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Examiners' Report
June 2013

GCSE Physics 5PH1H 01

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June 2013

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Introduction

Unit P1 Universal Physics

The unit is divided into six topics and all six topics are tested in the examination.

The examination paper was designed to enable candidates to show what they knew, understood and were able to do. Within the question paper, a variety of question types were included, such as objective questions, short answer questions worth one or two marks each and longer questions worth three or four marks each. The two six mark questions were used to test quality of written communication.

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

Centres are aware that the next examination is in June 2014. There will be no changes to the format of the paper in June 2014.

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, 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 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)(i)

Only 40% of candidates were able to recall that CMB radiation is an abbreviation for cosmic microwave background radiation.

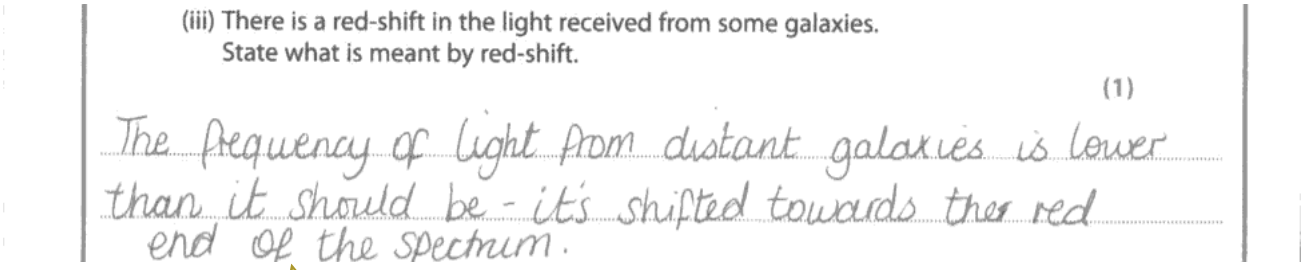
Question 1(a)(ii)

This simple item was generally correctly answered. Predictably, however, there were the minority of incorrect answers that may be expected, such as 'steady state' and 'heliocentric'.

Question 1(a)(iii)

The number of correct responses was disappointing. Many of the incorrect responses did not making sense when read through. A common mistake for example, was to state that it was the galaxies, rather than the light from them, that was shifted to the red end of the spectrum. Less successful candidates made references to galaxies or planets or stars appearing red.

An example of a correct response:


(iii) There is a red-shift in the light received from some galaxies.
State what is meant by red-shift.

(1)

The frequency of light from distant galaxies is lower than it should be - it's shifted towards the red end of the spectrum.

ResultsPlus
Examiner Comments

Both parts of the response would have been awarded a mark.

ResultsPlus
Examiner Tip

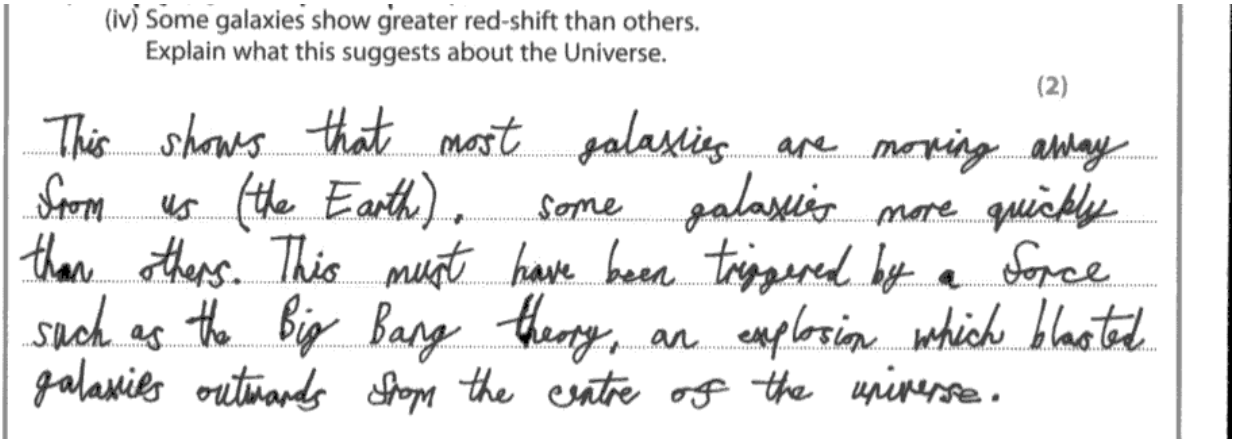
Candidates should be prepared to memorise the basic facts as stated in the specification.

Question 1(a)(iv)

Most candidates gained the mark for the Universe expanding. However, there were answers describing all sorts of other things expanding as well. The second mark was most commonly awarded for some galaxies moving faster with the link to the size of the redshift often not stated. A surprising number of answers talked about the Universe moving away from us and there were quite a few references to stars or planets or galaxies expanding.

A significant number of candidates only gave one answer for a two mark question.

The marker was able to ignore the extra information and award both marks.



(iv) Some galaxies show greater red-shift than others.
Explain what this suggests about the Universe.

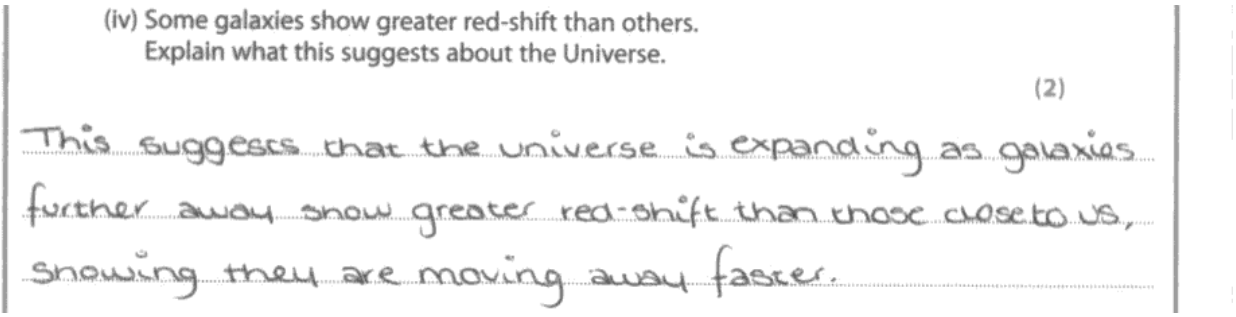
(2)

This shows that most galaxies are moving away from us (the Earth), some galaxies more quickly than others. This must have been triggered by a force such as the Big Bang theory, an explosion which blasted galaxies outwards from the centre of the universe.

ResultsPlus
Examiner Comments
Sometimes additional information may contradict an earlier part of the response and result in a loss of marks.

ResultsPlus
Examiner Tip
Try to make your answers concise and to the point.

This is a clear, concise response.



(iv) Some galaxies show greater red-shift than others.
Explain what this suggests about the Universe.

(2)

This suggests that the universe is expanding as galaxies further away show greater red-shift than those close to us, showing they are moving away faster.

ResultsPlus
Examiner Comments
This is an example of a good response.

ResultsPlus
Examiner Tip
Read the question carefully and underline the key words.

Question 1(b)(ii)

This question elicited a large number of very vague answers involving seeing further away, different planets, life on other planets etc. The most common award for the first mark was for a named type of electromagnetic radiation. Not many gained the second mark, but those who did usually wrote very comprehensive answers. Less successful candidates wrote about telescopes sending out various types of radiation in order to see different objects.

Very few responses considered that weaker signals could be collected, or mentioned about placing telescopes outside the Earth's atmosphere.

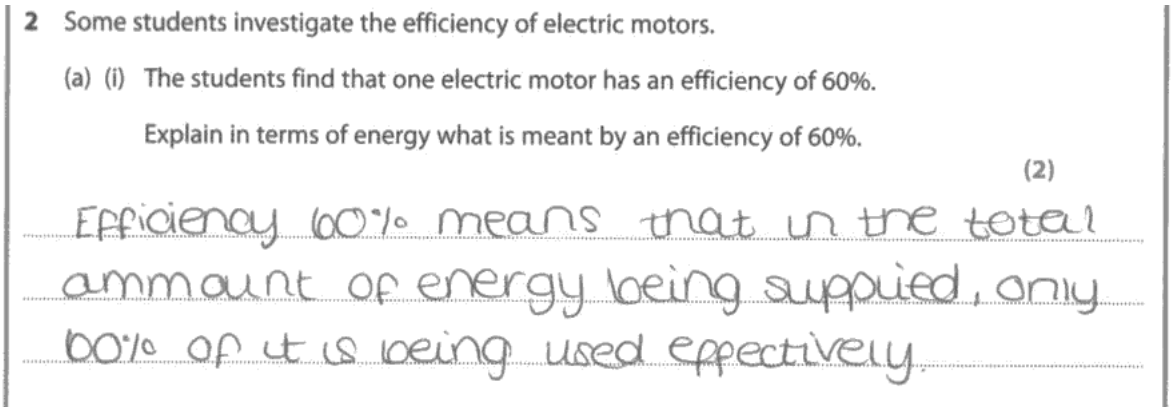
Question 2(a)(i)

Some candidates failed to score on this question because they merely restated the definition of efficiency from the formula page without any reference to the 60% mentioned in the question.

Most candidates scored by saying that 60% of the energy was useful; however, they could have scored 2 marks by relating this to the input energy.

Very few candidates made a reference to kinetic energy as the useful output of the motor.

This response scored both marks.



2 Some students investigate the efficiency of electric motors.

(a) (i) The students find that one electric motor has an efficiency of 60%.

Explain in terms of energy what is meant by an efficiency of 60%.

(2)

Efficienay 60% means that in the total ammaunt of energy being supplied, only 60% of it is being used effectively

ResultsPlus
Examiner Comments

The marker has allowed 'used effectively' as an acceptable description for the useful output energy of the motor.

ResultsPlus
Examiner Tip

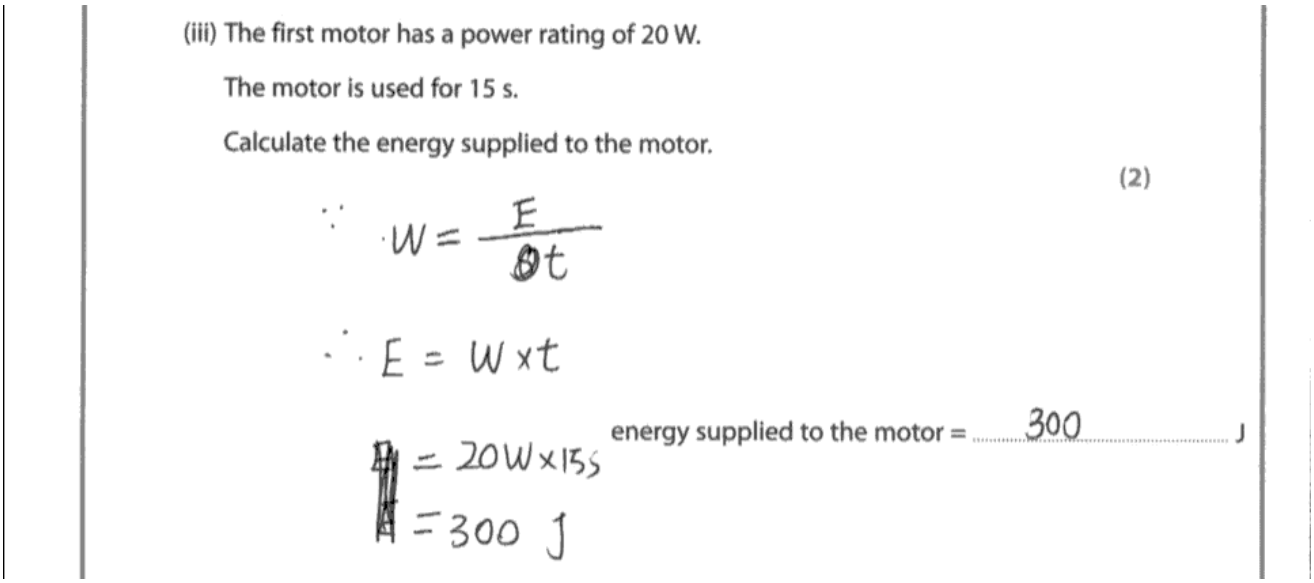
Read the question carefully to make sure that you have given the right answer. If you have spare time at the end of the examination, use it to check your work.

Question 2(a)(iii)

Most candidates scored well on this item with only 32% failing to gain at least 1 mark and almost 64% gaining both marks.

The most common error was to evaluate 15/20 or 20/15 rather than finding the product of power rating and time.

A well set out response:



(iii) The first motor has a power rating of 20 W.

The motor is used for 15 s.

Calculate the energy supplied to the motor.

(2)

$\because \quad W = \frac{E}{t}$

$\therefore \quad E = W \times t$

$= 20\,W \times 15\,s$

$= 300\ J$

energy supplied to the motor = 300 J

ResultsPlus

Examiner Comments

This was a good response to the question. The candidate has shown full working.

Had there been an error in the final evaluation, then some of the marks would still have been available. (2 marks)

ResultsPlus

Examiner Tip

Always show your working. You can still get marks even if your final answer is wrong.

One of the more common errors:

(iii) The first motor has a power rating of 20 W.

The motor is used for 15 s.

Calculate the energy supplied to the motor.

(2)

20 ÷ 15 =

energy supplied to the motor = 1.3 J

ResultsPlus

Examiner Comments

The candidate has made little attempt to explain what they are doing. (0 marks)

ResultsPlus

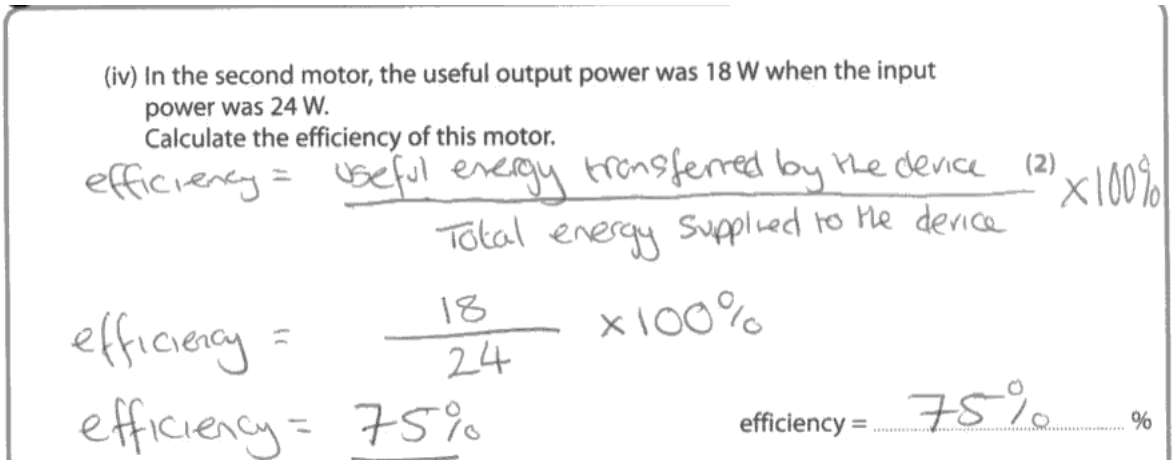
Examiner Tip

Always start the answer to a calculation by writing down the equation you are going to use from the formula page.

Question 2(a)(iv)

This item was well answered with over 80% of candidates scoring both marks. Only a few candidates evaluated the efficiency as 133%.

One of the many correct responses:



ResultsPlus
Examiner Comments

This is a well set out answer.

ResultsPlus
Examiner Tip

Always show your working. You can still get marks even if your final answer is wrong.

Question 3(b)(i)

This question was answered well by better candidates but less successful candidates struggled to produce sensible responses. A large number of candidates do not appear to recognise the difference between the behaviour of mirrors and lenses or even the difference between mirrors and lenses, whilst some candidates did not know the difference between the image and the light rays involved in forming it. There were many confused statements along the lines of 'the image is refracted' or 'the image hits the lens'.

This candidate has just done enough to score full marks.

(b) In 1610 Galileo used a refracting telescope to observe the planet Jupiter.

(i) Explain how a refracting telescope produces a magnified image of Jupiter.

(3)

In a refracting telescope, the objective lens focuses the light to produce the image, and the eyepiece lens magnifies the image.

ResultsPlus
Examiner Comments

This is a fairly basic description but sufficient to score 3 marks.

ResultsPlus
Examiner Tip

Use the marks at the side of a question as a guide to the form and content of your answer.

An example of one of the confused responses:

(b) In 1610 Galileo used a refracting telescope to observe the planet Jupiter.

(i) Explain how a refracting telescope produces a magnified image of Jupiter.

(3)

The concave mirror was being magnified as the image got to the middle. As the image gets to the middle it is magnided bigger and made bigger, then more detail is shown for example jupiters moons. two mirrors were used to reflect of eachother and refract through different boundarys.

ResultsPlus
Examiner Comments

The candidate has made an attempt to answer the question but the response does not convey any understanding. Adding a few scientific terms to a rewording of the question rarely receives any credit.

ResultsPlus
Examiner Tip

Be prepared to memorise the basic facts as stated in the specification.

Question 3(b)(ii)

This question was usually answered well with about 55% of candidates scoring full marks. Most candidates were able to relate Galileo's observation of moons orbiting Jupiter to his conclusion that 'not everything orbited the Earth'. Some responses included detailed explanations of the heliocentric model but failed to mention the geocentric model.

Candidates who did not score full marks usually scored either one mark for describing the geocentric model or two marks for recalling that Galileo had observed moons orbiting Jupiter.

A typical 2 mark response:

(ii) In 1610, the geocentric model of the Solar System was commonly accepted.

Explain how Galileo's observations contradicted the geocentric model.

(3)

The geocentric model stated that all the planets orbited the sun, but Galileo's observations proved that the heliocentric model was correct. He proved that Jupiter was orbited by moons by recording the movement weekly while looking through a telescope.

ResultsPlus
Examiner Comments

The confusion about the geocentric model does not affect the awarding of two marks for knowing that Galileo observed moons orbiting Jupiter.

ResultsPlus
Examiner Tip

Read the question carefully to make sure that you have given the right answer. If you have spare time at the end of the examination, use it to check your work.

A well presented response that was awarded full marks:

Geocentric model was the idea that everything orbited the Earth and it was thought of by Ancient Greeks; the Geocentric model was proved incorrect by Galileo observing Jupiter via a telescope as he found four moons orbiting Jupiter proving that NOT EVERYTHING orbited the Earth.

ResultsPlus
Examiner Comments

This is an example of the type of response that we were hoping for.

This response was awarded 3 marks.

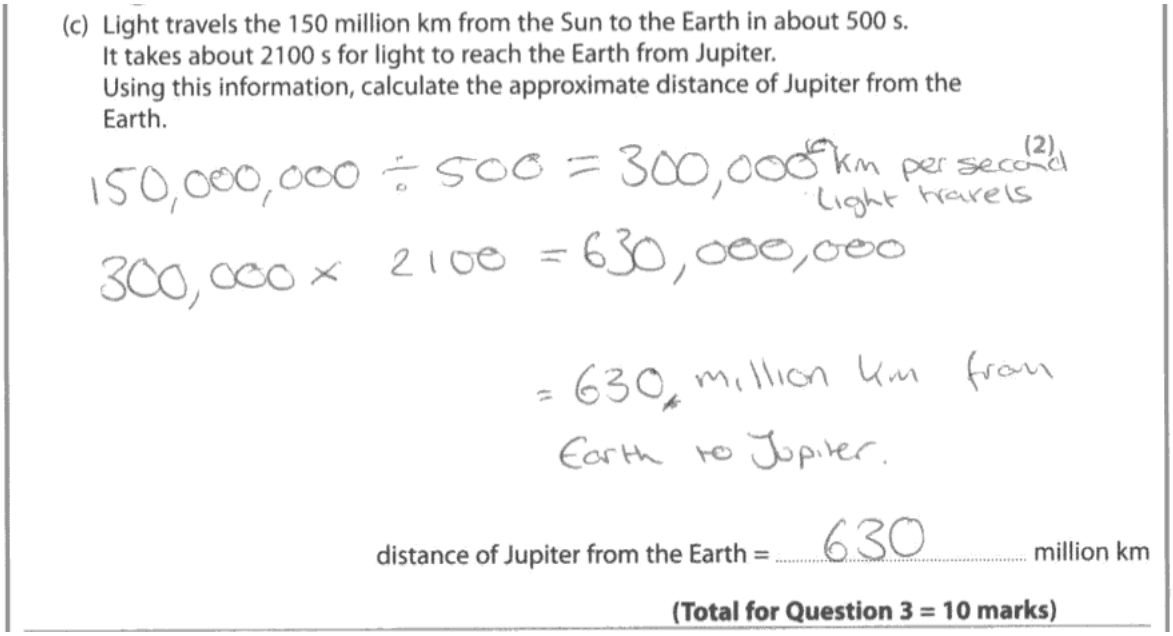
ResultsPlus
Examiner Tip

Candidates should use the mark allocation as a guide. They need to make as many correct statements as there are marks available.

Question 3(c)

This question was usually answered well, with almost 50% of candidates scoring full marks. The most common error was in handling powers of 10.

One of the many excellent responses to this question. It is similar to the 'show that' format where many candidates seem to do well.



(c) Light travels the 150 million km from the Sun to the Earth in about 500 s.
It takes about 2100 s for light to reach the Earth from Jupiter.
Using this information, calculate the approximate distance of Jupiter from the Earth.

(2)

150,000,000 ÷ 500 = 300,000 km per second
Light travels

300,000 × 2100 = 630,000,000

= 630 million km from Earth to Jupiter.

distance of Jupiter from the Earth = 630 million km

(Total for Question 3 = 10 marks)

ResultsPlus
Examiner Comments

This was an excellent response to the question. The candidate showed full working and made the effort to annotate the work. Had there been an error in the final evaluation, then some of the marks would still have been available.

ResultsPlus
Examiner Tip

It is always better to show HOW you arrived at your answer. You may be able to get a mark if your answer is wrong and the examiner can see that you used the correct method.

This is an example of a 1 mark response.

(c) Light travels the 150 million km from the Sun to the Earth in about 500 s.
It takes about 2100 s for light to reach the Earth from Jupiter.
Using this information, calculate the approximate distance of Jupiter from the Earth.

(2)

150 000 000 / 500 = 300 000

300 000 × 2100 = 690 000 000

distance of Jupiter from the Earth = 690 million km

(Total for Question 3 = 10 marks)

ResultsPlus
Examiner Comments

The candidate has shown a clear method of working and so the examiner was able to award 1 mark.

ResultsPlus
Examiner Tip

Always show your working. Without working this response would score no marks.

No marks were awarded for this response:

(c) Light travels the 150 million km from the Sun to the Earth in about 500 s.
It takes about 2100 s for light to reach the Earth from Jupiter.
Using this information, calculate the approximate distance of Jupiter from the Earth.

(2)

distance of Jupiter from the Earth = 600 million km

(Total for Question 3 = 10 marks)

ResultsPlus
Examiner Comments

As there is no working the examiner is unable to award any marks.

However, it seems certain that this candidate must be using a correct method by obtaining an answer of the correct order of magnitude.

ResultsPlus
Examiner Tip

Always show your working. You can still get marks even if your final answer is wrong.

Question 4(b)

Most candidates had some understanding of the processes involved. They appreciated that tectonic plates moved and caused earthquakes, but many thought the thermal energy was causing the plates to expand, or that it was created by the friction of the plates moving. Quite a few had the idea that the convection currents were in hot water or air below the Earth's crust.

Better candidates displayed a very good understanding, but some answers from less successful candidates were very confused.

The most frequently missed points were about pressure/energy building up, before being released suddenly when the plates jolted/slipped.

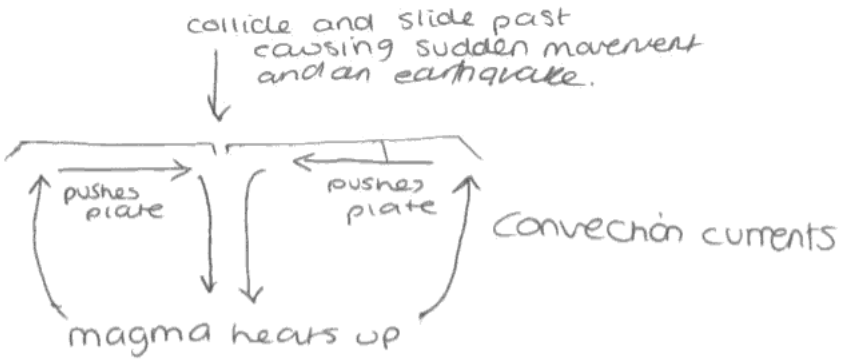
One of the many 3 mark answers:

(b) The Earth's surface is made up of many tectonic plates.
The interior of the Earth is a source of thermal energy.

Describe how this thermal energy can cause earthquakes.

You may draw a labelled diagram to help with your answer.

(3)



The thermal energy causes magma to move slowly. As the magma heats up it rises and pushes between the tectonic plates causing the tectonic plates to move. The magma cools sinks, is reheated and the process happens again, these are called convection currents. The plates either move towards or away from each other, if they move towards or past each other and collide and one slips past the other causing a sudden movement, an earthquake occurs.

ResultsPlus
Examiner Comments

The candidate has a good understanding of the process and whilst not fully explained is sufficient to score 3 marks.

ResultsPlus
Examiner Tip

Ensure that when there are three marks for the question, three points are made in the answer.

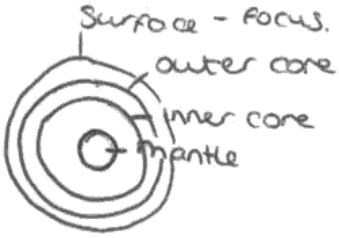
A typical 1 mark response:

(b) The Earth's surface is made up of many tectonic plates.
The interior of the Earth is a source of thermal energy.

Describe how this thermal energy can cause earthquakes.

You may draw a labelled diagram to help with your answer.

(3)



this thermal energy is in the mantle in the middle of the earth, when the heat passes through the inner core + outer core they can cause friction between the tectonic plates, when these plates slide or crash into each other an earthquake gets produced, from the amount of energy thats there.

ResultsPlus
Examiner Comments

The candidate scores one mark for the implication of tectonic plates moving. The idea that earthquakes result from tectonic plates crashing into each other was often stated by weaker candidates.

ResultsPlus
Examiner Tip

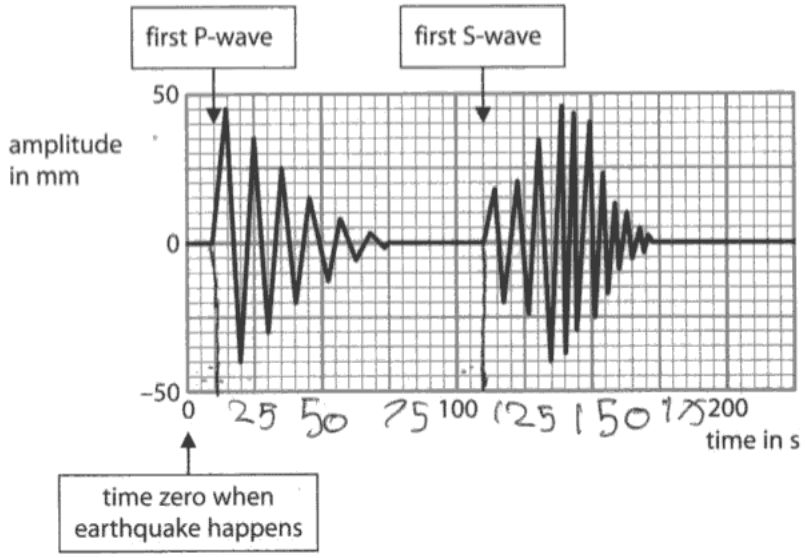
Candidates must prepare by memorising the basic facts as stated in the specification and using technical terms wherever possible in descriptions and explanations.

Question 4(c)

This item was answered correctly by more than 60% of candidates. The main sources of errors were misreading the graph or to give an answer 110 ie failing to subtract 10. Once again, many candidates lost a mark here through failing to show their working.

One of the many correct responses:

(c) The chart shows the arrival of earthquake waves at an earthquake monitoring station.



The S – P time (S minus P time) for earthquake waves is the time difference between the arrival of the first P wave and the first S wave.

Use the chart to estimate the S – P time for the earthquake waves shown.

(2)

110 - 10

S – P time = 100 seconds

ResultsPlus

Examiner Comments

The candidate clearly shows working on the graph and the final subtraction, an excellent response.

ResultsPlus

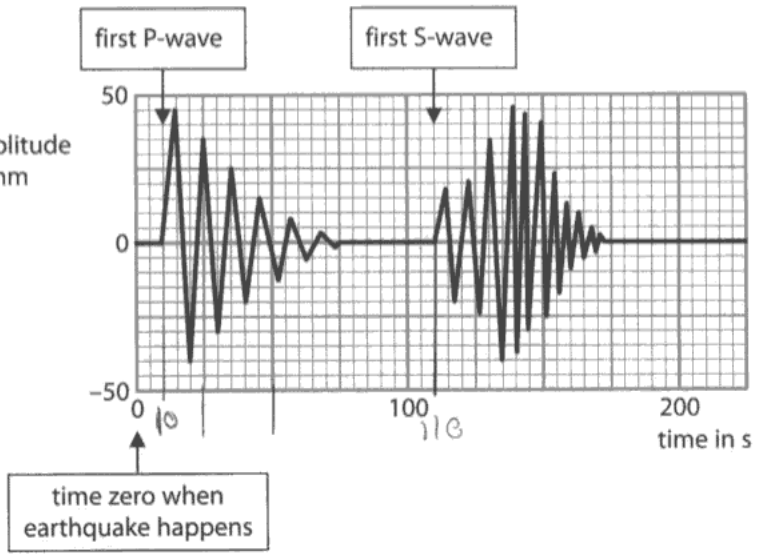
Examiner Tip

It is always better to show HOW you arrived at your answer.

You may be able to get a mark if your answer is wrong and the examiner can see that you used the correct method.

Another example scoring both marks:

(c) The chart shows the arrival of earthquake waves at an earthquake monitoring station.



The S – P time (S minus P time) for earthquake waves is the time difference between the arrival of the first P wave and the first S wave.

Use the chart to estimate the S – P time for the earthquake waves shown.

(2)

S = 110

P = 10

100

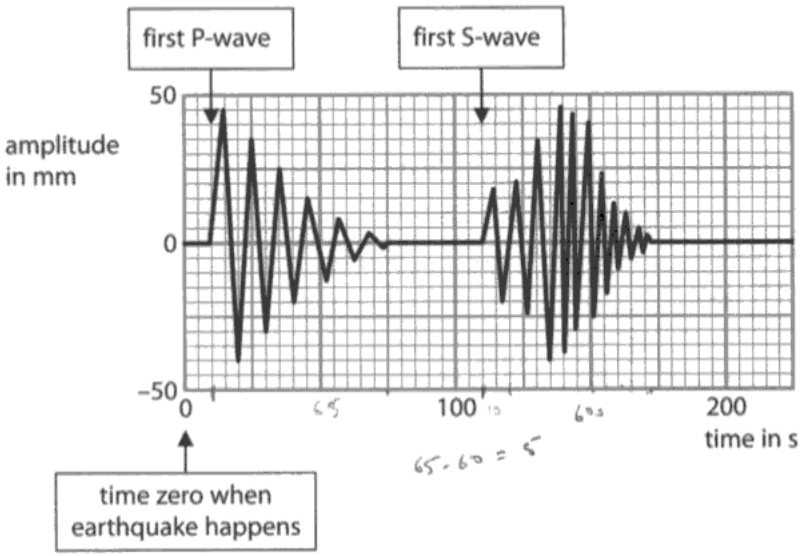
S – P time = 100 seconds

ResultsPlus
Examiner Comments
This candidate has clear concise working.

ResultsPlus
Examiner Tip
Always show your method of working in graphical and calculation questions.

This is a good example of why you should always show your method of working.

(c) The chart shows the arrival of earthquake waves at an earthquake monitoring station.



The S – P time (S minus P time) for earthquake waves is the time difference between the arrival of the first P wave and the first S wave.

Use the chart to estimate the S – P time for the earthquake waves shown.

(2)

110 − 10 = 10

S – P time = 10 seconds

ResultsPlus
Examiner Comments

Unfortunately, the candidate has made an error whilst subtracting.

The examiner is able to award 1 mark for the correct readings from the graph being used in the subtraction.

ResultsPlus
Examiner Tip

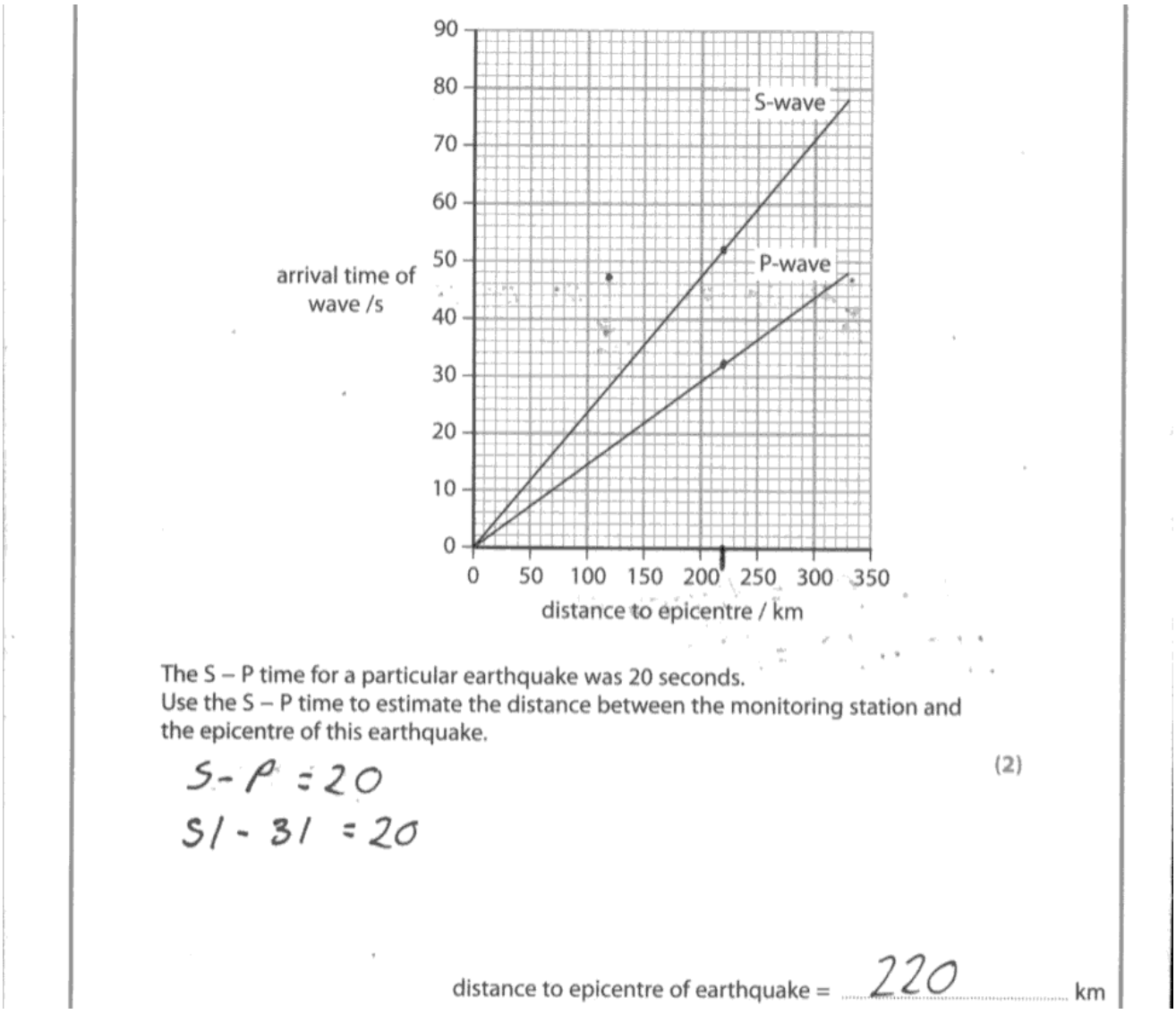
Read the question carefully to make sure that you have given the right answer. If you have spare time at the end of the examination, use it to check your work.

Question 4(d)

Only the most able candidates fared well with this item. Most candidates did not grasp the idea of S-P time.This resulted in many reading across the graph from 20s on the y-axis rather than looking for a 20s separation between the two lines on the graph. This led to a variety of answers based around the distances 80 km and 140 km, or various manipulations of them.

The other common incorrect responses were based around the final data points on the plotted graphs, either the S-P time of 30s or the distance to epicentre of 330km.

This is an example of a successful response.



The S – P time for a particular earthquake was 20 seconds.
Use the S – P time to estimate the distance between the monitoring station and the epicentre of this earthquake.

(2)

S - P = 20

51 - 31 = 20

distance to epicentre of earthquake = 220 km

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Examiner Comments

The candidate has identified the S-P time interval of 20 seconds on the graph and then indicated the correct distance on the X-axis.

Although there was misreading of the values of time on the y-axis, the values quoted were within the tolerance allowed for this item.

ResultsPlus
Examiner Tip

It is always better to show HOW you arrived at your answer.

You may be able to get a mark if your answer is wrong and the examiner can see that you used the correct method.

Question 4(e)

This item was generally well answered with almost 75% of candidates scoring 1 or 2 marks. Many candidates missed out on marks as their answers were too vague eg '…too low for humans to hear' rather than '…the frequency was too low.'

An example of one of the many 2 mark responses:

(e) Many earthquakes and volcanoes are linked to the production of infrasound waves.

Describe what is meant by **infrasound waves**.

(2)

they are longitudinal waves that have frequencies below 20Hz. Below a point which humans cannot hear.

(Total for Question 4 = 10 marks)

ResultsPlus
Examiner Comments

This is a clear response. The marks are both scored in the first sentence.

ResultsPlus
Examiner Tip

Ensure that when there are two marks for the question, two points are made in the answer.

An example of a response scoring 1 mark:

(e) Many earthquakes and volcanoes are linked to the production of infrasound waves.

Describe what is meant by **infrasound waves**.

(2)

infrasound waves are waves that have a wavelength frequency lower than 20,000 H_2 and can't be heard by humans. They are longitudinal and can travel long distances.

(Total for Question 4 = 10 marks)

ResultsPlus
Examiner Comments

The candidate has confused infrasound and ultrasound. However, as the marks are independent of one another, one mark has been awarded by the examiner for identifying the wave type as longitudinal.

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Examiner Tip

Candidates should read the question through very carefully, both before and after writing their answer.

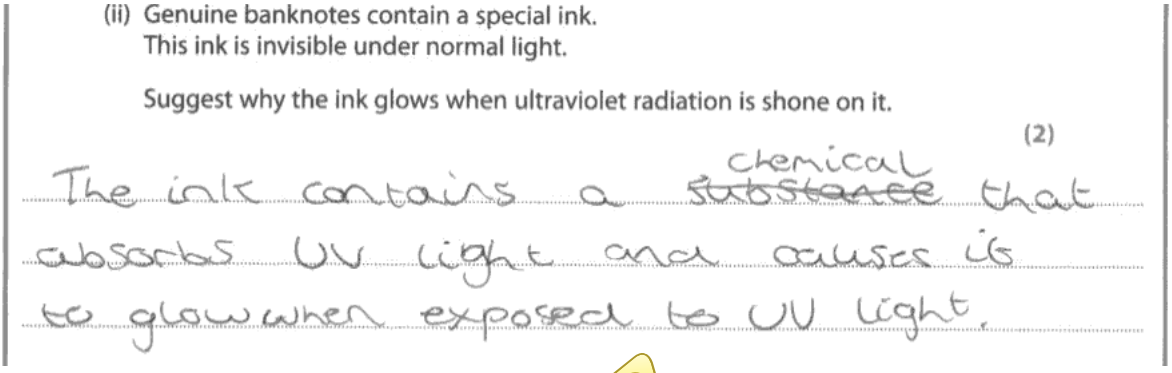
Question 5(a)(i)

Over 80% of candidates correctly identified an electromagnetic wave that is also an ionising radiation.

Question 5(a)(ii)

Only the most able candidates fared well with this item. Most candidates were not able transfer their knowledge of the uses of fluorescence in identifying genuine bank notes to suggest the reason why the bank note glowed when ultraviolet radiation is shone on it.

A typical 1 mark response:



(ii) Genuine banknotes contain a special ink.
This ink is invisible under normal light.

Suggest why the ink glows when ultraviolet radiation is shone on it.

(2)

The ink contains a chemical ~~substance~~ that absorbs UV light and causes it to glow when exposed to UV light.

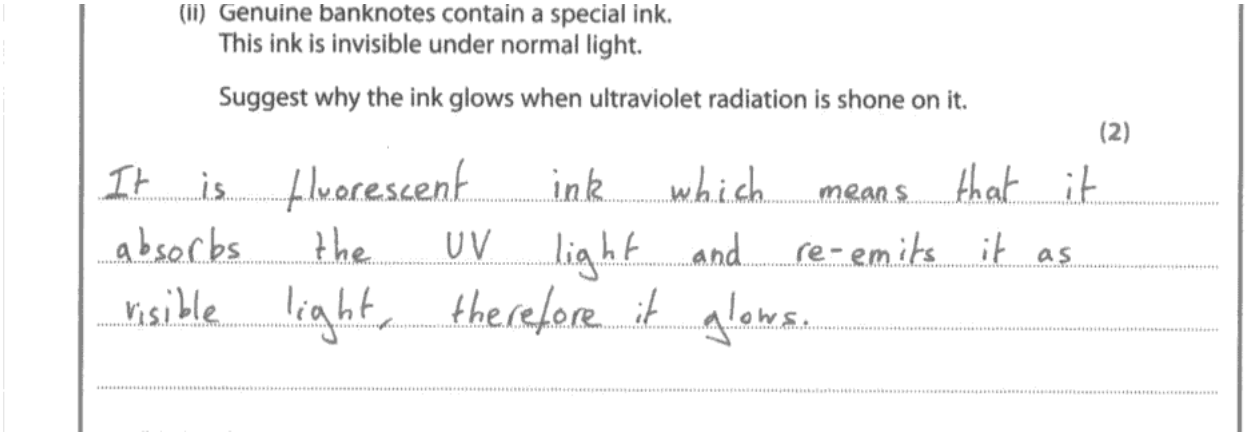
ResultsPlus
Examiner Comments

The candidate is awarded a mark for stating that the ink absorbs (energy from) ultraviolet radiation.

ResultsPlus
Examiner Tip

Ensure that when there are two marks for the question, two points are made in the answer that are not merely repeating the wording of the question.

An example of a response scoring both marks:



(ii) Genuine banknotes contain a special ink.
This ink is invisible under normal light.

Suggest why the ink glows when ultraviolet radiation is shone on it.

(2)

It is fluorescent ink which means that it absorbs the UV light and re-emits it as visible light, therefore it glows.

ResultsPlus
Examiner Comments

This is an example of the type of response that we were hoping for.

This response was awarded 2 marks.

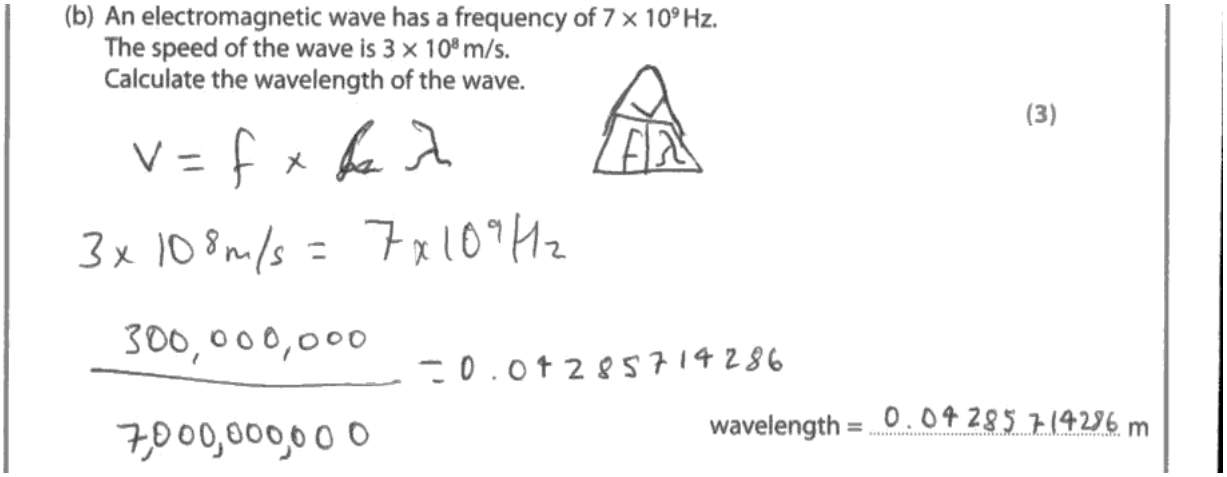
ResultsPlus
Examiner Tip

Read the question carefully to make sure that you have given the right answer. If you have spare time at the end of the examination, use it to check your work.

Question 5(b)

Almost 60% of candidates scored at least one mark for this item with almost 30% scoring all three marks. It was pleasing to note that many candidates are now writing the equation, transforming it and then making the substitution. However, having transformed the equation correctly, putting the smaller number on top seems to present a problem for some candidates. A number of candidates appeared either not to have a calculator or not to be familiar with how to use it for standard form.

An example of one of the 3 mark responses:


(b) An electromagnetic wave has a frequency of 7×10^9 Hz.
The speed of the wave is 3×10^8 m/s.
Calculate the wavelength of the wave.

(3)

$V = f \times \lambda$

$3 \times 10^8 \text{ m/s} = 7 \times 10^9 \text{ Hz}$

$\frac{300,000,000}{7,000,000,000} = 0.042857142\overline{86}$

wavelength = 0.042857142$\overline{86}$ m

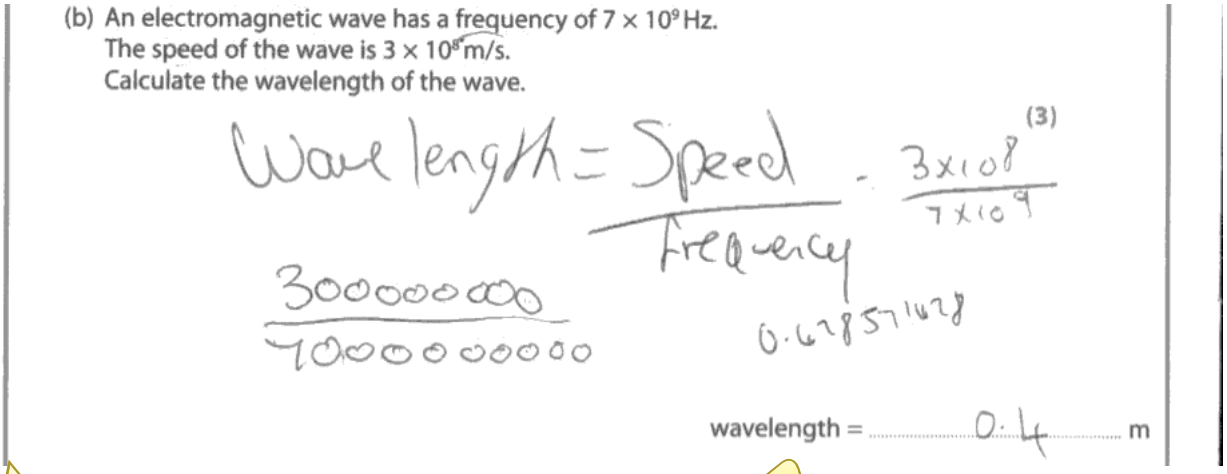
ResultsPlus
Examiner Comments

Although not all the working is included, there is sufficient for the examiner to award 2 marks if the answer had been incorrect.

ResultsPlus
Examiner Tip

Triangles are a good way to help to remember some equations BUT, the examiner will not award any marks for them.

A typical 2 mark response:


(b) An electromagnetic wave has a frequency of 7×10^9 Hz.
The speed of the wave is 3×10^8 m/s.
Calculate the wavelength of the wave.

(3)

Wavelength = Speed / Frequency $\frac{3 \times 10^8}{7 \times 10^9}$

$\frac{300000000}{7000000000}$ 0.042857142

wavelength = 0.4 m

ResultsPlus
Examiner Comments

This response shows good evidence of the candidate's method of working. This allows the examiner to award 2 marks as unfortunately, the candidate has made a power of ten error when converting the speed from standard form.

ResultsPlus
Examiner Tip

Candidates should always show their working. If they get the answer correct with no working, then they will get full marks but if their answer is wrong with no working, they will get zero.

Question 5(c)

Over 80% of candidates scored 2 or more marks on this item with over 55% scoring 4 or more marks. The different regions of the spectrum were well known and most candidates knew the damage caused by radiation. However, less successful candidates failed to associate the damage with specific radiations or named the wrong type of radiation. The link between frequency-energy and ability to cause damage to cells was often made, although some candidates who mentioned increasing frequencies did not associate that explicitly with increasing damage, and even fewer linked relevant cell or tissue damage or DNA mutation to penetrating ability.

A typical 4 mark response:

*(c) Radiation from different regions of the electromagnetic spectrum can affect the human body in many ways.

Discuss the different ways in which excessive exposure to electromagnetic radiations of various frequencies may cause damage to the human body.

(6)

Radiowaves have been suggested to cause brain tumours by the constant usage of mobile phones. When you're constantly exposed to Infrared radiation it can cause bad skin burns from the waves causing skin to move around and produce heat which burns you. Ultraviolet radiation comes from the sun and causes your skin cells to mutate which could cause skin cancer. It can also cause really bad eye damage. Gamma rays and X rays are known to be able to penetrate the skin and when exposed could mutate or destroy cells. It can also cause cancer.

(Total for Question 5 = 12 marks)

ResultsPlus
Examiner Comments

The candidate has failed to make any link between the frequency of electromagnetic radiation and its ability to cause damage.

ResultsPlus
Examiner Tip

To access full marks candidates must answer all aspects of a question.

An example of a 6 mark response:

*(c) Radiation from different regions of the electromagnetic spectrum can affect the human body in many ways.

Discuss the different ways in which excessive exposure to electromagnetic radiations of various frequencies may cause damage to the human body.

(6)

Exposure to microwave radiation can cause the internal heating of body cells, since they contain water, and microwaves heat the moisture in objects. Infra-red radiation has a higher frequency than microwaves, and can cause skin burns. Prolonged exposure to ultraviolet waves can cause eye damage if they are from the sun and skin cancer in some cases, since it has an even higher frequency than infra-red. X-rays and gamma rays are the most dangerous since they have higher frequencies than all other electromagnetic waves, and so carry more energy. They are also both ionising and can cause DNA damage, cell mutation and cancer if exposed to those waves for a long period of time.

(Total for Question 5 = 12 marks)

ResultsPlus

Examiner Comments

The candidate has correctly linked at least three types of electromagnetic radiation to the damage they can cause. Although not explicit, there is a clear link between the frequency of the electromagnetic radiations and their ability to cause damage.

An example of a 2 mark response:

*(c) Radiation from different regions of the electromagnetic spectrum can affect the human body in many ways.

Discuss the different ways in which excessive exposure to electromagnetic radiations of various frequencies may cause damage to the human body.

(6)

One electromagnetic radiation is x-rays. This can cause cancer, and also damage the cells. Another one is ultra-violet. Too much exposion to this could cause damage to the skin and eyes. Micro radiation in things like mobile phones can eventually damage our brains.

ResultsPlus

Examiner Comments

The candidate has linked the minimum number of electromagnetic radiations to the correct damage caused by the radiations. There is no detail of the damage caused and so the examiner has awarded 2 marks.

Question 6(a)

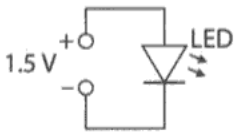
Over 50% of candidates scored this mark. One of the more common incorrect responses was alternator.

Question 6(b)

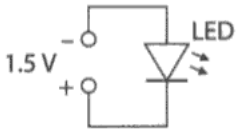
Only the most able candidates fared well with this item. Most candidates found it difficult to transfer their understanding of a.c and d.c. to this unfamiliar situation.

An example of a 2 mark response:

(b) A light emitting diode (LED) can only emit light when connected correctly to a potential difference.



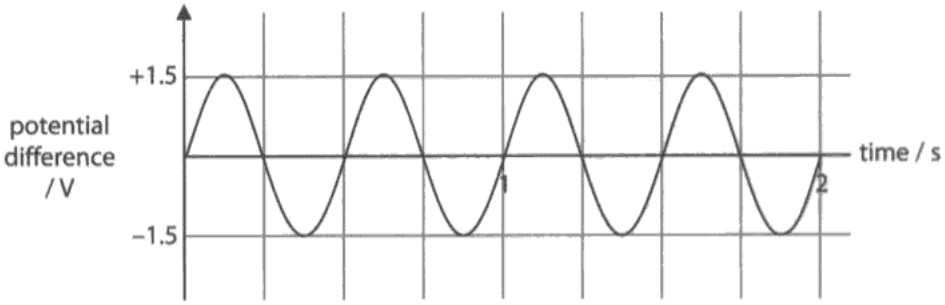
LED emits light



LED does **not** emit light

Use this information to suggest what happens when this alternating voltage is connected across the LED.

(2)



the LED will emit light when the potential difference is positive, but ~~then~~ will stop when negative therefore the LED will flash on and off very quickly.

ResultsPlus
Examiner Comments

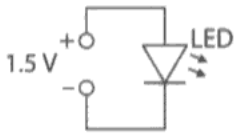
The candidate has done enough to gain both marks.

ResultsPlus
Examiner Tip

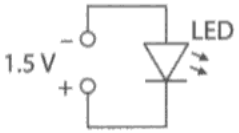
Candidates should practise applying their knowledge to new situations by attempting questions in support materials, or exam papers from previous sessions.

This response is typical of those scoring 1 mark.

(b) A light emitting diode (LED) can only emit light when connected correctly to a potential difference.



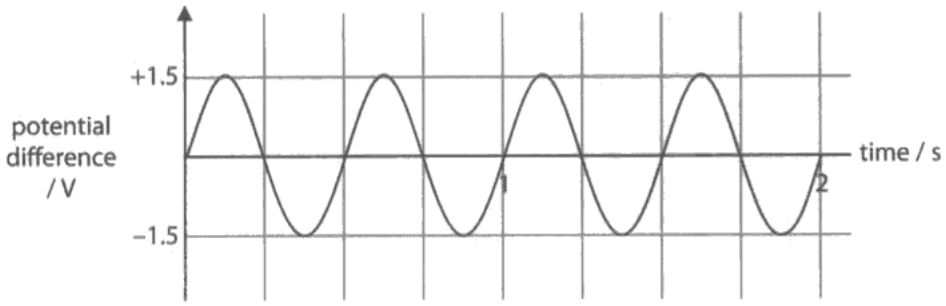
LED emits light



LED does **not** emit light

Use this information to suggest what happens when this alternating voltage is connected across the LED.

(2)



the light would flicker and turn on & off. ~~the~~

ResultsPlus
Examiner Comments

The candidate states that the LED will turn on and off but does not explain why this will happen.

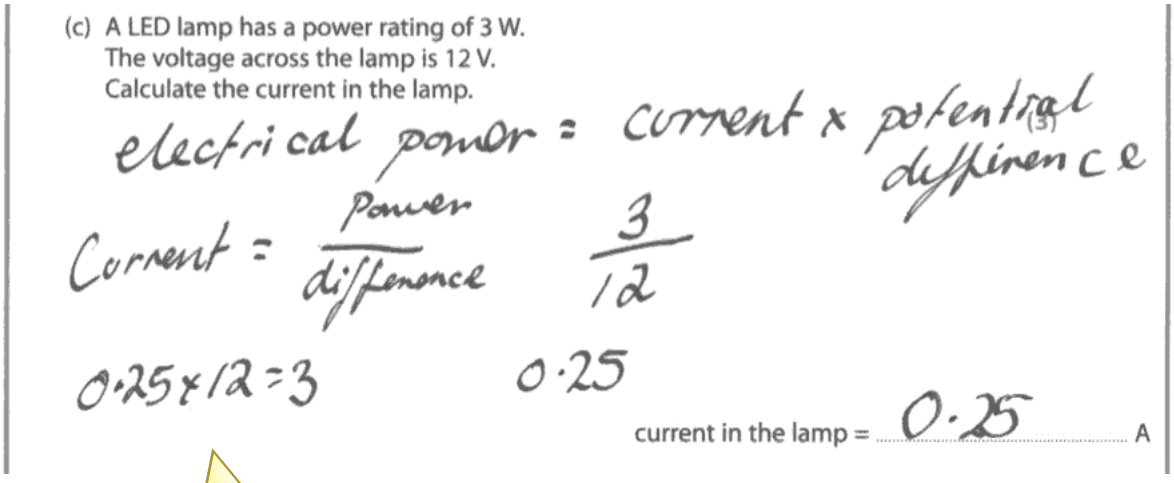
ResultsPlus
Examiner Tip

The command word **describe** requires candidates to say what is happening. **Explain** is the command word used when we want you to use some Science to say why something happens.

Question 6(c)

Almost 40% of candidates scored full marks on this item. It was pleasing to note that most of the candidates gaining full marks are writing the equation, transforming it and then making the substitution. However, for some candidates, having transformed the equation, evaluating a fraction with the smaller number on top, seems to present a problem. A very common error was to write 3/12 = 4, whilst a significant proportion of candidates crossed out correct answers and replaced them when the number had not come out as an integer.

This is a well set out response gaining all 3 marks.


(c) A LED lamp has a power rating of 3 W.
The voltage across the lamp is 12 V.
Calculate the current in the lamp.

electrical power = current x potential difference

Current = power / difference

3 / 12

0·25 x 12 = 3

0·25

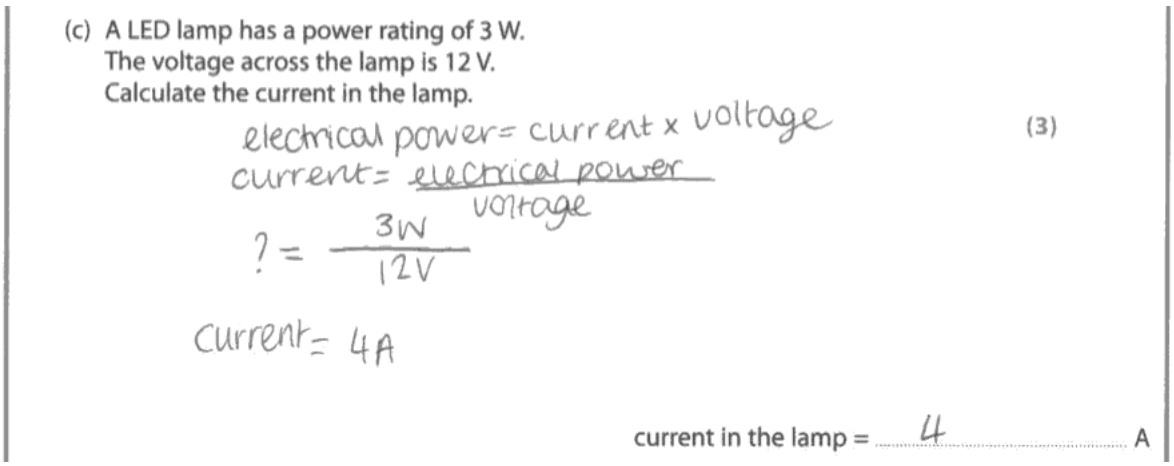
(3)

current in the lamp = 0·25 A

ResultsPlus
Examiner Comments

This was an excellent response to the question. The candidate showed full method of working. Had there been an error in the final evaluation, then some of the marks would still have been available.

This was an all too familiar example of a response scoring 2 marks.


(c) A LED lamp has a power rating of 3 W.
The voltage across the lamp is 12 V.
Calculate the current in the lamp.

electrical power = current x voltage

current = electrical power / voltage

? = 3W / 12V

current = 4A

(3)

current in the lamp = 4 A

ResultsPlus
Examiner Comments

The candidate has been awarded 2 marks for a correct transformation and substitution. Unfortunately, the candidate then evaluated 12/3 rather than 3/12.

ResultsPlus
Examiner Tip

Candidates should always show their working. If they get the answer correct with no working, they will get full marks, but if their answer is wrong with no working, they will get zero.

Question 6(d)

This item was answered well by many candidates. Responses at level 1 were from candidates who did no or very little processing of the information provided about LED and fluorescent light fittings. However, almost 60% of candidates did some processing of the information in their discussion of the benefits of LED fittings to reach levels 2 and 3.

An example of a level 3 response:

Use the information to discuss the benefits of replacing fluorescent fittings with LED fittings.

(6)

the lifetime of LED fittings are 5 times as long as fluorescent ones (50000 hours). 1.6 tonnes of CO_2 is saved a year by the LED fittings wich slows down the rate of global warming. 3,000 kwh are saved buy LEDs a year there for saving £420 a year on electricity (3,000 kwh x 14p/KWh). The cost of the LED fittings is £2,000, you would make that money back in 4.8 years (5 years) by the amount of energy you would save. LEDs are 200% brighter than fluorescent improving the lighting in the room/ area.

In conclustion I feel LED fittings have a lot of benifits and are alot better than fluorescent ones

(Total for Question 6 = 12 marks)

TOTAL FOR PAPER = 60 MARKS

ResultsPlus
Examiner Comments

The candidate has processed more than half the data points in the table including calculating the amount of money saved each year by switching to LED fittings and also the payback time of the LED fittings. The examiner was able to match this response to the criteria for level 3 and award 6 marks.

ResultsPlus
Examiner Tip

Candidates must be very clear in their responses and say exactly what they mean. Examiners will not make assumptions from what they have not said.

A typical level 1 response:

Use the information to discuss the benefits of replacing fluorescent fittings with LED fittings.

(6)

The LED's save 3000 kWh of energy each year, they also save 1.6 tonnes of CO_2 each year. The lighting levels are much higher *and the light is brighter. *200% raised. Compared to the fluorescent fittings the LED's will last 40,000 hours more. The LEDS ~~use~~ cost 14p /kWh, which is considerably cheap.

ResultsPlus

Examiner Comments

The candidate has done some processing of the information to be able to say that LED fittings last 40 000 hours longer than fluorescent fittings.The examiner was able to award 2 marks for this response.

ResultsPlus

Examiner Tip

When provided with information to consider, you will gain little or no credit for simply repeating the data. Always try to process the data before using it in your answer.

This is an example of a level 2 response.

Use the information to discuss the benefits of replacing fluorescent fittings with LED fittings.

(6)

Replacing fluorescent fittings with LED fittings is very beneficial. ~~The benefits of replacing~~ these the benefits are:

The lighting is much better + the total energy saved each year by using LEDs means that it is more efficient.

- The Co_2 saving each year by using LED's is 1.6 tonnes, this also benefits the environment.

£20 is saved each year, the average lifetime of LED fittings is longer than the fluorescent fittings by about 40,000 hours.

ResultsPlus

Examiner Comments

The candidate has done some processing including calculating the amount of money saved each year by switching to LED fittings. However there is insufficient processing to reach level 3. The examiner was able to match this response to the criteria for level 2 and award 4 marks.

Paper Summary

The paper allowed candidates of all abilities to access marks in all questions. Less succesful candidates found difficulty with describe, explain and discuss questions, and with some of the calculations. In order to improve their performance, candidates should:

- 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
- use the marks at the side 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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