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Examiners' Report
March 2012

GCSE Physics 5PH1F 01

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March 2012

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Introduction

This is the second examination of the first unit of the new specification.

There will be a general increase in difficulty from question 1 to question 6 but each will start with at least one item targeted at the lowest ability expected for the paper. It is important, therefore, that all candidates attempt to answer each question.

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.

The overall impression was that majority of candidates coped well with this examination.

Successful candidates:

- read the questions carefully and answered the questions as they were set
- used scientific terms correctly
- were willing to think through the possibilities and apply their knowledge when the question asked for suggestions to explain new situations
- were able to tackle calculations methodically and show the stages in their working
- were able to construct their explanations in a logical order, using the marks at the side of the questions as a guide.

Less successful candidates:

- did not read the questions carefully, and gave answers that were related to the topic being tested, but did not answer the question
- did not understand the meaning of key scientific terms 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.

Question 1 (a) (i)

This question was answered well by the majority of candidates, with over 70% scoring both marks. A significant number of candidates interchanged the two types of electromagnetic radiation and scored only one mark.

Question 1 (a) (ii)

The majority of candidates, over 60%, correctly identified gamma rays as having the highest frequency.

Question 1 (b) (i)

The majority of candidates scored two marks on this question. The most popular answers referred to the identification of forged banknotes and the writing of secret messages. Weaker candidates often failed to score two marks by giving insufficient descriptions.

(b) A special ink is invisible when looked at under normal light.
It glows when ultraviolet radiation is shone on it.

(i) Describe how this ink could be used.

(2)

this ink could be used to detect forged bank notes

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Examiner Comments

Most candidates gave this answer to gain the available marks for this question.

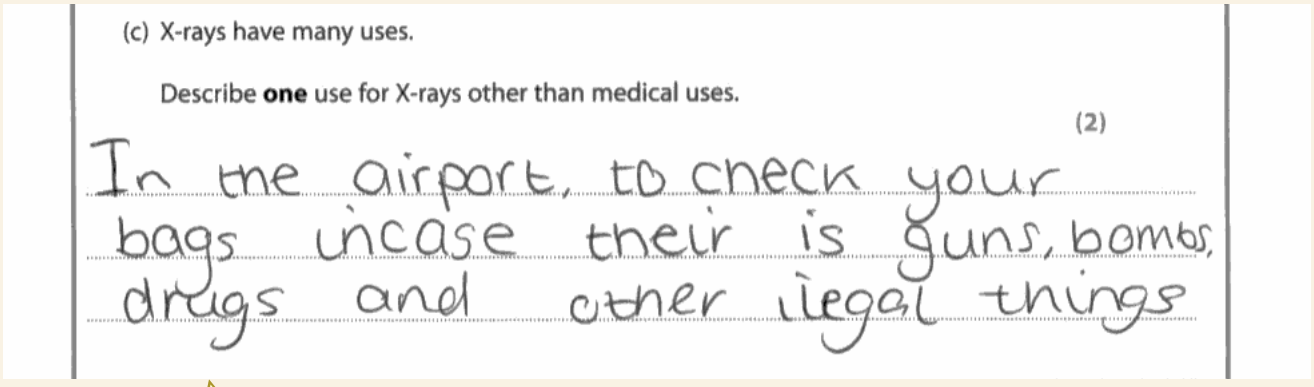
Question 1 (b) (ii)

The vast majority of candidates scored one mark for this question.

Question 1 (c)

A wide variety of possible uses were given, with the most popular being in security checks at airports. A significant number of candidates, despite being asked to consider non-medical uses, gave responses referring to broken bones or teeth.

This candidate scored two marks.



(c) X-rays have many uses.

Describe **one** use for X-rays other than medical uses.

(2)

In the airport, to check your bags incase their is guns, bombs, drugs and other iiegal things

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Examiner Comments

The answer gives a recognised application and detail of how it is used.

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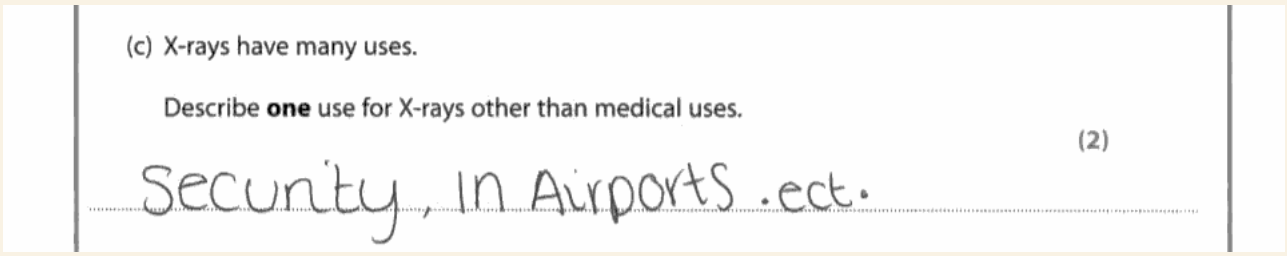
Examiner Tip

When candidates attempt to answer questions that have two marking points, they should try and ensure that they make two separate points in their responses.

This response scored one mark.



(c) X-rays have many uses.

Describe **one** use for X-rays other than medical uses.

(2)

Secunity, In Airports .ect.

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Examiner Comments

This was accepted as a valid application, but the candidate has given no detail of how X-rays are used.

Question 2 (a)

Successful candidates drew from their own experimental experience and used the information in the question to give detailed descriptions of how to measure the focal length of a lens using a distant object.

Weaker candidates gave only a part or a confused answer, with the weakest candidates merely stating that you measured the distance with a metre rule.

A weak response scoring no marks.

Using lenses

2 (a) Sunita prepares some equipment for a class practical.

She measures the focal length of different lenses.
She uses a metre rule, some white card and the light from a distant window.

Describe how she could measure the focal length of a lens using this equipment.

(2)

she could measure the focal length by measuring it with a ruler

ResultsPlus
Examiner Comments

The candidate has not used the information in the question.

This response scored both marks.

Using lenses

2 (a) Sunita prepares some equipment for a class practical.

She measures the focal length of different lenses.
She uses a metre rule, some white card and the light from a distant window.

Describe how she could measure the focal length of a lens using this equipment.

(2)

She could project an image onto a screen (white card) ~~and~~ using the light from the window and when the image is clear she measures from the lense to the screen (this is the focal length)

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Examiner Comments

The candidate has used the information in the question to give a clear description of how to measure the focal length of a lens.

Question 2 (b) (i)

Only 56% of candidates were able to recall that the change in direction of the ray entering the lens was known as refraction.

Question 2 (b) (ii)

Most candidates recognised that light would change direction as it exited the lens, and many correctly predicted the direction it would take.

Students should be encouraged to use a ruler when drawing straight lines.

Question 2 (d)

The popularity of astronomy with candidates was demonstrated here as many were able to give a full and accurate account of Galileo's observations and conclusions.

Question 3 (b) (i)-(iii)

The majority of candidates plotted the points correctly, within a half square tolerance. It was encouraging to note that very few candidates were seen to lose marks by the poor placement of points.

Of some concern was the small, but significant, number of candidates that didn't plot the points at all, even though they drew a best-fit curve. It is possible that they had missed part (b) (i) of the question.

Candidates need to be encouraged to read the question paper carefully so that no questions are inadvertently missed.

Almost without exception, candidates drew a curve to join the points, although a large number omitted to include the point at 0, 90.

There were very few instances seen of candidates extending the cooling curve for the silver can in order to answer 3 (b) (iii). Other candidates must have estimated this by eye, giving rise to the large range of answers.

Question 3 (b) (iv)

Only 50% of candidates gave a temperature within the accepted range. A significant number seemed to think that the can would carry on cooling well below room temperature.

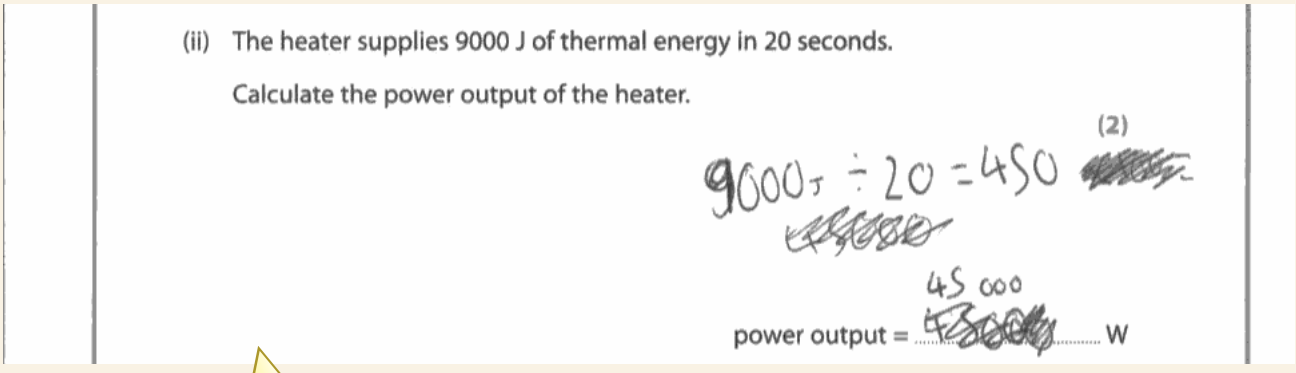
Question 3 (c) (i)

Almost as popular as the correct answer was, “black attracts heat from the sun”. It was not possible to credit this, and teachers should be aware of the need to encourage candidates to use the correct scientific terminology when talking of methods of heat transfer such as conduction, convection and radiation.

Question 3 (c) (ii)

The formula for this calculation was given on page 2 of the question paper; hence marks were only awarded for correctly substituting the figures and evaluating the answer. The majority of candidates were able to substitute the values correctly, though a smaller number gave the correct answer. It was apparent that some candidates had problems dealing with the powers of 10 involved. Centres had prepared candidates well for this type of question with almost 70% of candidates scoring both marks.

This response scored one mark for correct substitution.


(ii) The heater supplies 9000 J of thermal energy in 20 seconds.

Calculate the power output of the heater.

(2)

9000 J ÷ 20 = 450

45 000

power output = ... W

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Examiner Comments

The ambiguity regarding the answer meant that the mark for evaluation could not be awarded.

ResultsPlus
Examiner Tip

Candidates should check that the final answer line agrees with their working.

This response was given one mark.

(ii) The heater supplies 9000 J of thermal energy in 20 seconds.

Calculate the power output of the heater.

(2)

P 405
20 | 9000

power output = 405 W

ResultsPlus
Examiner Comments

This would have been given zero marks if the working had not been shown.

ResultsPlus
Examiner Tip

Always write down the equation being used and show your working.

This well presented response was given two marks.

(ii) The heater supplies 9000 J of thermal energy in 20 seconds.

Calculate the power output of the heater.

(2)

Power = energy used / time taken

P = 9000 / 20

power output = 450 W

ResultsPlus
Examiner Comments

The candidate has written down the equation needed, substituted values and evaluated correctly.

Question 3 (c) (iii)

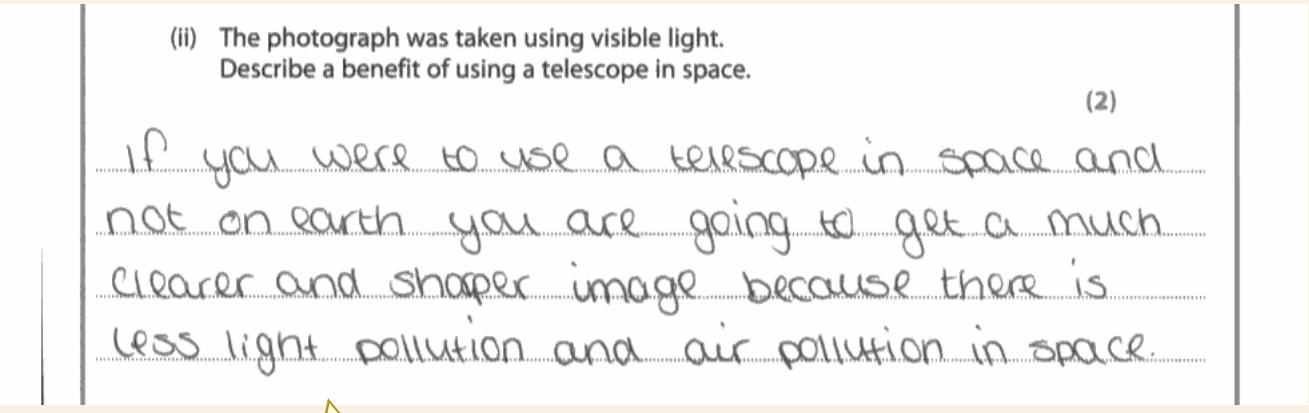
There were fewer correct responses to this question than 3 (c) (ii). Many candidates scored no marks as no working was shown.

There were many examples of students inserting numbers the wrong way round (18000 / 9000) to give an answer of 2 or 200%. Students should be made aware that no process can be more than 100% efficient. So if, efficiency comes out at over 100% they should revisit how they have done the substitution step of their calculation.

Question 4 (a) (ii)

An encouraging number of candidates were able to clearly demonstrate an appreciation of the benefits of astronomy carried out above the Earth's atmosphere. Good answers made clear the role of the atmosphere and its different elements in distorting or obscuring the view of a ground-based telescope. Less able candidates seemed to think that being a little closer to the object being viewed was significant, or compared the telescope in space to the naked eye rather than a ground-based telescope.

This response gained both marks.


(ii) The photograph was taken using visible light.
Describe a benefit of using a telescope in space.

(2)

If you were to use a telescope in space and not on earth you are going to get a much clearer and shaper image because there is less light pollution and air pollution in space.

ResultsPlus
Examiner Comments

The candidate gives a clear description of the benefits of a telescope in space.

Question 4 (b) (i)

The majority of candidates gave a correct type of electromagnetic radiation.

Question 4 (b) (ii)

This was not as well answered as 4 (a) (ii); candidates found it difficult to provide enough clarity of expression when discussing the improvements to understanding of the Universe furnished by modern telescopes. Most answers tended to concentrate on the idea that modern telescopes gave greater resolution, e.g. "You get a much clearer image so you can see more stuff"; more able candidates were able to successfully qualify this, e.g. "The images are more detailed so you can see new planets and stars". A small number of candidates referred to specific discoveries, such as "You can use them for detecting things like microwaves, which gave evidence of how the Universe started in the Big Bang".

Weak candidates described things seen already before modern telescopes, and few candidates thought that radio telescopes could "hear" sound waves from space.

Question 4 (c) (i)

A large number of candidates answered this well, with answers ranging from the detailed, "a nebula is formed of a cloud of dust and gas, mostly hydrogen", to the less detailed, "cloud of gas".

Question 4 (c) (ii)

This was well answered by most candidates, with some excellent full explanations being seen. Most answers included references to gravitational attraction being involved in the contraction of the nebula, with the transfer into heat energy gaining a third mark. Some candidates did not read the question thoroughly, and just wrote down the life cycle of a star from nebula to black dwarf via red giant.

Not very well expressed, but sufficient detail for three marks.

(ii) A nebula eventually becomes a star.

Describe how a nebula becomes a star.

(3)

It becomes a star by gravity pull the gas and dust in, the star then creates a lot of heat and the temputure becomes very hot. All this together can cause the nebula to have nuder reashon.

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Examiner Comments

The candidate has made a good enough attempt at making three separate points to gain the three marks available.

This response scored no marks.

because gradually dust builds up to ~~from~~ the birth of a star and grows over time by expanding then the outer layer of it disappears and a white dwarf is left.

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Examiner Comments

The candidate has confused the nebula stage with later stages in the life cycle of a star.

ResultsPlus
Examiner Tip

Read through your work to make sure that you have actually answered the question that you were asked.

Question 5 (b)

More able candidates successfully identified the stages of emission, reflection and detection of ultrasound waves as an aid to finding prey for the bat.

Weaker students clearly thought that ultrasound was 'super-powered hearing'. There were lots of references to moths making tiny noises which the bat's 'ultrasound hearing' can pick up.

There were also a significant number of responses which stated that the bat used its eyes to achieve this.

Candidates often contradicted themselves by first annotating their diagram correctly and then writing something to the effect that the bat listened out for the flapping of a moth's wings and then used ultrasound to communicate with other bats.

Question 5 (c)

The use of X-rays for seeing broken bones, and ultrasound for examining a fetus were well understood by most candidates, though some struggled to express this understanding in their responses. The differences between them were less clearly understood.

Many more students knew that ultrasound reflected than knowing that X-rays are absorbed.

There were very few references to ultrasound being used for 3-D imaging, or to acquire a moving picture.

Very few candidates made any real attempt at comparing and contrasting the two types of medical scans.

This response was given six marks.

*(c) Ultrasound and X-rays are used for medical scans.

Compare and contrast the advantages of using ultrasound and X-rays for medical scans.

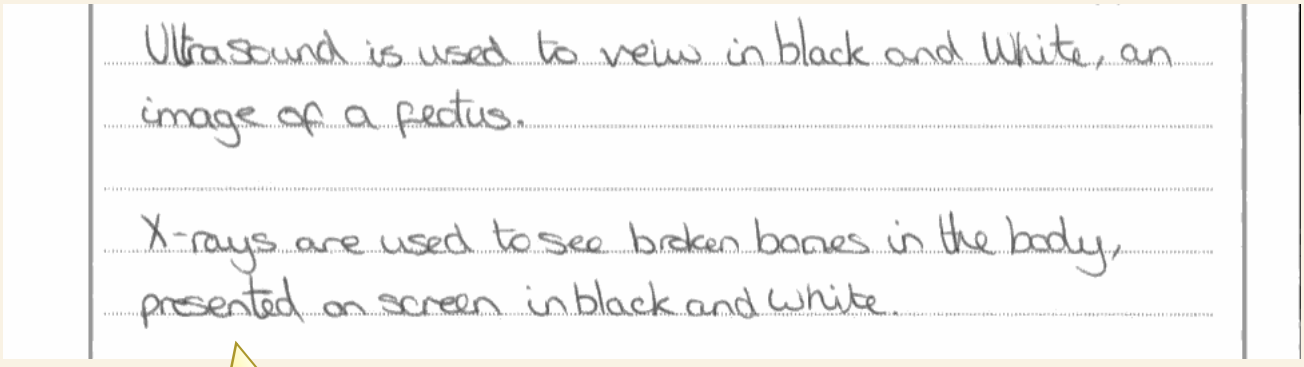
(6)

~~with the x~~ advantages of using X-rays are that doctors are able to see the bone or fracture, advantages of ultrasound are that a pregnant women is able to find out whether her baby has a heart beat or not, and to check if everything is okay with the baby, ultrasound is safer than X-rays as it doesn't damage the body.

ResultsPlus
Examiner Comments

There is sufficient detail and evidence of a comparison to reach level 3.

This response was given four marks.



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Examiner Comments

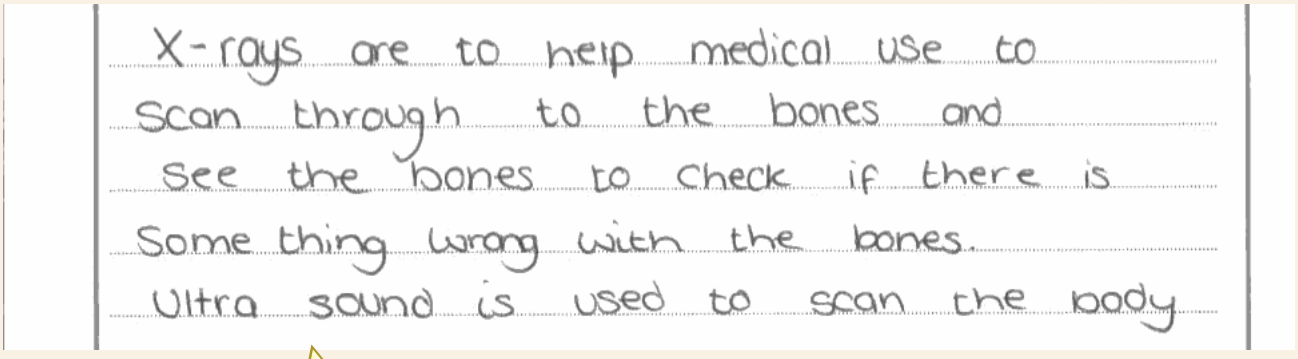
There is no extra detail beyond the description of two uses.

No attempt was made to compare or contrast the two types of medical scan.

ResultsPlus
Examiner Tip

In six mark questions try to put as much detail in as you can but, be careful not to put in wrong science as this can move you to the bottom of a level.

This response was given two marks.



ResultsPlus
Examiner Comments

The candidate only gives a simple use of X-rays. The use of ultrasound is not sufficient.

ResultsPlus
Examiner Tip

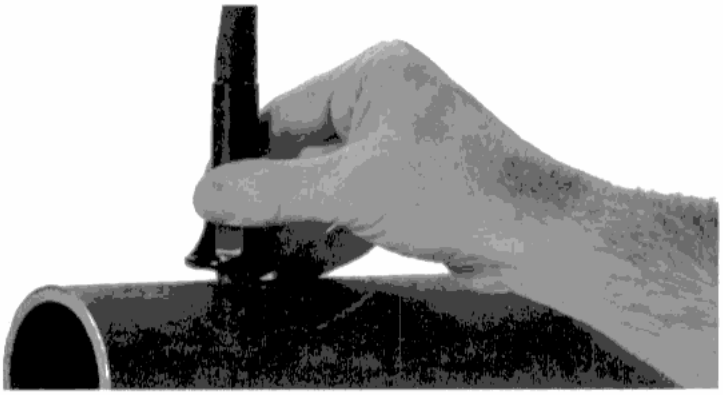
When answering the six mark questions try to structure the answer before starting to write, to ensure that it is clear and coherent. Remember spelling, punctuation and grammar at all times.

Question 5 (d)

Most candidates were able to gain at least one mark here, but few achieved all three as they struggled with reconciling the powers of 10. Only the most able recognised that the time of travel equated to twice the thickness of the metal (as the wave was reflected).

A very common response gaining one mark.

(d) Ultrasound is used to scan metal pipes to measure their thickness.



The ultrasound wave travels through the metal and is reflected at the inner surface of the metal.
The reflected wave is detected after 0.003 ms (0.000 003 s).
The speed of the ultrasound in the metal is 5000 m/s.

Calculate the thickness of the metal.

(3)

distance = speed × time

5000 × 0·003 = 15

thickness of metal = 15 m

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Examiner Comments

The candidate has substituted the wrong value for time.

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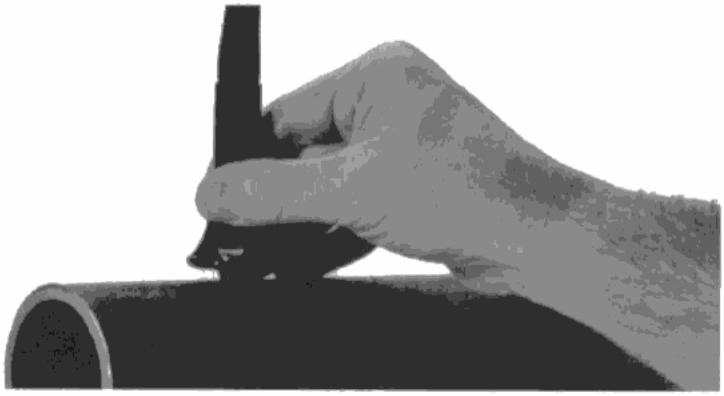
Examiner Tip

Make sure you read the question carefully. The value for time in seconds should be substituted into the equation.

A common answer from a more able candidate which gains two marks.

(d) Ultrasound is used to scan metal pipes to measure their thickness.



The ultrasound wave travels through the metal and is reflected at the inner surface of the metal.
The reflected wave is detected after 0.003 ms (0.000 003 s).
The speed of the ultrasound in the metal is 5000 m/s.

Calculate the thickness of the metal.

(3)

distance = speed × time

5000 × 0·000003 = 0.015

thickness of metal = 0.015 m

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Examiner Comments

A clearly set out calculation assists in correct evaluation.

It is essential that candidates have a calculator in the exam, and are confident in using it. Questions using realistic values will often produce difficult numbers.

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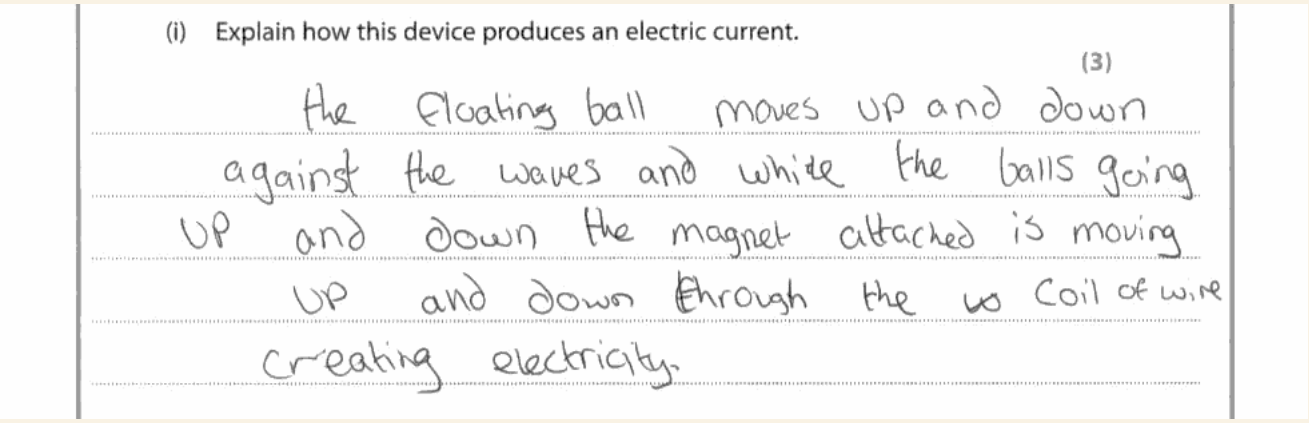
Examiner Tip

Remember to bring your own calculator to the exam, as you will be more familiar with its use.

Question 6 (b) (i)

Most candidates recognised the idea of transferring (kinetic) energy from the waves to the magnet. However, few were able to describe the scientific principles of electromagnetic induction. This is a difficult concept, especially when applied to a novel situation rather than the laboratory experiments candidates might be used to.

A fairly typical example of an answer scoring two marks.


(i) Explain how this device produces an electric current.

(3)

the floating ball moves up and down against the waves and while the balls going up and down the magnet attached is moving up and down through the ~~to~~ coil of wire creating electricity.

ResultsPlus
Examiner Comments

Very few candidates talked about the magnetic field of the permanent magnet interacting with the wire in the coil.

Question 6 (b) (ii)

Many candidates knew what was necessary in order to increase the current but a number struggled to express this in a rewardable fashion. "Use a bigger coil and a bigger magnet" was a popular response that couldn't be credited, as simply increasing the size of these does not necessarily increase the current. Candidates need to be made aware of the importance of the correct terminology for this process, so that they can be given credit for their knowledge, e.g. "Use a coil with more turns and a stronger magnet".

The key idea that bigger magnets are not necessarily stronger needs reinforcing with students.

Question 6 (c)

Many able candidates gave an answer that clearly stated both advantages and disadvantages of tidal power, and quite a few further qualified these answers by comparing tidal power to other methods of electricity generation. Less able candidates often confused tidal power with hydroelectric power and talked of running out of water as a disadvantage.

Many students gave responses referring to wave power, rather than tidal, stating that when there were lots of waves more electricity would be generated, and that this depended on the weather / wind.

Only a few responses made reference to the national grid. Most implied that the local town could only get its power from the dam, so when the tide (or waves!) weren't flowing there would be no electricity going to the houses.

This response was given full marks.

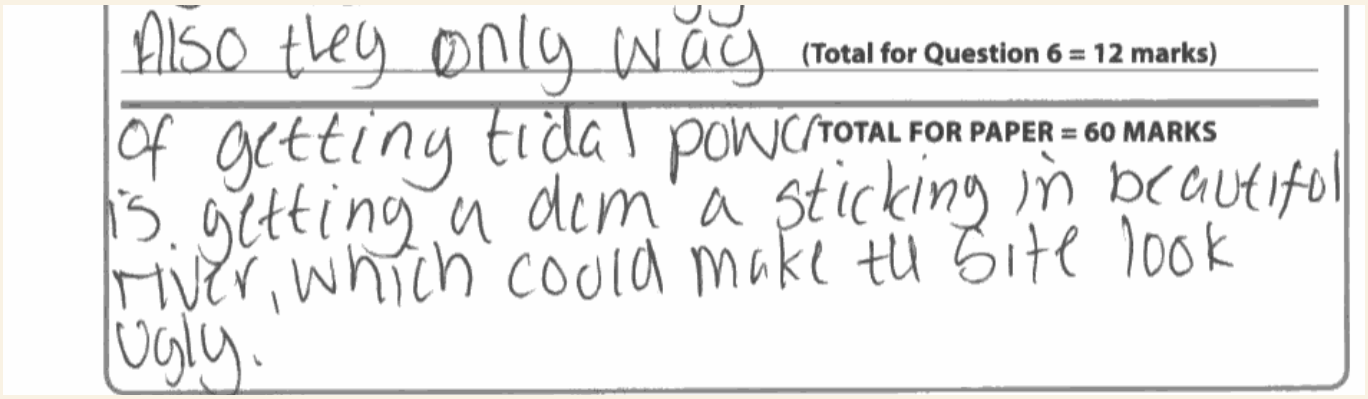
*(c) Another way of producing electricity from a renewable source is tidal power.
A dam is built across the mouth of a river.
Tidal water gets trapped behind the dam.

The trapped water is used to generate electricity.

Discuss the advantages and disadvantages of using tidal power rather than other methods of generating electricity.

(6)

the advantages of using ~~tra~~ tidal power rather then other methods of generating electricy with things such as oil and coal which is non renewable and tidal power is reneabale is, tidal power will never run out but oil and coal will. Also it dosent pollute the atmosphere and cause global warming. On the other hand tidal power dosent give as much energy as oil and coal.



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Examiner Comments

The candidate gives detailed advantages and disadvantages of tidal power and also contrasts tidal power with the atmospheric pollution caused by generating electricity using fossil fuels.

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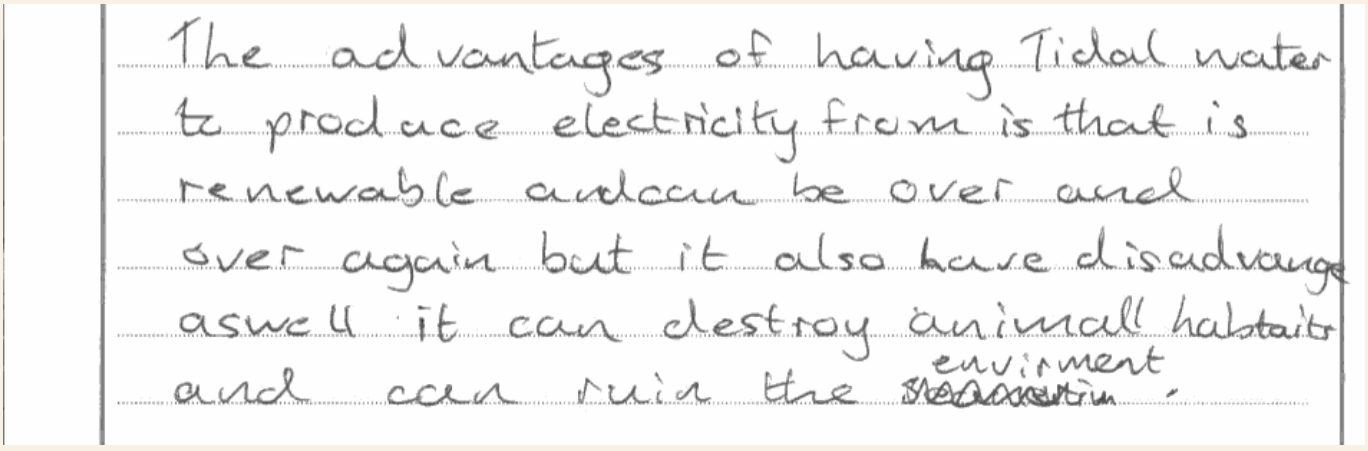
Examiner Tip

Try to save time by not repeating the same information in an answer. Try to include specific scientific words in your answers.

This response scored four marks.



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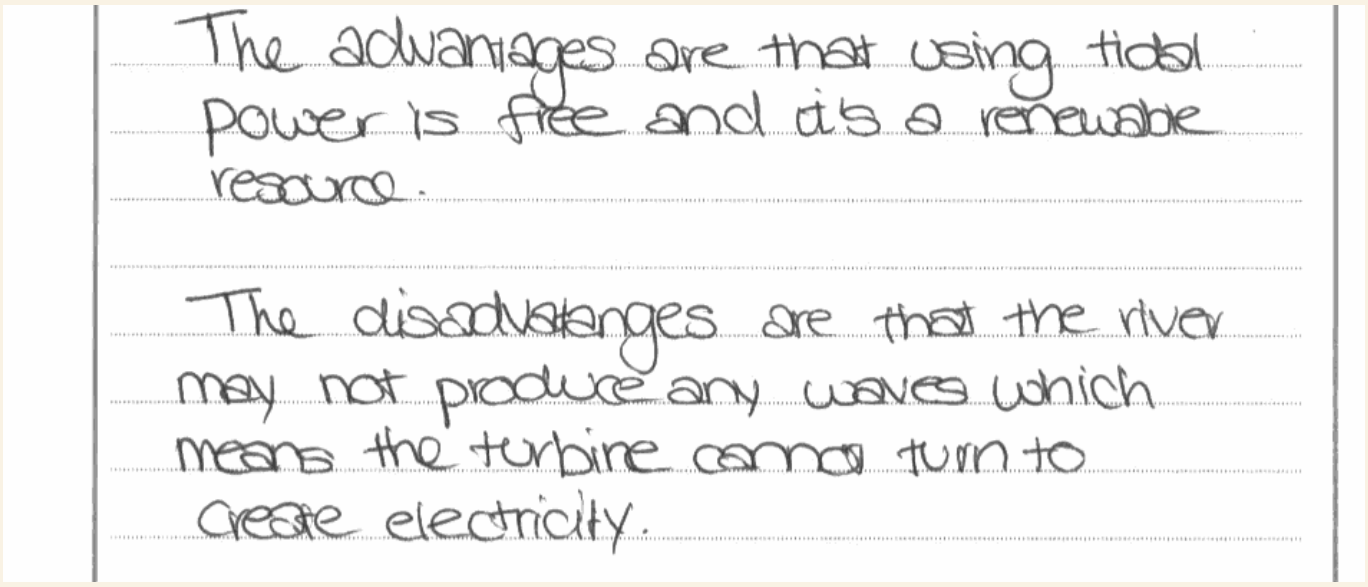
Examiner Comments

The candidate gives a straightforward advantage and disadvantage of using tidal power to generate electricity.

This response was given two marks.



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Examiner Comments

The candidate has given a straightforward advantage of using tidal power to generate electricity.

The second part of the answer is not a valid disadvantage of tidal power.

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Examiner Tip

Read through your work to make sure that you have actually answered the question that you were asked.

Paper Summary

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

Candidates should:

- memorise the basic facts which are 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
- read the question carefully and underline the key words.

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