examiner tip

Remember that the line of best fit may be a curve.

(b) The student recorded these readings.

current / A	potential difference / V
0.00	0.0
0.20	2.0
0.31	4.0
0.37	6.0
0.42	8.0
0.44	10.0

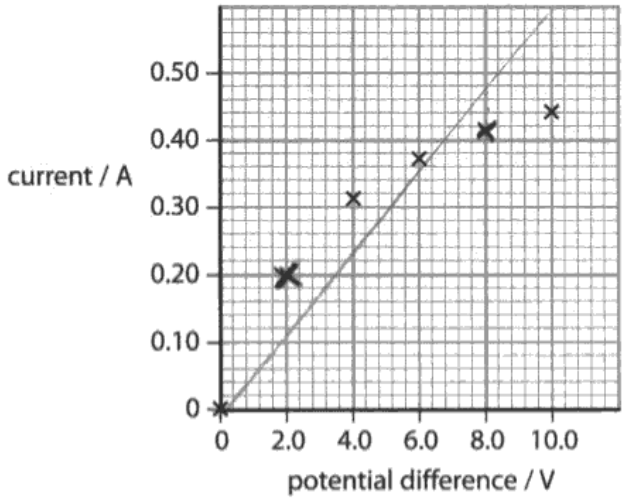
Four points are plotted on the graph.

(i) Plot the points for 2.0 V and 8.0 V.

(1)

(ii) Draw the line of best fit.

(1)



ResultsPlus
examiner comment

This response scored 2 marks.

The points are plotted correctly. The line goes through the origin and has a reasonable distribution of points on either side.

Question 3(c)

This question was generally answered well but some candidates were unable to correctly insert values into an equation that they were given and others are unable to complete the division correctly.

(c) Calculate the resistance of the lamp when the current is 0.44 A and the potential difference is 10.0 V.

(2)

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

$\frac{10.0}{0.44}$

23.00

resistance = [illegible] Ω

ResultsPlus
examiner comment

This response includes the substitution and correctly takes the answer to two significant figures (although significant figures were ignored for this calculation). 2 marks were awarded.

(c) Calculate the resistance of the lamp when the current is 0.44 A and the potential difference is 10.0 V.

(2)

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

$\frac{10.0V}{0.44A} = 2.27\Omega$

resistance = ... Ω

ResultsPlus
examiner comment

This response scored 1 mark for showing the substitution, although the final answer is incorrect.

ResultsPlus
examiner tip

Always show the examiner what you are doing with numerical values, do not just give the answer.

(c) Calculate the resistance of the lamp when the current is 0.44 A and the potential difference is 10.0 V.

(2)

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

$\frac{10.0}{0.44} = 0.044$

resistance = 0.044 Ω

ResultsPlus
examiner comment

This candidate could correctly substitute but either did not understand the meaning of the division sign or was using the calculator incorrectly. 1 mark was awarded.

ResultsPlus
examiner tip

Make sure you can divide correctly.

(c) Calculate the resistance of the lamp when the current is 0.44 A and the potential difference is 10.0 V.

(2)

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

$R = \frac{0.44}{10}$

resistance = 0.044 Ω

ResultsPlus
examiner comment

Candidates must know what the symbols used in the equation mean. This answer did not receive any marks.

ResultsPlus
examiner tip

Use the formulae sheet at the front of the examination paper. This gives the equations in both words and symbols.

Question 3(d)

A large number of candidates did not mention any type of energy in their answer. The simple answer of 'electrical energy is converted to light and heat' was not often given.

(d) Describe the energy transfer that takes place in the lamp.

(2)

The flow of electrons come from the cell and flow into the bulb that (if filament) will light up the filament to be white-hot. (if noble gas) will pass a flow of electrons through causing the gas to glow.

(Total for Question 3 = 10 marks)

ResultsPlus
examiner comment

This answer mentions light but not as a form of energy and so was not awarded any marks.

(d) Describe the energy transfer that takes place in the lamp.

(2)

the energy transfer that takes place in the lamp is that it loses some energy.

(Total for Question 3 = 10 marks)

ResultsPlus
examiner comment

This answer does not give the name of the energy that was lost and therefore does not score any marks.

ResultsPlus
examiner tip

Remember to name energy types when dealing with energy transfer.

Down to Earth

Question 4(b)(ii)–(iii)

Most candidates used the equation correctly and calculated the momentum of the aircraft but did not realise that the momentum was zero when it stopped and therefore the change in momentum was the same as the value for the momentum.

(ii) The velocity of the aircraft when it lands is 75 m/s.

The mass of the aircraft is 130 000 kg.

Calculate the momentum of the aircraft.

(2)

75m/s x 130 000kg =

momentum = 9750000 kg m/s

(iii) The aircraft comes to a stop.

State the momentum change of the aircraft from when it lands to when it stops.

(1)

change in momentum = 9749925 kg m/s

9750000 - 75 = 9749925

ResultsPlus
examiner comment

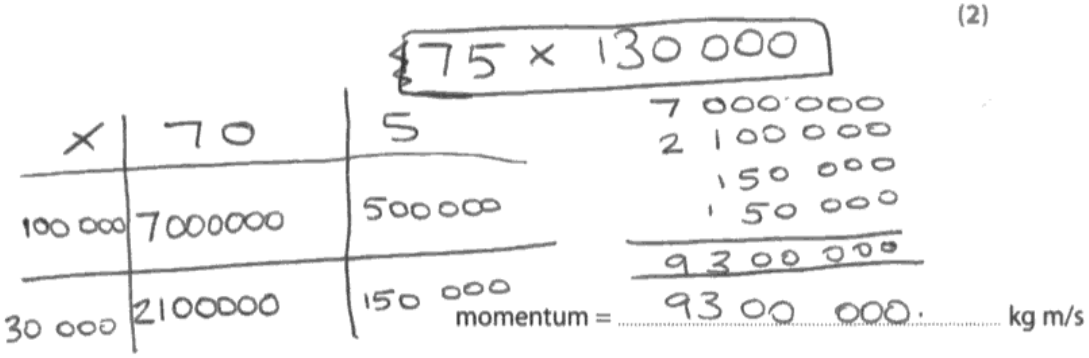
This candidate is just trying to use the numbers given in the question rather than trying to understand the physics. 2 marks were awarded for (b)(ii) but no marks were awarded for (b)(iii).

(ii) The velocity of the aircraft when it lands is 75 m/s.

The mass of the aircraft is 130 000 kg.

Calculate the momentum of the aircraft.

(2)



momentum = 9300 000 kg m/s

(iii) The aircraft comes to a stop.

State the momentum change of the aircraft from when it lands to when it stops.

(1)

change in momentum = ... kg m/s

ResultsPlus
examiner comment

All candidates need to have calculators for this examination. 1 mark was awarded here for showing substitution in (b)(ii).

(ii) The velocity of the aircraft when it lands is 75 m/s.

The mass of the aircraft is 130 000 kg.

Calculate the momentum of the aircraft.

(2)

momentum = 9750,000 kg m/s

(iii) The aircraft comes to a stop.

State the momentum change of the aircraft from when it lands to when it stops.

(1)

change in momentum = 0 kg m/s

ResultsPlus
examiner comment

This candidate read that the aircraft had stopped and stated the momentum when it had stopped rather than the change in momentum as the question required. 2 marks were awarded for (b)(ii) but no marks would be awarded for (b)(iii).

ResultsPlus
examiner tip

Read each part of the question carefully.

Question 4(c)(i)

Many candidates gave answers based on non-scientific, everyday ideas. It showed that such candidates have a poor grasp of the concept of momentum as they did not realise that if the aircraft takes a longer time to slow down then the momentum changes more gradually and the force on the passengers would be less. Candidates must include scientific concepts rather than non-scientific ideas, such as the passengers would be 'thrown forward'.

(c) When the aircraft lands, the momentum of each passenger also changes.

(i) Explain why it is more comfortable for a passenger if the aircraft takes a longer time to slow down.

(2)

The passengers will not be pushed back into their seats a force will be acting on the passengers it takes longer to slow down there will be less force acting on them

ResultsPlus
examiner comment

This candidate was awarded 1 mark for knowing that if the plane takes a longer time to stop then the force acting on the passengers will be less.

ResultsPlus
examiner tip

Understand that when momentum changes there is a force exerted and the longer it takes the momentum to change the smaller the force.

(c) When the aircraft lands, the momentum of each passenger also changes.

(i) Explain why it is more comfortable for a passenger if the aircraft takes a longer time to slow down.

(2)

The longer the aircraft takes to slow down the easier it becomes on the passengers, so their bodies can readjust better to coming back on land. The slower the aircraft lands also makes it safer to land on the ground instead of increasing the speed on the aircraft.

ResultsPlus
examiner comment

This answer was not awarded any marks as it does not use any physical concepts in attempting to give an explanation.

(c) When the aircraft lands, the momentum of each passenger also changes.

(i) Explain why it is more comfortable for a passenger if the aircraft takes a longer time to slow down.

(2)

because there is less force and slower rate of momentum decrease

ResultsPlus
examiner comment

This answer includes a correct reference to both force and momentum so was awarded 2 marks.

Question 4(c)(ii)

Many candidates realised that the need for a longer runway had something to do with an aircraft having greater mass, velocity or momentum but did not always include two factors in order to gain both marks.

(ii) Suggest why some aircraft need a very long runway to land safely.

(2)

because they are heavyer Aircrafts and they are travling at a faster speed these both have effects on the stopping distance.

(Total for Question 4 = 10 marks)

ResultsPlus
examiner comment

This answer was awarded 2 marks; 'heavyer' being taken as acceptable for 'greater mass' and 'faster speed' for higher velocity.

(ii) Suggest why some aircraft need a very long runway to land safely.

(2)

Because the momentum might be higher and needs a long time to slow down therefore its going to need a longer run way.

(Total for Question 4 = 10 marks)

ResultsPlus
examiner comment

Only 1 mark was awarded for the mention of higher momentum.

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If 2 marks are assigned to an answer, remember you should make two relevant points to be awarded both marks.

Living with radioactivity

Question 5(a)(i)

Many candidates did not appreciate that the question asked for a source of background radiation that does not occur naturally, which ruled out cosmic rays, food, etc. This question also showed that a significant number of candidates believe that chemotherapy is radioactive rather than being treatment by drugs. The most frequently seen correct answer was X-ray (machines).

Question 5(a)(ii)

The fact that radon gas originates in granite rocks was known by surprisingly few candidates. However, if the origin was known then it easily explained why some parts of the country did not have radon and this gave candidates the opportunity of scoring both marks.

(ii) Radon gas is a natural source of background radiation.

In some parts of the country, a lot of the background radiation comes from radon gas.

Explain why there is no radon gas in some other parts of the country.

(2)

a Some parts of the country do not have powerplants where they dispose of waste which causes radon gas and other sources of bachround radiation in the air

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Power plants were quite often believed to be the origin of radon gas.
No marks were awarded.

(ii) Radon gas is a natural source of background radiation.

In some parts of the country, a lot of the background radiation comes from radon gas.

Explain why there is no radon gas in some other parts of the country.

(2)

Radon gas is released from rocks where it is trapped for years and then released out of tiny cracks or if it is dug out of the ground.

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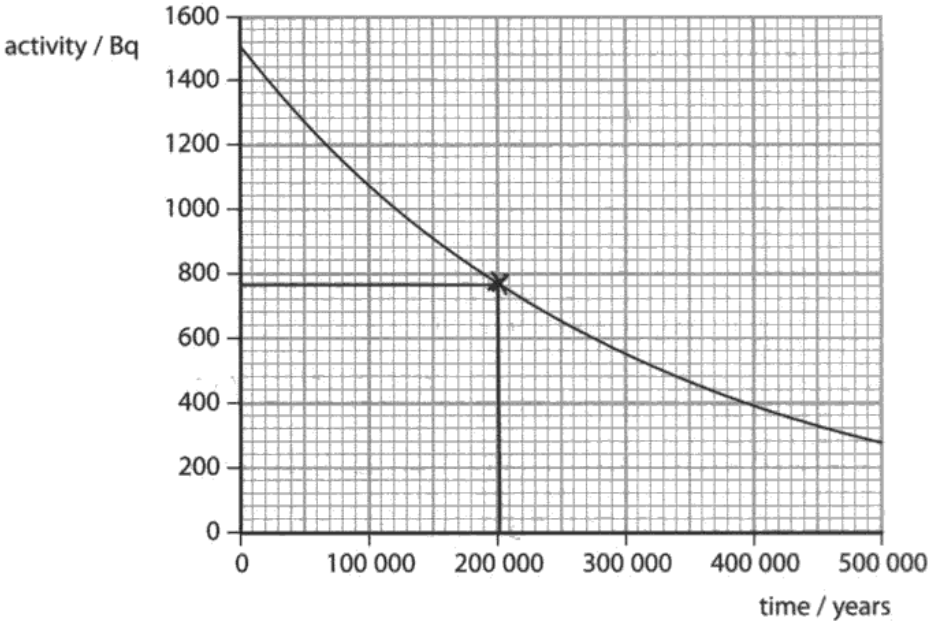
This is a rare example where 1 mark was awarded. The candidate knows the origin of radon gas but does not explain why it is not found in some parts of the country.

Question 5(b)(i)

The majority of candidates were able to score 2 marks. It was unusual for candidates to draw two horizontal lines to the curve at appropriate values of the activity and then show that by taking lines from the curve to the *y*-axis that the half-life was about 200 000 years. Most candidates took half the activity between 700 Bq and 800 Bq and drew a horizontal line to meet the curve and then a vertical line to the *x*-axis indicating the half-life.

(b) Technetium-99 is one of the radioactive isotopes in nuclear waste.

The graph shows the decay curve for technetium-99.



(i) Use the graph to show that the half-life of technetium-99 is about 200 000 years.

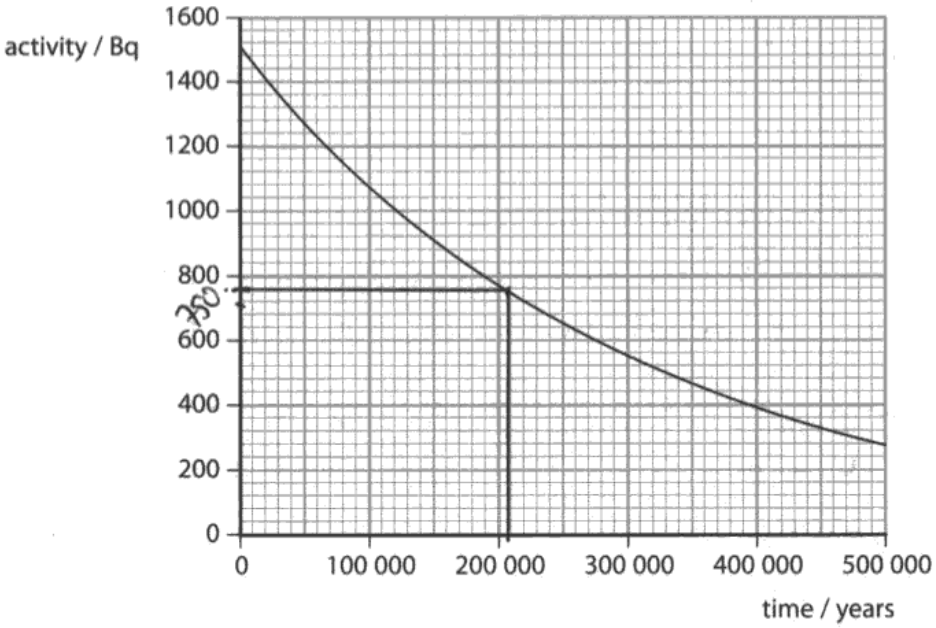
(2)

ResultsPlus
examiner comment

This answer gained 2 marks for showing the half-life is about 200 000 years, having started the horizontal line from 760 Bq.

(b) Technetium-99 is one of the radioactive isotopes in nuclear waste.

The graph shows the decay curve for technetium-99.



(i) Use the graph to show that the half-life of technetium-99 is about 200 000 years.

(2)

peak activity = 1500.

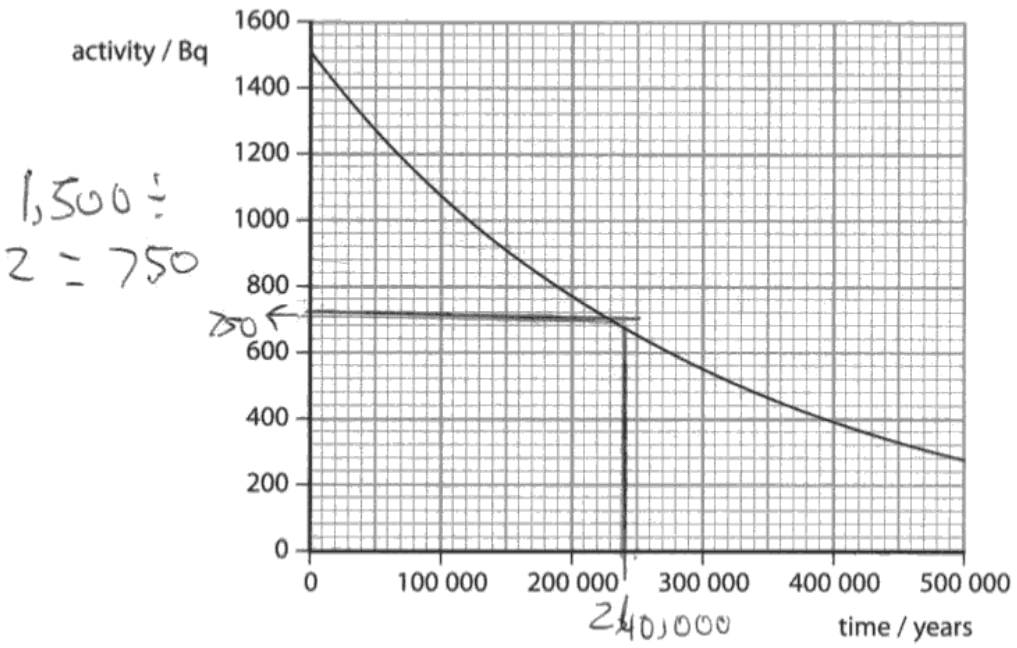
1500 ÷ 2 = 750.

ResultsPlus
examiner comment

This answer gives additional information indicating that half the initial activity is used to determine the half-life and was awarded 2 marks.

(b) Technetium-99 is one of the radioactive isotopes in nuclear waste.

The graph shows the decay curve for technetium-99.



(i) Use the graph to show that the half-life of technetium-99 is about 200 000 years.

(2)

ResultsPlus
examiner comment

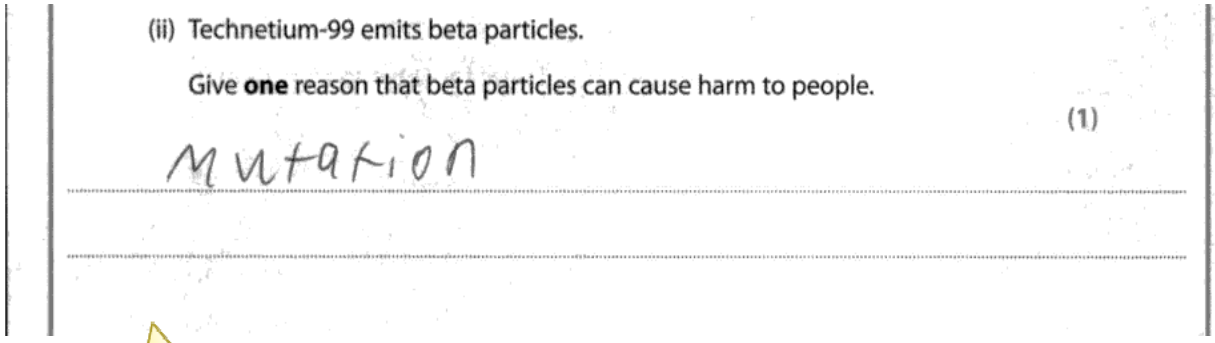
This response only scored 1 mark, as the line from the curve to the *x*-axis does not meet the line from the *y*-axis and gives a value which is out of tolerance.

ResultsPlus
examiner tip

Ensure that lines are drawn accurately and if an incorrect line is replaced indicate clearly which line is to be marked.

Question 5(b)(ii)

A disappointing number of candidates could not offer one of the acceptable answers, either because they gave a general description of the penetration of beta particles rather that relating the answer to people (as requested in the question) or their answers were incomplete.



(ii) Technetium-99 emits beta particles.

Give **one** reason that beta particles can cause harm to people. (1)

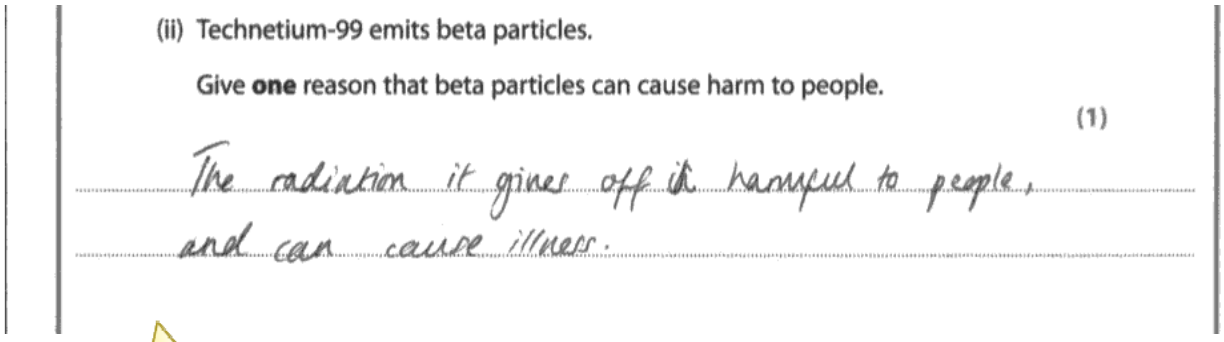
mutation

ResultsPlus
examiner comment

This answer needs to be extended to explain what is likely to be mutated. The mark was not awarded.

ResultsPlus
examiner tip

Make sure your answer provides a complete explanation.



(ii) Technetium-99 emits beta particles.

Give **one** reason that beta particles can cause harm to people. (1)

The radiation it gives off is harmful to people, and can cause illness.

ResultsPlus
examiner comment

An acceptable answer would be that beta particles can cause cancer. This answer does little more than repeat the stem of the question therefore the mark was not awarded.

(ii) Technetium-99 emits beta particles.

Give **one** reason that beta particles can cause harm to people.

(1)

they can travel through materials

ResultsPlus
examiner comment

This answer is not related to people and therefore did not score a mark.

Question 5(c)

Although there has been an improvement in the way candidates answer this type of question, many of them struggled to answer it in a coherent way. The best responses mentioned one or more properties of nuclear waste and then linked them to a problem caused as a result of these properties before going on to suggest one or more solutions.

Less able candidates mentioned that nuclear waste was harmful to humans or named a method for dealing with it. It appeared that some candidates may have felt that they needed to fill all the space available because they repeated the same point in different words.

*(c) There are many radioactive isotopes in nuclear waste.

Technetium-99 is just one of these isotopes.

People are worried about how we should deal with nuclear waste.

Explain why it is difficult to deal with nuclear waste safely.

(6)

It is difficult to deal with nuclear waste safely because many factors need to be considered. Such as its half-life how long it takes to decay. People need to know where exactly to bury it & how deep down into the ground. They need to know how radioactive it is & if its harmful.

ResultsPlus
examiner comment

This answer makes the point that nuclear waste is buried under ground. This is a Level 1 response and was awarded 2 marks.

*(c) There are many radioactive isotopes in nuclear waste.

Technetium-99 is just one of these isotopes.

People are worried about how we should deal with nuclear waste.

Explain why it is difficult to deal with nuclear waste safely.

(6)

It is difficult to deal with nuclear waste safely as it isn't easy to get rid of, it has a long half-life and can travel

ResultsPlus
examiner comment

This answer includes the point that nuclear waste has a long half-life. One isolated point is made; this is a Level 1 response and it scored 2 marks.

*(c) There are many radioactive isotopes in nuclear waste.

Technetium-99 is just one of these isotopes.

People are worried about how we should deal with nuclear waste.

Explain why it is difficult to deal with nuclear waste safely.

(6)

because there is no-where to put the nuclear wast. Its difficult because no-one wants the nuclear waste in their cantry or near them because if it leaks and releases radiation and cause damage to health like cause cancer and mutations. Another reason why its difficult because if ~~its~~ it does leak no-one will know about it. the nuclear waste could have been handled ~~badly~~ badly and could have caused a nuclear bomb causing many deaths.
~~Bdidt~~ the half life for the waste ~~by~~ may be very long so the radiation could go on for a very long time if it leaks.

(Total for Question 5 = 12 marks)

ResultsPlus
examiner comment

This answer gives detail on why it is difficult to get rid of nuclear waste, the problems it can cause and it also gives a property of nuclear waste, ie that it has a long half-life. It is a coherent account linking facts. It is a Level 3 response and was awarded all 6 marks.

ResultsPlus
examiner tip

Try to link facts together using 'because ' or 'therefore'.

*(c) There are many radioactive isotopes in nuclear waste.

Technetium-99 is just one of these isotopes.

People are worried about how we should deal with nuclear waste.

Explain why it is difficult to deal with nuclear waste safely.

(6)

it is difficult to deal with nuclear waste safely because there is few places to dispose it. sometimes it gets dumped in the sea, sometimes it gets launched into space and sometimes it gets buried underground but because it is radioactive it can harm the environment and it can harm people. it can burn/damage the skin, cause cancer and harm people.

ResultsPlus
examiner comment

This answer explains how nuclear waste can be treated and links this to the harm it can cause. It is a Level 2 response and was awarded 4 marks.

Static electricity

Question 6(a)(i)

Most candidates knew that electrons had a negative charge and so scored the mark for this question.

Question 6(a)(ii)

The majority of candidates knew that the mass of an electron is much smaller than the mass of a neutron.

Question 6(b)(i)

The word 'charge' was not used very often but most candidates managed to gain marks for knowing that a spark was likely to be produced and this could cause a fire or explosion. The incorrect answer that was most frequently given was that there was a danger of electrocution.

(b) At a petrol station, a pipe is used to transfer petrol to the storage tanks.

The pipe is earthed.

There is friction between the petrol and the end of the pipe.

(i) Explain why it is dangerous **not** to earth the pipe.

(2)

It can give you an electric shock or cause a spark.

ResultsPlus
examiner comment

1 mark was awarded for 'cause a spark'

(b) At a petrol station, a pipe is used to transfer petrol to the storage tanks.

The pipe is earthed.

There is friction between the petrol and the end of the pipe.

(i) Explain why it is dangerous **not** to earth the pipe.

(2)

The friction could cause a spark that could ignite the petrol which is flammable.

ResultsPlus
examiner comment

This answer is typical of those that scored both marks.

(b) At a petrol station, a pipe is used to transfer petrol to the storage tanks.

The pipe is earthed.

There is friction between the petrol and the end of the pipe.

(i) Explain why it is dangerous **not** to earth the pipe.

(2)

It is dangerous not to earth the pipe because of the charges that are in the pipe could jump to another object that is a conductor and make a spark

ResultsPlus
examiner comment

This is a well-organised answer, which explains that charges jump and produce a spark. It was awarded both marks.

Question 6(b)(ii)

Candidates had to explain 'earthing' in terms of charge or electrons being removed, but many were reluctant to mention charge and often referred to static electricity. There was also a minority of candidates who did not understand the term 'earthing' and thought that it meant the petrol was being put into the ground and so it would be safer if it caught fire.

(ii) Explain how earthing the pipe makes this process much safer.

(2)

It makes it much safer because the charge goes to the groun and it stops there being friction

ResultsPlus
examiner comment

This response mentions charge and where it is going so both marks were awarded.

(ii) Explain how earthing the pipe makes this process much safer.

(2)

It makes any chance of the pipe bursting become no risk as it will be in the earth and cant get to humans.

ResultsPlus
examiner comment

No marks were awarded here; the candidate does not understand the meaning of 'earthing'.

(ii) Explain how earthing the pipe makes this process much safer.

(2)

Earthing the pipe makes this process much safer because any electricity build up from friction will be sent straight to the ground stopping an explosion

ResultsPlus
examiner comment

This response gives electricity, which is not acceptable instead of charge. The first marking point was not given.

However, 'will be sent straight to the ground' is acceptable for 'is removed' so the second marking point was awarded and the answer scored 1 mark overall.

Question 6(c)

Some candidates did not read the question carefully and tried to provide an explanation for all three situations and then often got into a tangle. Others decided to start by explaining how the balloon or rod would be charged and sometimes mentioned movement of electrons at this stage. This was not asked for and they again got into a tangle trying to explain that rubbing the balloon on the hair would charge both the balloon and hair.

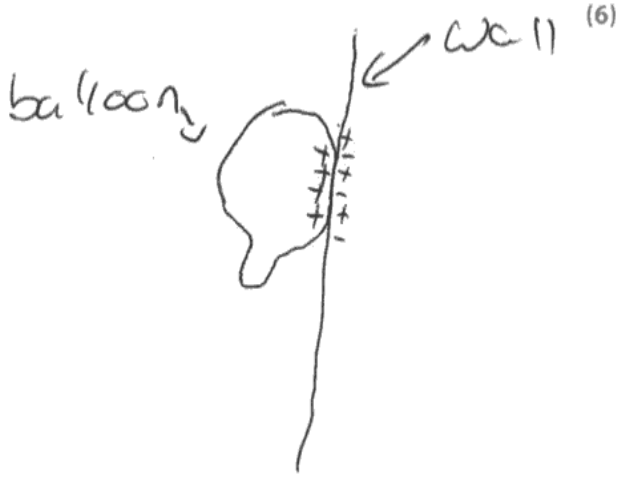
The best responses stated clearly that opposite charges attract and then described the effect they had on the hair, paper or water. A few had never seen water being attracted and despite the picture gave a description to explain why it curved away.

There was a great deal of incorrect science demonstrated in answers to this question but in most cases candidates were able to identify an object that was positively charged and one that was negatively charged and stated there was an attraction because opposite charges attract. Most candidates assumed that the hair, paper and water all had charges and did not consider induction, but diagrams sometimes showed the separation of charges which was worthy of credit.

Explain in terms of electric charges how **one** of these effects is caused.

You may include diagrams to help with your answers.

(6)



When you rub a balloon against your head you're charging it so when you put it against the wall it can stick to it.

ResultsPlus
examiner comment

This answer describes an effect of charging a balloon even though it does not use an example shown in the photographs. The diagram also shows charge on the balloon although it is incorrect on the wall. This is a Level 1 response which was awarded 2 marks.

Explain in terms of electric charges how **one** of these effects is caused.

You may include diagrams to help with your answers.

(6)

when your ~~~ put a stattirely charged object near an object with an opposite charge it attracts each other This is because positive's + negatives attract and due to the balloon is positively charged it attracts the negatively charged hair. we know this because positives only attract negatives

(Total for Question 6 = 12 marks)

TOTAL FOR PAPER = 60 MARKS

ResultsPlus
examiner comment

This answer explains that the hair must be negatively charged but does not consider how it acquired this charge. It then states that negative and positive charges attract. This is a Level 2 response that was awarded 4 marks.

Explain in terms of electric charges how **one** of these effects is caused.

You may include diagrams to help with your answers.

(6)

The balloon has been rubbed on a ~~negatively~~ positively charged surface causing friction and transferring of electrons. The balloon is then attracted to the girls hair because the hair is negatively charged. Opposite charges attract causing her hair to rise to the balloon. The negatively charged electrons in her hair repel each other causing her hair to spread out.

ResultsPlus
examiner comment

This answer not only includes attraction between positive and negative charge but also explains that the hair spreads out because the negative charges repel. This part of the answer is Level 2.

The answer also includes transfer of electrons causing the charge and the diagram shows charge separation for the balloon near the wall. This takes the answer to Level 3 and 6 marks are awarded.

ResultsPlus
examiner tip

Accurate diagrams are very useful when concepts are difficult to explain in words.

Summary

In order to improve their performance candidates should:

- become familiar with the information on the formulae sheet and use it in the examination
- read questions carefully and make sure that they answer the question that is actually asked
- check the scale when adding points to graphs
- consider all points including (0,0) when drawing the line of best fit and remember that a line of best fit need not be a straight line but may be a curve
- name the forms of energy when describing energy transfer
- show substitution in equations for calculations instead of just giving the answer
- use diagrams to help explain difficult concepts
- link the facts in long answer questions with 'because' or 'therefore'.

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