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Examiners' Report
June 2014

GCSE Physics 5PH2F 01

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June 2014

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Introduction

This unit is divided into six topics, and candidates' knowledge and understanding of all six topics is tested in the examination.

It was intended that the examination paper would allow every candidate to show what they knew, understood and were able to do. To achieve this, each question increased in difficulty as the question progressed. Within the question paper, a variety of question types were included, such as objective questions, short answer questions worth 1 or 2 marks each, and longer questions worth 3 or 4 marks each.

The two 6 mark questions were used to test quality of written communication. It was particularly pleasing to note the much improved performance on such questions on this P2 paper compared to earlier series of examinations. Candidates usually wrote more, and more sensibly, in this series.

The overall impression of the examiners was that the majority of candidates had been well prepared for this examination.

Successful candidates were:

- well-grounded in the fundamental knowledge required
- willing to think through the possibilities and apply their knowledge when the question asked for suggestions to explain new situations
- able to tackle calculations methodically and show the stages in their working
- able to construct their explanations in a logical order, using the mark allocations given beside the parts of each question as a guide.

Less successful candidates:

- had gaps in their knowledge
- did not read the questions carefully, giving answers that were related to the topic being tested but did not answer the question
- did not understand the meaning of key scientific words and phrases
- found difficulty in applying their knowledge to new situations
- did not show the stages in their working
- did not think through their answers before writing.

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.

Question 1 (a) (ii)

Candidates were asked what was measured by the meters in the electric circuit.

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Examiner Comments

This candidate correctly answered the question.

ResultsPlus
Examiner Comments

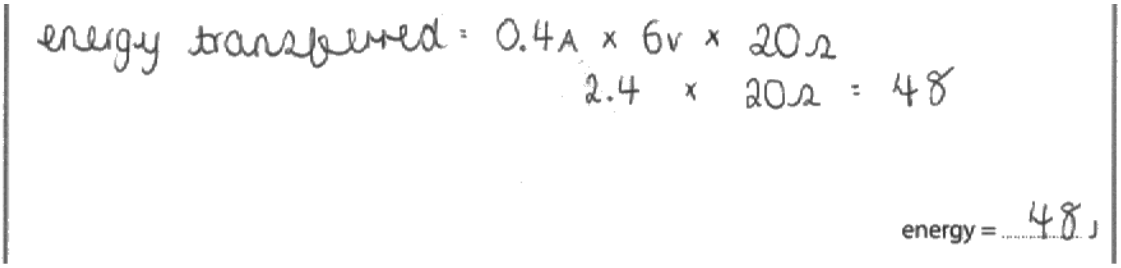
This was a common mistake. This candidate scored 1 mark.

ResultsPlus
Examiner Tip

Always read the question carefully.

Question 1 (b)

Candidates were asked to use the equation energy transferred = current x potential difference x time to calculate the energy transferred to the lamp.

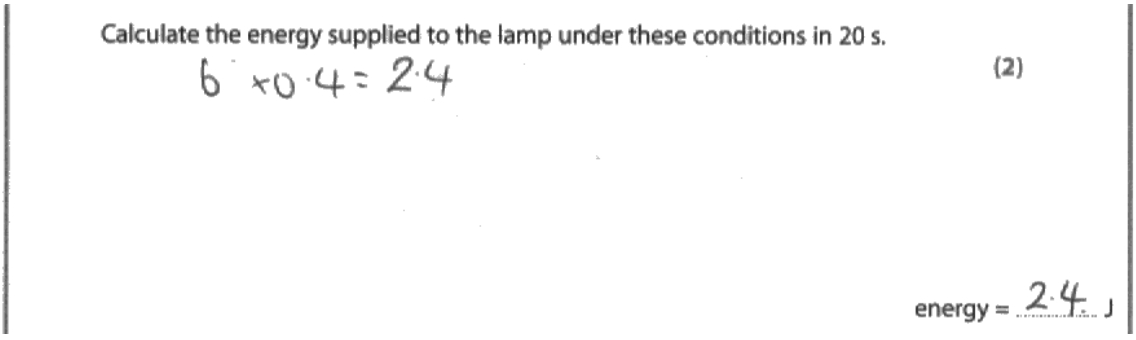


ResultsPlus
Examiner Comments

This candidate has correctly substituted into the equation and correctly evaluated the energy transferred to the lamp.

ResultsPlus
Examiner Tip

Always write down the equation that you are going to use from the front of the paper.



ResultsPlus
Examiner Comments

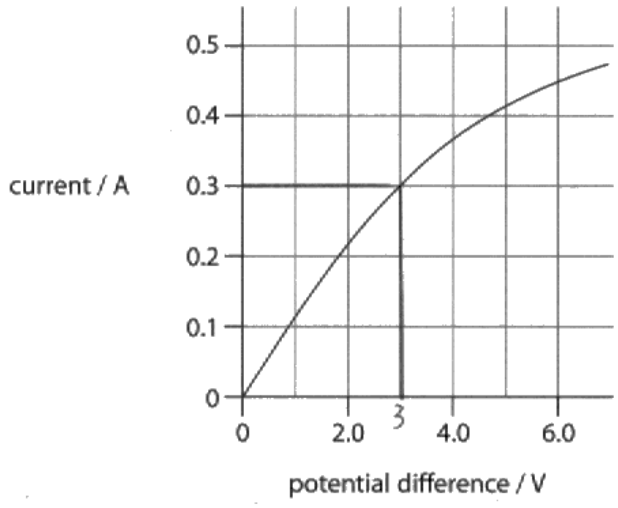
A common mistake was calculating the power of the lamp.

ResultsPlus
Examiner Tip

Always read the question carefully and underline the key words in the question. In this example 'Calculate the energy supplied' should be underlined.

Question 1 (c)

Candidates had to use the graph to find the potential difference across the lamp for a current of 0.3 A and then use these values to calculate the resistance of the lamp filament.



Calculate the resistance of the lamp when the current in the lamp is 0.3 A.

resistance = potential difference ÷ current ($R = V / I$)

(3)

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

$R = \frac{3.0}{0.3} = 10\ \Omega.$

resistance = 10 Ω

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Examiner Comments

Successful candidates showed clearly how the potential difference (voltage) across the lamp was determined from the graph. This candidate shows another useful step by writing the value on the axis.

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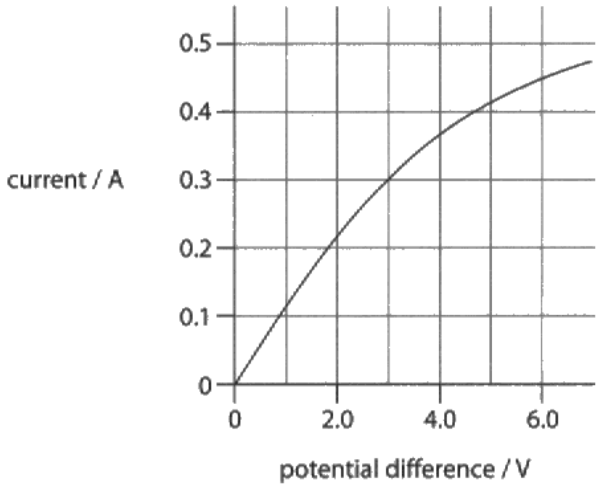
Examiner Tip

With longer calculations write down all your working step by step.

Less successful candidates gave examiners no indication of what they were thinking.



Calculate the resistance of the lamp when the current in the lamp is 0.3 A.

resistance = potential difference ÷ current $(R = V / I)$

(3)

resistance = 20 Ω

ResultsPlus
Examiner Comments

When using a graph, always draw lines to show how you are using the graph.

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Examiner Tip

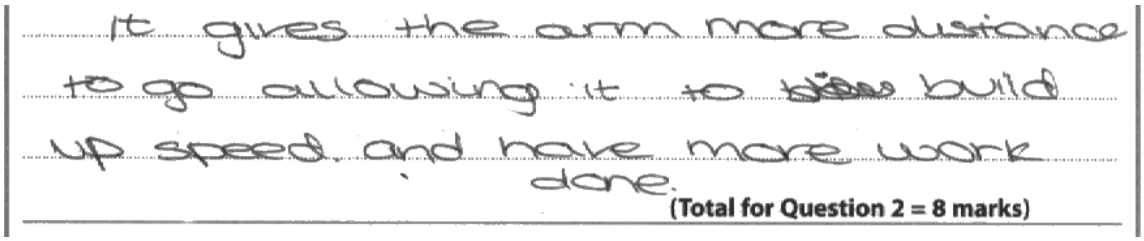
With a 3 mark calculation always show the intermediate steps used in arriving at your final answer.

Question 2 (a) (ii)

Most candidates successfully identified power as the rate of doing work. The most common mistake was to choose 'energy' and occasionally 'speed' was chosen.

Question 2 (b) (iii)

Candidates were asked to explain why more work is done when a javelin thrower extends their throwing arm.



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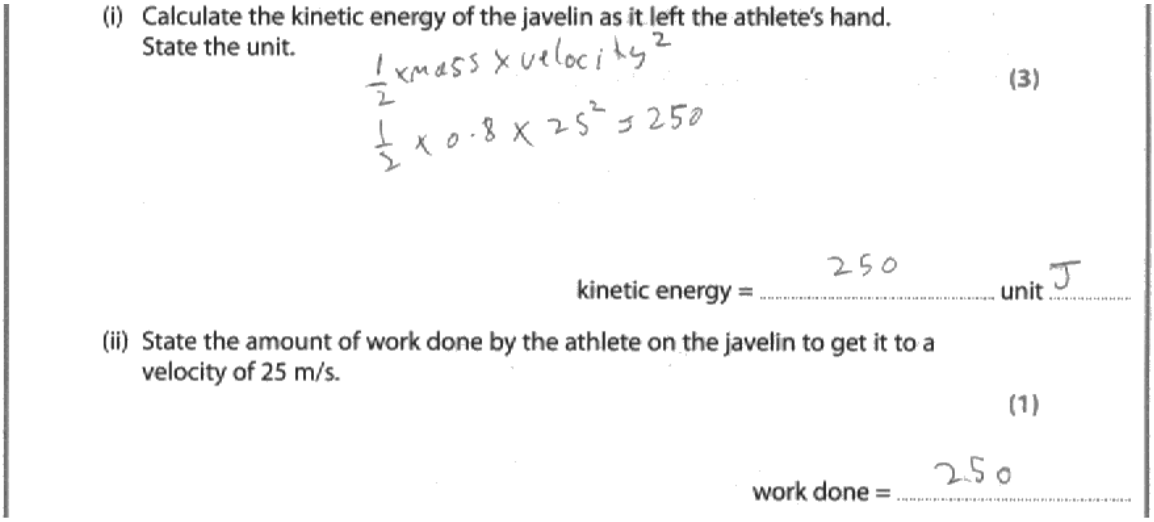
Examiner Comments

This candidate has identified the key idea that extending the arm increases the distance the arm moves but has not linked it to the equation for work done.

Question 2 (b) (i-ii)

Candidates were asked in Q2 (bi) to calculate the kinetic energy of a javelin, stating the unit of energy. In Q2 (bii) they had to equate the increase in kinetic energy to the work done on the javelin. Many candidates scored well in the first part but, often failed to give the joule (J) as the correct unit. Part b (ii) was only answered correctly in a small minority of cases.



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Examiner Comments

This is an example of a fully correct response. Candidates were not required to give a unit in part b (ii).

$\frac{1}{2}$ mass × velocity^2

0.4 × 25^2 = 250

(3)

kinetic energy = 250 unit J

(ii) State the amount of work done by the athlete on the javelin to get it to a velocity of 25 m/s.

force × distance moved

25 × 0.8 = 20

(1)

work done = 20

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Examiner Comments

This was a very common response. Candidates attempted to calculate a value for work done.

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Examiner Tip

If the question asks ' State', this means no further calculation is expected.

0.5 × 0.8 × 25^2 = 250

(3)

kinetic energy = 250 unit KE

(ii) State the amount of work done by the athlete on the javelin to get it to a velocity of 25 m/s.

(1)

work done = 6250

ResultsPlus
Examiner Comments

Many candidates failed to give the correct unit for kinetic energy and so only scored 2 marks.

ResultsPlus
Examiner Tip

Learn the unit for commonly used physical quantities.

Question 3 (a)

The majority of students were able to show a good understanding of basic electrostatics in this question.

The balloons repel each other because they have the same charge

The cloth is left with a positive charge.

The charged particles that are transferred from the cloth to the balloons are called electrons

ResultsPlus
Examiner Comments
This is one of the fully correct responses.

The balloons Repel each other because they have the same Charge

The cloth is left with a Positive charge.

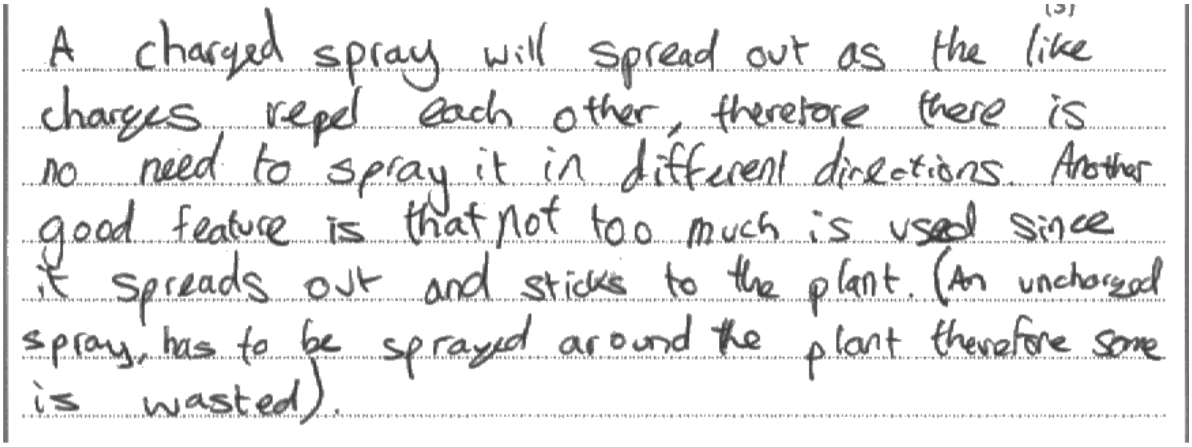
The charged particles that are transferred from the cloth to the balloons are called protons

ResultsPlus
Examiner Comments
A common mistake was to state that protons are the charges that move.

ResultsPlus
Examiner Tip
In all common electrostatic phenomena it is negatively charged electrons that move.

Question 3 (b) (i)

Candidates were asked to explain the advantages of using a charged insecticide spray over an uncharged spray. Many candidates used the diagram to explain about repulsion between charges of the same type and their attraction to the uncharged plant.



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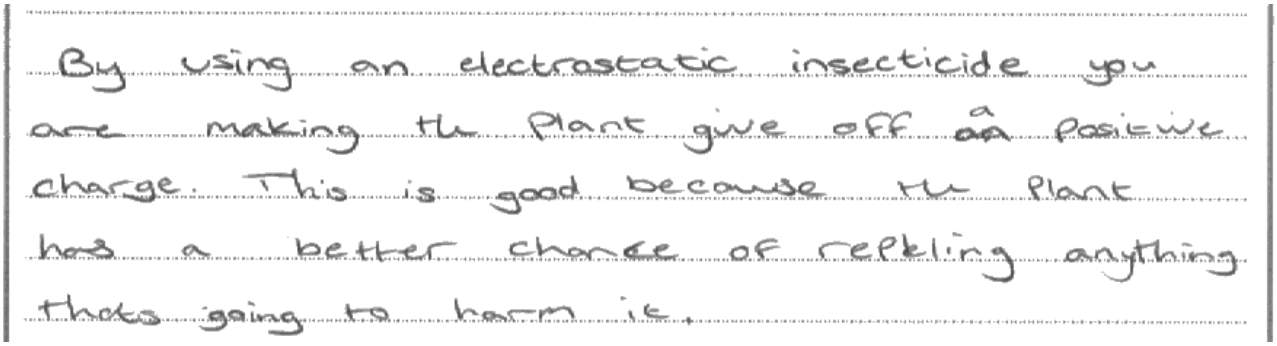
Examiner Comments

This is an example of a response scoring all 3 marks.

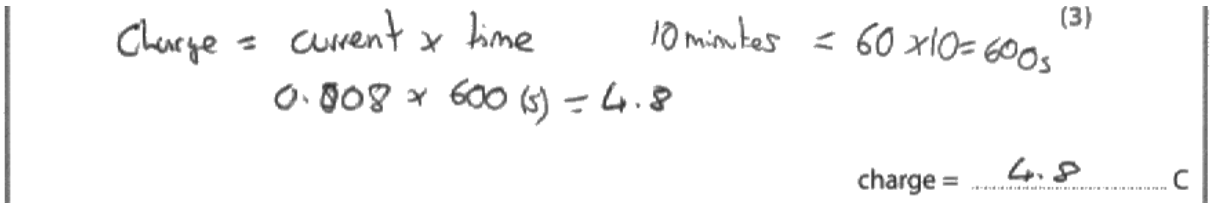


ResultsPlus
Examiner Tip

Some weaker candidates thought that the spray was used to give plants an electrical charge.

Question 3 (b) (ii)

Candidates were asked to calculate the charge supplied to the sprayer using the equation charge = current x time. The most common error was a failure to convert the time in minutes into seconds.

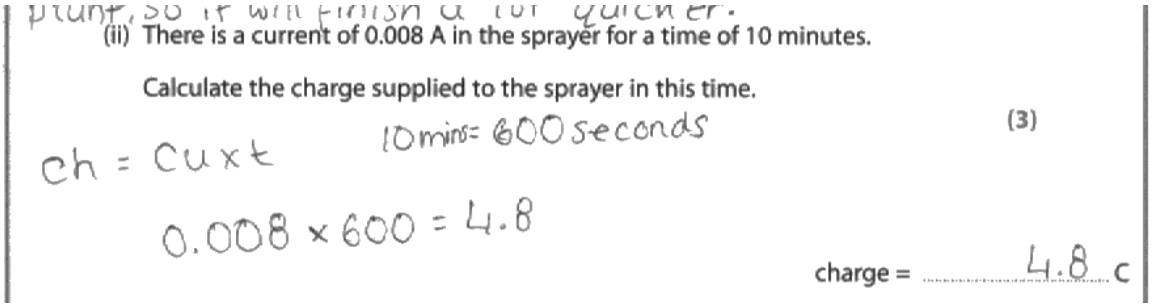


ResultsPlus
Examiner Comments

This is an example of a candidate correctly writing down the equation to be used, converting the time to seconds and evaluating the charge supplied to the sprayer.

ResultsPlus
Examiner Tip

Make use of the equations given at the front of the paper.



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Examiner Comments

The candidate has used their own abbreviations of the equations supplied at the front of the paper to find the correct answer.

current =
0.008 x 10 = 0.08

C S = 0.08 C

(3)

charge = 0.08 C

charge supplied = current x time

(Total for Question 3 = 10 marks)

ResultsPlus
Examiner Comments

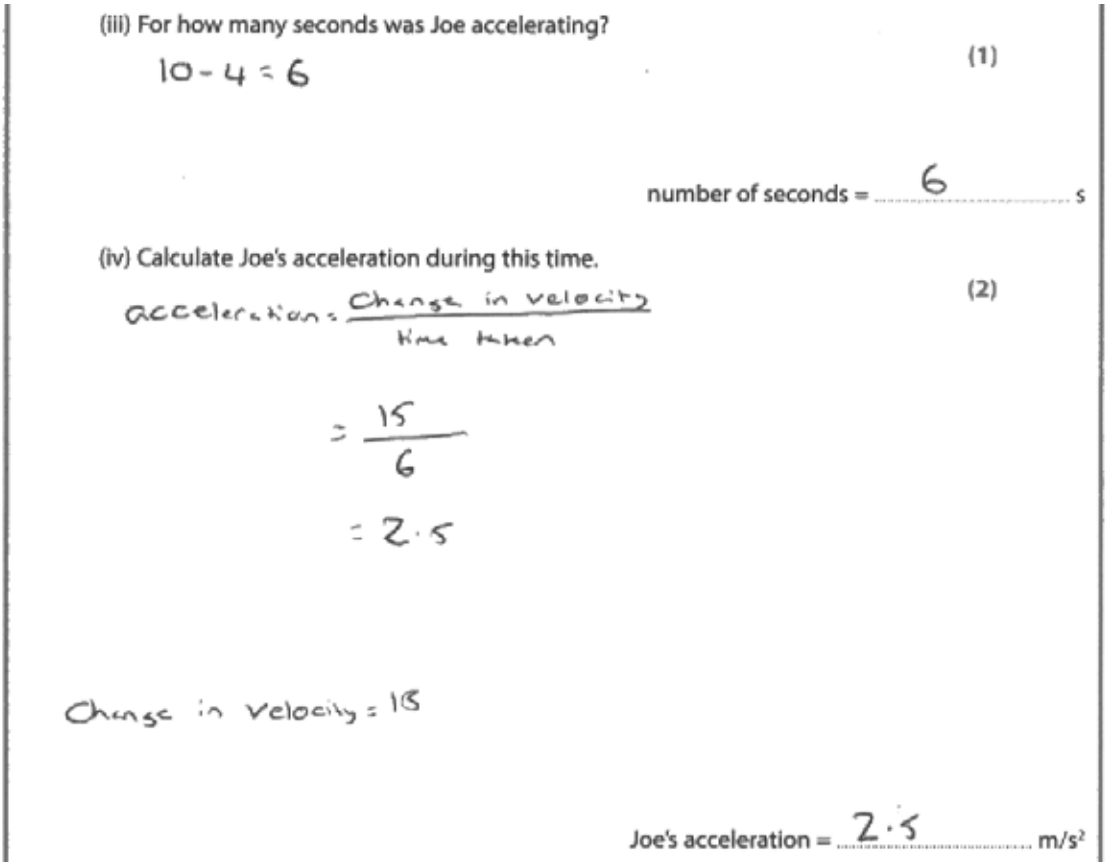
This is an example of failing to convert the time to seconds. The examiner was able to award 2 out of the 3 marks for this response.

ResultsPlus
Examiner Tip

It is important that you show all your working when answering calculations.

Question 4 (a) (iii-iv)

Candidates were asked in Q4a(iii) to determine from the graph how many seconds Joe was accelerating. In part (iv) they used this time to calculate Joe's acceleration during that time.



(iii) For how many seconds was Joe accelerating?

10 - 4 = 6

(1)

number of seconds = 6 s

(iv) Calculate Joe's acceleration during this time.

(2)

acceleration = change in velocity / time taken

= 15 / 6

= 2.5

Change in velocity = 15

Joe's acceleration = 2.5 m/s²

ResultsPlus
Examiner Comments

This is one of the fully correct responses seen by examiners.
This candidate shows how to set out the working for this calculation.

number of seconds = 10 s

(iv) Calculate Joe's acceleration during this time.

(2)

change in velocity ÷ time taken

15 ÷ 10

Joe's acceleration = 1.5 m/s²

ResultsPlus
Examiner Comments

This shows one of the more common errors. The candidate clearly shows they know how to calculate the acceleration in part (iv) and the examiner was able to award 2 marks.

ResultsPlus
Examiner Tip

Always show your working in calculations.

(iii) For how many seconds was Joe accelerating?

(1)

10 - 4 = 6

number of seconds = 6 s

(iv) Calculate Joe's acceleration during this time.

(2)

0 - 25

starts 0

ends 15

Joe's acceleration = 15 m/s²

ResultsPlus
Examiner Comments

This candidate correctly calculated the time, but did not go on to use the equation for acceleration.

ResultsPlus
Examiner Tip

Make use of the equations given at the front of the examination paper.

Question 4 (b) (i)

Candidates were asked to calculate the size of the resultant of two forces. The majority of candidates gave the correct answer and only a small number either added or multiplied the two forces.

ResultsPlus
Examiner Comments

This is one of the many correct responses.

Question 4 (b) (ii)

Candidates were asked to calculate the weight of Joe and his bag from the given total mass. Most candidates correctly evaluated the weight.

ResultsPlus
Examiner Comments

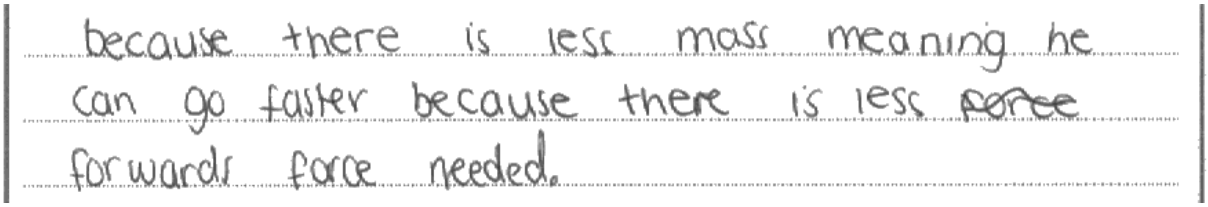
This is one of the many correct responses seen by examiners.

ResultsPlus
Examiner Comments

One mistake was to divide by ten instead of multiplying.

Question 4 (c)

Candidates were asked to explain why Joe found it easier to accelerate when riding without his heavy bag. Only the more able candidates seemed able to link the easier acceleration to a lower mass and therefore an increased acceleration from the same force.



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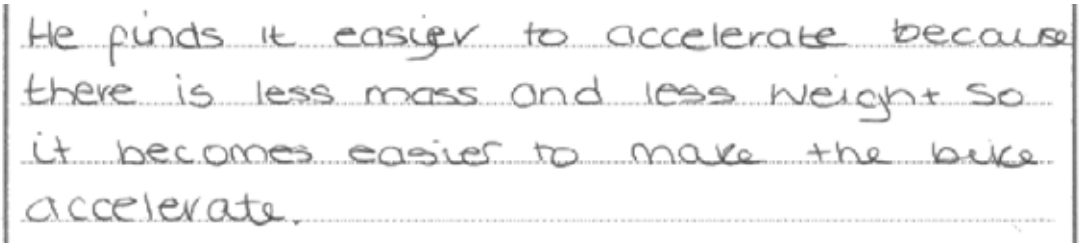
Examiner Comments

This is one of the few fully correct responses seen by examiners.



ResultsPlus
Examiner Comments

A large number of candidates identified the reduction in mass but, failed to fully explain the link to a smaller force being required for the same acceleration.

Question 5 (a) (i)

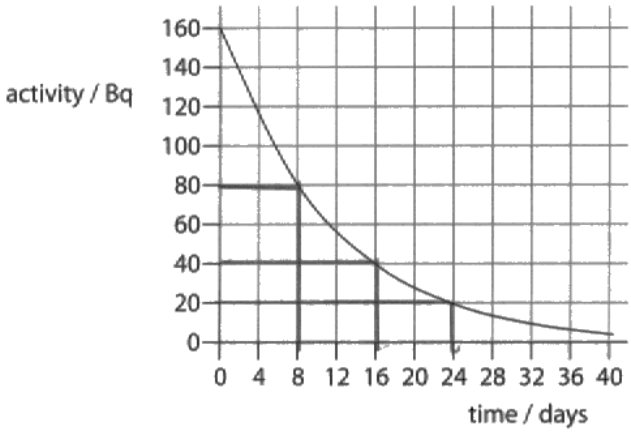
The vast majority of candidates correctly identified particle X as a proton.

Question 5 (a) (ii)

Particle Y was correctly identified as an electron by most candidates.

Question 5 (b) (i)

There was a pleasing increase in the number of candidates using the decay curve to correctly determine the half-life of iodine - 131.



160 —8d→ 80 —8d→ 40 —8d→ 20

(2)

half-life = 8 days

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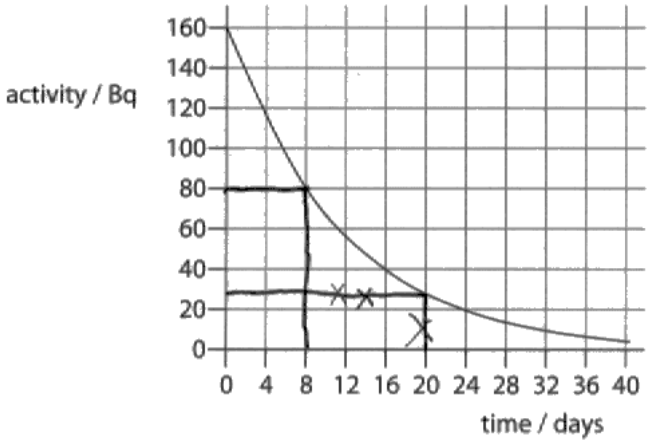
Examiner Comments

Working in both the answer space and on the graph indicates an understanding of half-life.

Question 5 (b) (ii)



Half-life = 8 days
3 quarters = 16 days

time = 16 days

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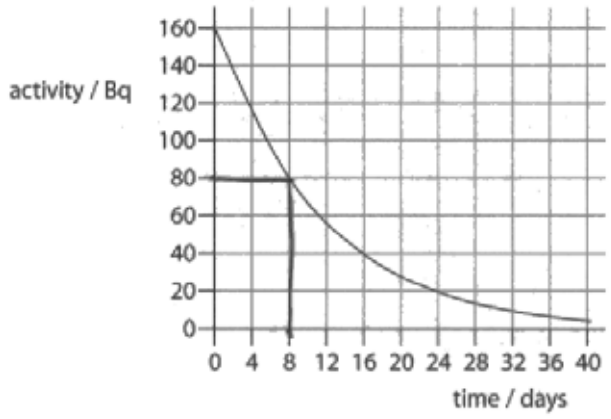
Examiner Comments

This is one of the fully correct responses.



800/2 = 400 (8) 400/2 = 200 (8)

(2)

time = 16 days

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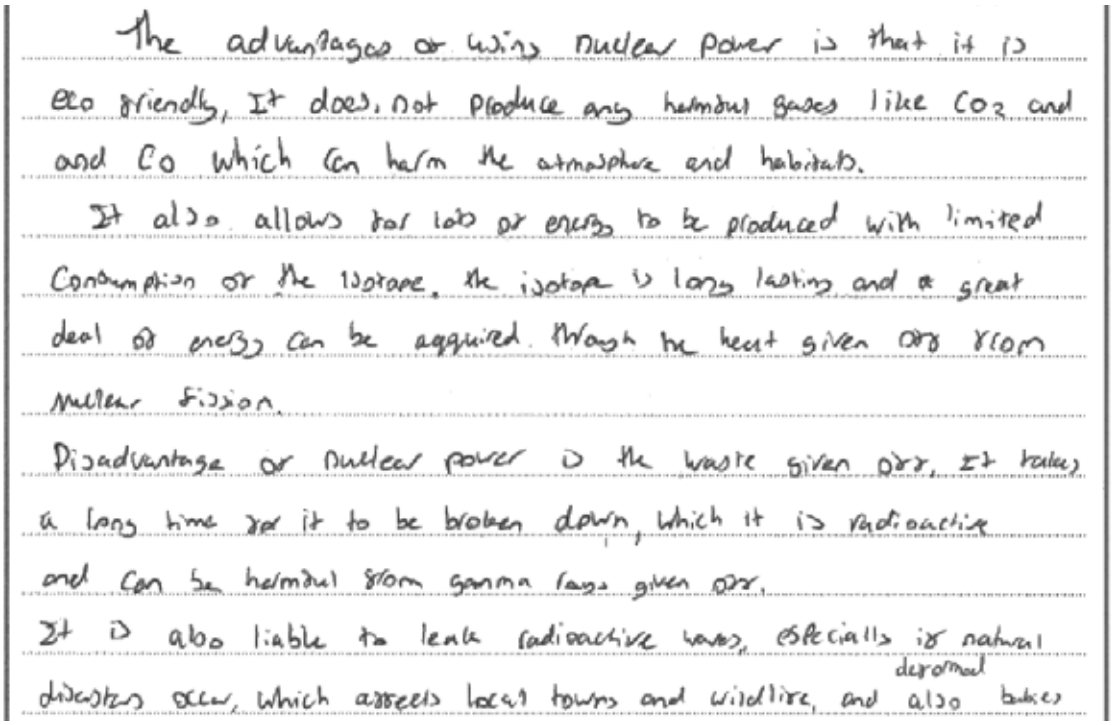
Examiner Comments

This is another example of correct working and evaluation.

Question 5 (c)

Candidates were asked to discuss the advantages and disadvantages of using nuclear power to provide electrical energy for the National Grid system.



The advantages of using nuclear power is that it is eco friendly, It does not produce any harmful gases like CO_2 and and Co which can harm the atmosphere and habitats.

It also allows for lots of energy to be produced with limited consumption of the isotope, the isotope is long lasting and a great deal of energy can be acquired through the heat given off from nuclear fission.

Disadvantage of nuclear power is the waste given off, It takes a long time for it to be broken down, which it is radioactive and can be harmful from gamma rays given off.

It is also liable to leak radioactive waves, especially if natural disasters occur, which affects local towns and wildlife, and also takes decades

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Examiner Comments

To score full marks candidates needed to produce a detailed discussion that included both advantages and disadvantages. This is one example of the many responses seen by examiners scoring full marks.

Nuclear energy isn't renewable energy. this means that it can't be reused and environmentally friendly. Nuclear energy isn't safe and it must be handled with care and in a controlled area at all times. An advantage is that nuclear power can provide homes with electricity for longer periods than other methods can. Another advantage is that nuclear energy converted into electricity is reliable and beneficial to big cities.

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Examiner Comments

This is an example of a level two response. The candidate has produced a simple discussion that contains just one advantage and one disadvantage of the use of nuclear power in generating electrical energy for the National Grid system. The examiner was able to award 4 marks.

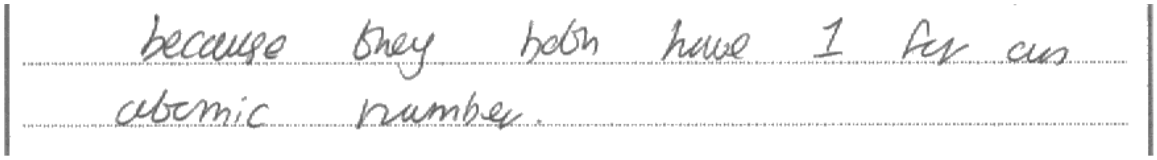
Nuclear power is easy to convert into electrical energy but it is also non-renewable which means that it will eventually run out. Also, when the nuclear power gets used up it produces greenhouse gases which are a main cause of the damaged environment.

ResultsPlus
Examiner Comments

This is an example of a level one response. The candidate has given a limited discussion with only one correct disadvantage of the use of nuclear power stations to generate electrical energy for the National Grid system. The examiner was able to award 2 marks.

Question 6 (a) (ii)

Most candidates were able to state that the symbols indicated that the two nuclei contained the same number of protons. Common mistakes were to state that the symbols showed the nuclei had the same number of neutrons or electrons.



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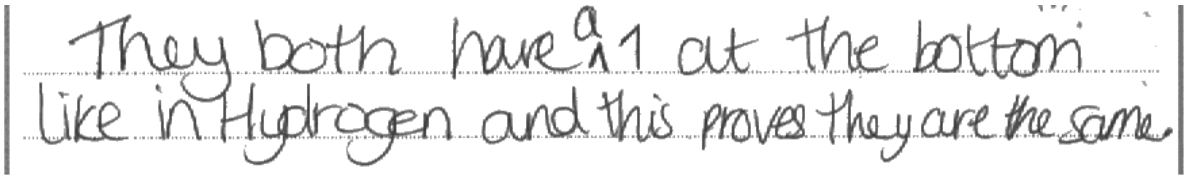
Examiner Comments

This is an example of one of the correct responses.



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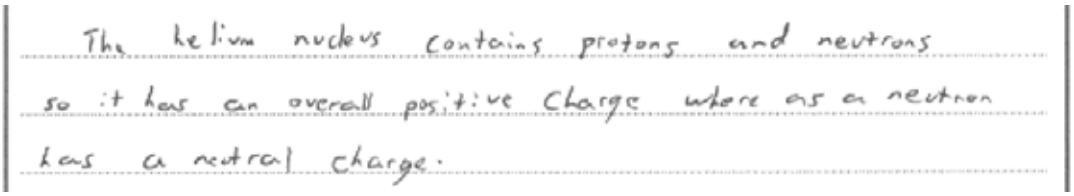
Examiner Comments

This response was considered to be just sufficient for the mark.

Question 6 (b) (i)

Many candidates made good attempts at comparing the charges of a helium nucleus and a neutron.



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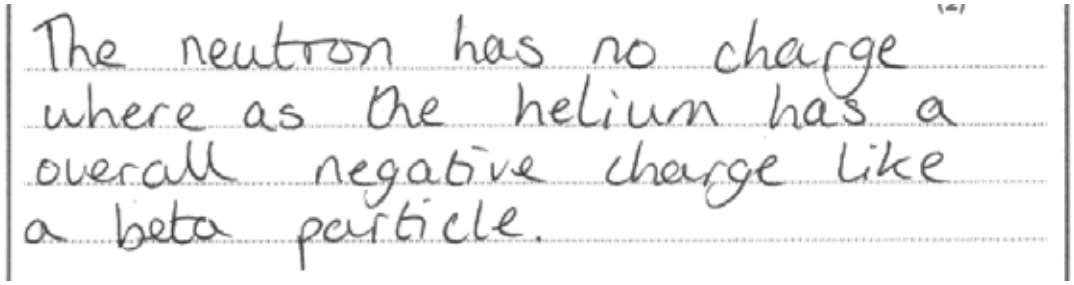
Examiner Comments

This is one of the fully correct responses produced by candidates.



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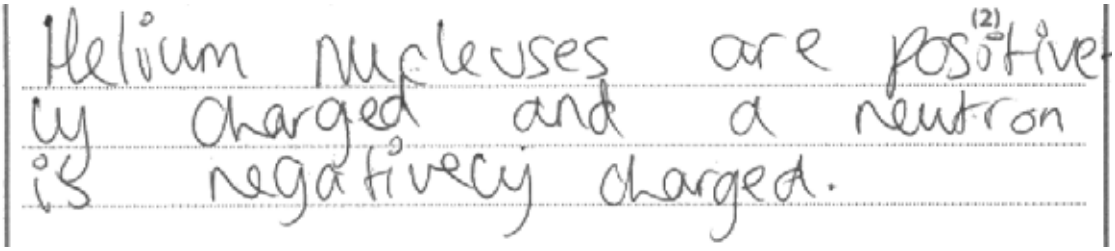
Examiner Comments

Thsi is an example of one of the numerous variations of responses that scored 1 mark.



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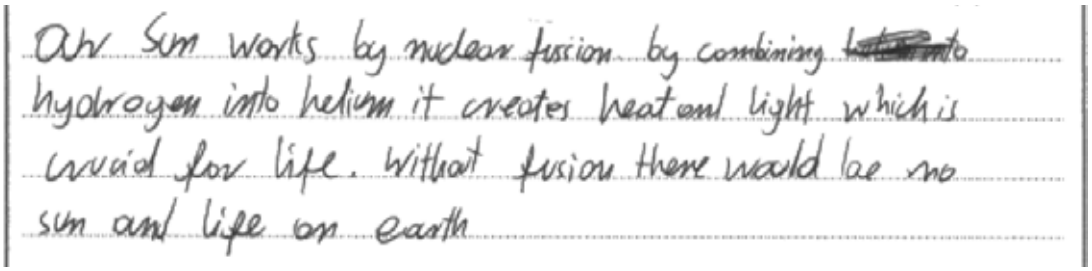
Examiner Comments

This is an example of another response that scored 1 mark.

Question 6 (b) (ii)

Many candidates produced good responses explaining why nuclear fusion is important to life on Earth but, there was considerable confusion between nuclear fission and nuclear fusion. Another source of confusion was with the fusion of the nuclei in cells.



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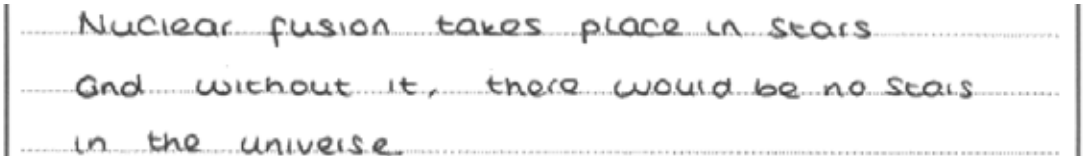
This is an example of one of the 2 mark responses seen by examiners.



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This is an example of one of the 1 mark responses produced by candidates.

Question 6 (c)

Candidates were asked to describe how the neutrons released in nuclear fission are used to produce a controlled chain reaction in a nuclear reactor. There were many clear and accurate descriptions of nuclear fission and most commonly candidates included a brief description of control rods being used to absorb neutrons. This section of the specification seemed to be well understood by the majority of candidates.

In Nuclear fission, a slow neutron collides with uranium and causes the uranium nucleus to be unstable. Then the uranium atom splits into two daughter nuclei which are called krypton and Barium. They also produce two more neutrons which then go again and collide with another Uranium atom. This repeats. This is a chain reaction. In the process this produces a LOT of heat energy. They use this process in a nuclear reactor and use the heat energy to boil water to release steam. This steam turns the turbines and makes electricity. They have to control this reaction or an explosion can occur. They use boron control rods to absorb any spare neutrons produced in fission so that each reaction is done in a good space in time and not all together so that no explosion takes place.

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Examiner Comments

This is an example of a level three response that gained all 6 marks. The candidate gives a clear and detailed description of nuclear fission and also outlines the use of control rods.

In nuclea fission, large unstable nuclei split up to make smaller one more stable ones.
Uranium 235 is split by fission, it makes two daughter nuclei with 2 or more neutrons between them. The neutrons produced by fission are used for continuous chain reactions. they are atoms which have equal charges are released. If there were too many atoms there would be an explosion.

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Examiner Comments

This is an example of a level 2 response. The candidate gives a simple description of a chain reaction but, there is no correct statement about controlling the chain reaction. The response was given 4 marks.

Nuclear atom are ~~com~~ connected during nuclear fission. fission is the splitting of atoms

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Examiner Comments

This limited description giving one fact about nuclear fission is an example of a level one response and was given 2 marks.

Paper Summary

The paper allowed candidates of all abilities to access marks in all questions. Less successful candidates found difficulty with describe, explain and discuss questions, and with some of the calculations.

Based on their performance on this paper, candidates are offered the following advice:

- memorise the basic facts as stated in the specification
- use technical terms wherever possible in descriptions and explanations
- give a reason as well as a statement when answering an 'explain' question
- practise applying their knowledge to new situations by attempting questions in support materials or exam papers from previous sessions
- read the question carefully and underline the key words
- have a calculator to use, as this is an essential requirement for this examination
- use the marks at the end of a question as a guide to the form and content of their answer.

Grade Boundaries

Grade boundaries for this, and all other papers, can be found on the website on this link:

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