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Examiners' Report
June 2016

GCSE Physics 5PH1H 01

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Introduction

This unit is divided into six topics and all six topics were tested in the examination. The examination paper allowed every candidate to demonstrate what they know, understand and can do. There was a variety of question types such as multiple choice and short response questions as well as opportunities to show their ability to construct a meaningful longer response by extended writing. The latter questions, particularly the two six-mark items, each simultaneously allows candidates to demonstrate the quality of their written communication in a physical situation.

This report will provide exemplification of and comments on candidates' interpretation of the questions. It should be read alongside the mark scheme which shows a more comprehensive account of responses which were allowed and those which did not reach the standard required. In this context, it is worth mentioning four important words used in the mark-scheme – accept, ignore, condone and reject.

- Accept(able) – a suitable alternative response and can often score full marks. Thus positrons/positive electrons are suitable alternatives. This may also be used when dealing with significant figures in the final answer to a calculation.
- Ignore – correct (usually) but irrelevant to the question. The question is marked as if this part was not there. So, for example, in a question asking for an explanation of refraction in terms of wave-speed, discussion of density changes may be ignored.
- Condone – not really correct or complete. This represents the minimum level of response to be considered for a mark. This might in some circumstance be to allow the use of 'negative charge' in place of 'electron(s)'.
- Reject – so badly incorrect that the mark cannot be awarded even if the correct answer is there as well. An obvious example would be the mention of positive and negative electrons flowing in a wire.

This report does not provide all acceptable answers to each question. Candidates are infinitely resourceful and innovative in their responses. As long as a response is *correct* (at the level), *relevant* and *sufficient* it should score the mark even if it is not specified in the mark-scheme. This is most noticeable in the extended writing responses.

Some examples of responses which scored some or none of the marks are included to enable teachers to tackle common misconceptions during future classroom activities.

Many excellent answers were seen and very few response spaces were left blank.

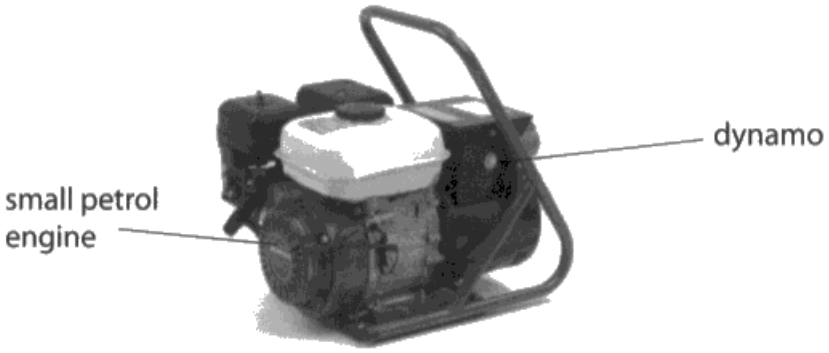
Less successful candidates wasted time by virtually repeating the question as a prelude to making a meaningful response, for example by writing a complete sentence when a single word was enough.

- lost marks by not showing their working in calculations in which they made an error.
- did not distinguish between 'explain' and 'describe'.
- did not check that they have answered the question/task set by re-reading the question even if they checked their answer.

Question 1 (a)

This, the first question on the paper, tested the How Science Works ideas about benefits, drawbacks and risks.

1 The photograph shows a portable petrol-driven generator.



The small petrol engine drives the dynamo.
The dynamo generates electricity.
This arrangement is not efficient in generating electricity.

(a) Apart from efficiency, state one advantage and one disadvantage this petrol-driven generator has, when compared with a small wind-powered generator.

(i) Advantage

(1)

It is portable so can be moved crand and taken with you.

(ii) Disadvantage

(1)

Petrol is expensive

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Examiner Comments

This represents the minimum acceptable response to the item. The property of being portable was extracted from the introductory information as being relevant and advantageous. Expense of fuel was accepted as compared to no fuel costs when the wind is used. It scored both marks.

Other acceptable advantages centred on ideas of weather dependency and size. Unsustainability and polluting effects were able to score as disadvantages.

Question 1 (b)

The majority of students scored the first mark on this two part item.

(b) The table gives some data about the small petrol engine.

energy transferred to surroundings in each second	5200 J
energy supplied to dynamo in each second	2800 J

(i) Calculate the total energy supplied to the petrol engine in each second.

(1)

total energy supplied to the petrol engine in each second = 8000 J

(ii) Use the data to calculate the efficiency of the petrol engine.

(2)

efficiency = $\frac{5200}{2800} \times 100$ = 185.714

efficiency = $\frac{5200}{8000} \times 100$

efficiency = 65 %

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Examiner Comments

The second part was not answered as welll as the first part. The energy transferred to the surroundings per second was often taken to be the useful part of the efficiency idea.

This response scored 1 for (i) and 0 for (ii).

(b) The table gives some data about the small petrol engine.

energy transferred to surroundings in each second	5200 J
energy supplied to dynamo in each second	2800 J

(i) Calculate the total energy supplied to the petrol engine in each second.

(1)

total energy supplied to the petrol engine in each second = 92 J

(ii) Use the data to calculate the efficiency of the petrol engine.

(2)

$$\text{efficiency} = \frac{5200}{2800} \times 100\%$$

$\frac{1300}{7}$

efficiency = 185.714285 %

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Examiner Comments

Candidates often try to answer by randomly using numbers supplied in the question.

Question 1 (c)

This follows through to a statement directly from the specification, which offered most a chance to score well from a basic piece of understanding.

(c) The dynamo generates an electric current by induction.

Explain what is meant by induction of a current.

(3)

The induction of a current is where current is created when a magnet enters a coil of wire, this ~~creates~~ causes a an electric electric current to form where electrons are transfered thus inducing a current.

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Examiner Comments

Many candidates used (relative) motion between a magnet and a coil. Other movements, however, involving any conductors and magnetic fields, such as in a dynamo, were, of course, allowed.

This response scored the full three marks.

The most common omission was that of movement.

(c) The dynamo generates an electric current by induction.

Explain what is meant by induction of a current.

(3)

Induction of a current is when a coil and a magnet are used together to make a current that will be used to power something. The ~~faster~~ bigger the magnet, the ~~higher~~ faster the current.

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Examiner Comments

The final 'sentence' although it may have the germ of a correct idea is irrelevant.

This response is limited to 2 marks.

A variety of other supposed 'descriptions' of induction were given such as this:

(c) The dynamo generates an electric current by induction.

Explain what is meant by induction of a current.

(3)

Induction of a current is when a current is made due to energy being created. ~~by a ma~~

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Examiner Comments

This falls foul of other statements in the specification as well as containing nothing of note. This scored zero.

Question 2 (b) (i)

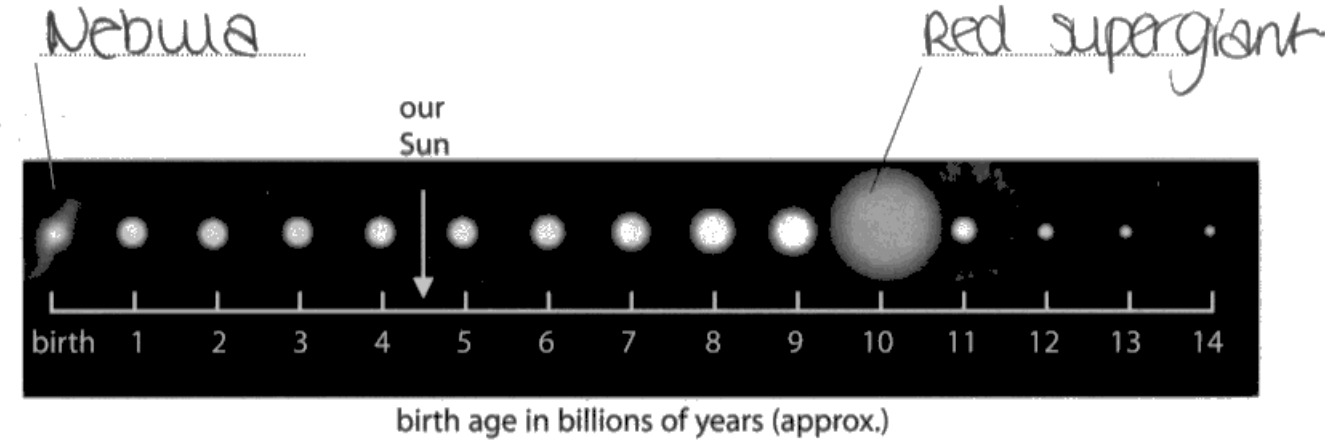
This item involved analysing the data and completing the sequence. The vast majority scored the mark for nebula / cloud of dust /gas and nearly 3/4 of candidates scored both marks.

Errors tended to be made when labelling the red giant.

(b) The diagram shows the stages in the evolution of a star like our Sun.

The sizes of the star are not drawn to scale.

The position of our Sun now is shown.



(i) Label the two stages indicated.

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Examiner Comments

Candidates sometimes mixed up the two sequences for stars of different mass.

This response scored only the first mark.

Question 2 (c)

In this item, the sequence for more massive stars was tested.

(c) Another main sequence star has a mass much greater than the mass of our Sun.

State the next stages in the evolution of this star, before it becomes a neutron star.

(2)

After expanding to become a [illegible], Red Giant, a more massive sun will become a supernova. And then a neutron star.

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Examiner Comments

Almost all mentioned supernova but fewer, as here, knew that the other (earlier) stage was red super giant (or super red giant even).

This response scored 1.

Question 2 (d)

The specification states that candidates should be able to describe the role of gravity in the life cycle of stars.

This was considered to be worth only one of the two marks since although gravitational pull is involved, there is no mention of its direction.

(d) In a main sequence star, fusion in the core generates thermal energy. As a result, the hydrogen and helium ions are pushed outwards.

Explain why these ions do not just quickly move outwards.

(2)

due to the gravitational pull of the star and the density

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Examiner Comments

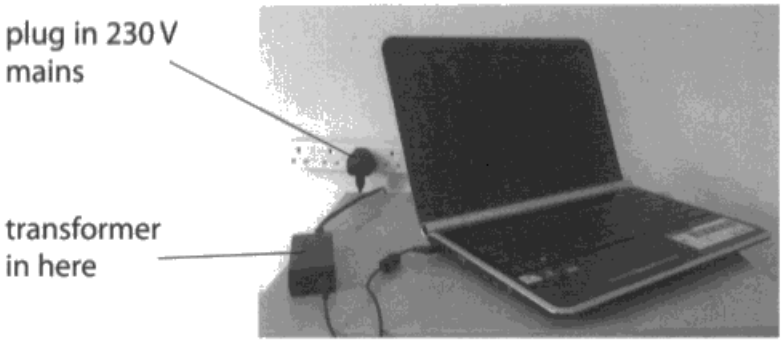
A variety of responses indicated that gravity pushes the ions/particles together, slows them down (like friction) or keeps them together in some way. A significant number of candidates thought that there is no gravity in space.

Question 3 (a)

This item represents a common and relevant calculation.

There were several opportunities for errors in this common calculation.

3 The photograph shows a laptop computer plugged into the 230 V mains.



(a) The laptop is left on standby.

Its power consumption from the mains is 3.2 W.

The cost of 1 kWh of electrical energy is 14 p.

Calculate the cost of leaving the laptop on standby for 24 hours.

(3)

Cost of electricity = Power x time x cost of 1 kWh.

645.15

= 3.2 x 1440 x 0.14

3.2 W

14p

1440 mins

cost = 645 p

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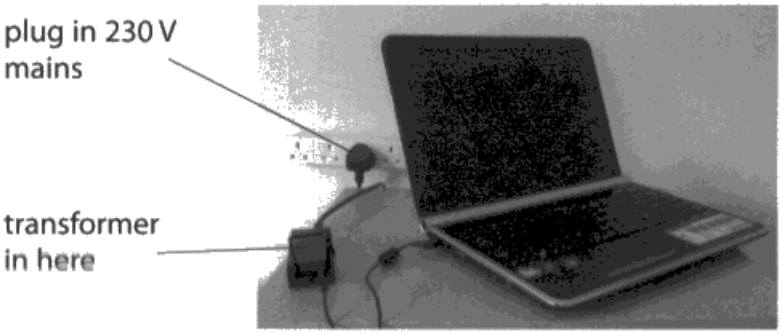
Examiner Comments

Here the unit for power was left as W whereas the equation needs kW and the time was changed to minutes instead of leaving it in hours.

One mark was scored for the fact that any power was multiplied by any time x cost per unit.

3 The photograph shows a laptop computer plugged into the 230 V mains.



(a) The laptop is left on standby.

Its power consumption from the mains is 3.2 W.

The cost of 1 kWh of electrical energy is 14 p.

Calculate the cost of leaving the laptop on standby for 24 hours.

0.4 2.5.

cost = power x time x cost of one (3)

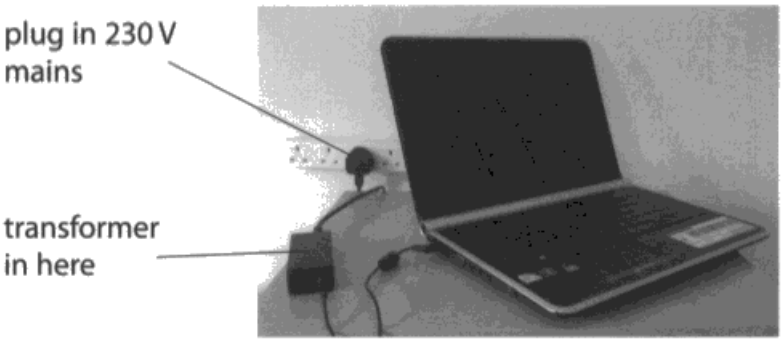
112.

cost = 112 p

ResultsPlus
Examiner Comments

Although the candidate has written down a correct word equation , they have not identified the relevant values. Therefore no marks could be awarded.

3 The photograph shows a laptop computer plugged into the 230 V mains.



(a) The laptop is left on standby.

Its power consumption from the mains is 3.2 W.

The cost of 1 kWh of electrical energy is 14 p.

Calculate the cost of leaving the laptop on standby for 24 hours.

(3)

3.2 x 14 x 24 = 1075.2p

cost = 1075.2 p

ResultsPlus
Examiner Comments

1 mark is awarded for attempting the correct calculation.

Question 3 (b)

This item involves an equation supplied on the question paper. The major problem appears to be in transposing the subject of the equation.

(b) When the laptop is in normal use, its power consumption from the mains is 97 W.

Calculate the current drawn from the mains.

(3)

0.97 ÷ 230 = 4.2
(W) (V)

current = 4.2 A

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Examiner Comments

The learning and use of triangles does not seem to help. Part marks can be scored even though the final answer is incorrect. One such mark will often be for substituting numerical values in the place of letters / words in the given equation. Although possibly not the best way of tackling calculations, it can show that the student knows for what the symbols stand.

This scored 2 marks since there is an incorrect change of unit.

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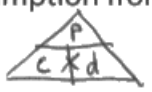
Examiner Tip

Encourage students to insert numerical values into the supplied equation and also practice cross-multiplication or similar as often as practical.

This response includes a triangle but seems superfluous.

(b) When the laptop is in normal use, its power consumption from the mains is 97 W.

Calculate the current drawn from the mains.



(3)

Power = current x potential difference

$$\text{current} = \frac{\text{Power}}{\text{Potential difference}}$$

$$\text{current} = \frac{97\text{w}}{230\text{v}} = 0.4217391304$$

current = 0.4 A

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Examiner Comments

This scores all 3 marks. The calculation working is set down logically and would allow part scoring even if the division was incorrectly performed.

Question 3 (c) (i)

The calculation involved in this item was thought to be more demanding than that of 3b.

(c) The transformer shown in the photograph steps down the mains voltage of 230 V to 9.2 V.

The primary coil of the transformer has 4700 turns.

(i) Calculate the number of turns on the secondary coil.

(3)

$\frac{V_P}{V_S} = \frac{N_P}{N_S}$

$\frac{230}{9.2} = \frac{4700}{N_S}$

$\frac{230 \times 4700}{9.2} = N_S$

$= 117500$

number of turns = 117500

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Examiner Comments

In practice, well over half scored the maximum 3 marks. Many of the rest, like this one, were able to score the part mark of 1 for substitution of relevant values into the correct equation. Once again, changing the subject was the problem.

Question 4 (a) (ii)

Candidates were expected to use the proximity of the 800 nm wavelength to the visible part of the electromagnetic spectrum to predict the type of radiation there.

The most common incorrect response was ultraviolet but the majority of candidates scored the mark.

Question 4 (a) (iii)

This item compared radiation received by a detector outside the Earth's atmosphere with that at the Earth's surface.

(iii) Suggest why there is a difference in the two graphs at a wavelength of 1850 nm.

(2)

The layer of gases surrounding our earth doesn't allow as much radiation to reach the earth's surface. whereas outside the atmosphere, nothing is absorbed and therefore it's greater. as some of it is absorbed (waves)

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Examiner Comments

This candidate gave a lengthy but reasonably accurate reason for the difference, scoring both marks. The physical process of absorption was mentioned although in a negative way outside the atmosphere.

.

Other students answered in terms related to other parts of the specification.

(iii) Suggest why there is a difference in the two graphs at a wavelength of 1850 nm.

(2)

As there are convection currents and much more radiation in the centre of the earth than the atmosphere.

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Examiner Comments

Here the radiation seems to be coming from inside the Earth outwards. It scored zero.

Question 4 (b)

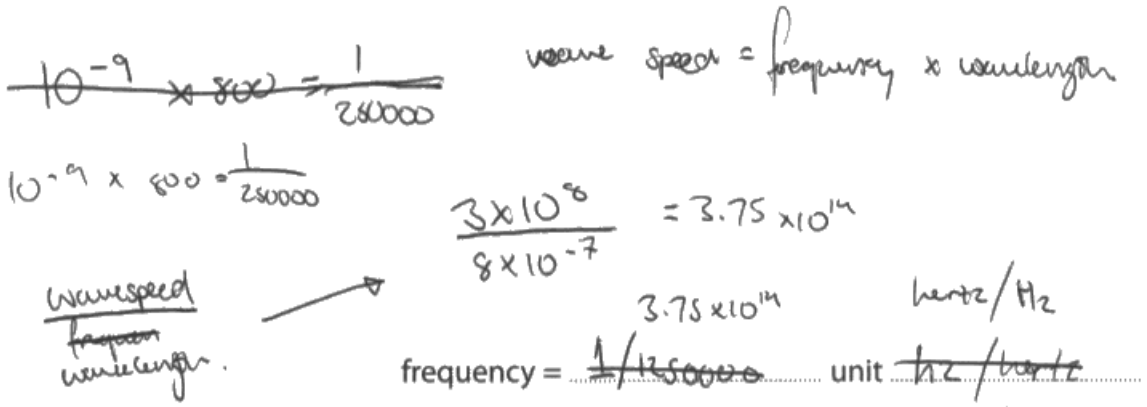
This calculation involved a straightforward equation but with data including standard form and units which are not the straightforward form.

(b) The velocity of light in a vacuum is 300 000 000 m/s (3×10^8 m/s).

1 nm = 10^{-9} m (1 / 1 000 000 000 m)

Calculate the frequency of radiation that has a wavelength of 800 nm. Give the unit.

(4)



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Examiner Comments

Although this response is untidy, there is enough there to see the working and the correct answer, with unit. It scored all four marks.

Even among those who managed the calculation correctly, however, quite a high proportion did not know the units of frequency. In words, hertz (correct) and Hertz (not correct as a unit) were both credited. However, in symbols, only Hz was rewarded but not hz.

Question 4 (c)

This item tested understanding of a phenomenon mentioned or implied in seven statements in the specification. The one most relevant to this item (3.18) is about relative movement and is not confined to red-shift, although this is the aspect involved in most of the others.

(c) Some light is emitted with a wavelength of 600.0 nm from our Sun.
When measured in the spectrum of another star, the light has a wavelength of 598.8 nm.

Explain what information this gives about the star.

(2)

This shows that the star is moving towards us as the wavelength is shorter and being squashed suggesting blue shift which shows that it is moving towards us.

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This response shows a firm understanding of the idea refering to it in a logical way: movement, wavelength shorter, (moving) towards us and blue-shift. The technical term blue-shift is not in the specification but would be credited in the absence of the other points. It scored both marks.

A variety of incorrect or insufficient responses were seen.

(c) Some light is emitted with a wavelength of 600.0 nm from our Sun.
When measured in the spectrum of another star, the light has a wavelength of 598.8 nm.

Explain what information this gives about the star.

(2)

this shows that the wave is 600.0nm away from our sun, and that the star is closer to the other star than the sun as then its wavelength is only 598.8nm. away from it.

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Many referred to distances rather than motion, though not normally as extreme as this, which scored zero.

A significant number wrote about red-shift. Either they confused the source of each radiation or only associated a change of wavelength with red-shift without really understanding what the technical term means.

(c) Some light is emitted with a wavelength of 600.0 nm from our Sun.
When measured in the spectrum of another star, the light has a wavelength of 598.8 nm.

Explain what information this gives about the star.

(2)

This means that the star is moving away, we know this because of Red shift

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This response was awarded one mark because it associated the change in wavelength with movement even though the direction was wrong.

Question 5 (a) (ii)

The eyepiece of a telescope aims to magnify the image produced by the objective lens (or mirror).

(ii) Describe the function of the eyepiece lens.

(2)

Focus the image

Turn it the 'right side up'.

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Examiner Comments

Many other statements were made – some correct but irrelevant and others just wrong. This scored zero.

(ii) Describe the function of the eyepiece lens.

(2)

It magnifies the image, so a clearer and more detailed ~~img~~ image is seen.

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Examiner Comments

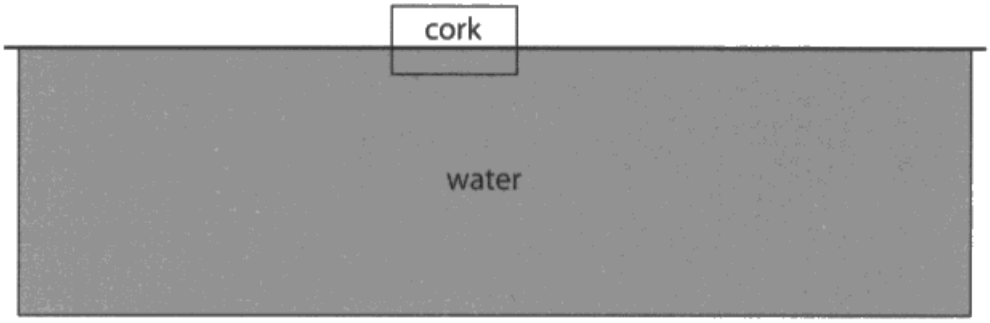
It is insufficient just to say 'magnify'. To score the second mark the response must show which image is being made bigger. The image from the objective lens or the real image or even just the image at the focal point is sufficient detail. This just scored 1 mark.

Question 5 (b) (i)

This was essentially a question based on a practical experiment.

To score full marks, it was necessary to refer to some instruction regarding the practical experiment as well as mention something about how observations will distinguish between the two types of wave.

(b) (i) A cork floats on some water.



Describe how this arrangement can be used to show whether waves on the water surface are transverse or longitudinal.

You may add to the diagram to help your answer.

(3)

Disturbing the water will send a wave towards the cork and the ~~cork~~ cork will move in the ~~direction~~ same way as the wave. If the wave is transverse, the cork will move up and down. If the wave is ~~Longitudinal~~ longitudinal the cork will undulate side to side.

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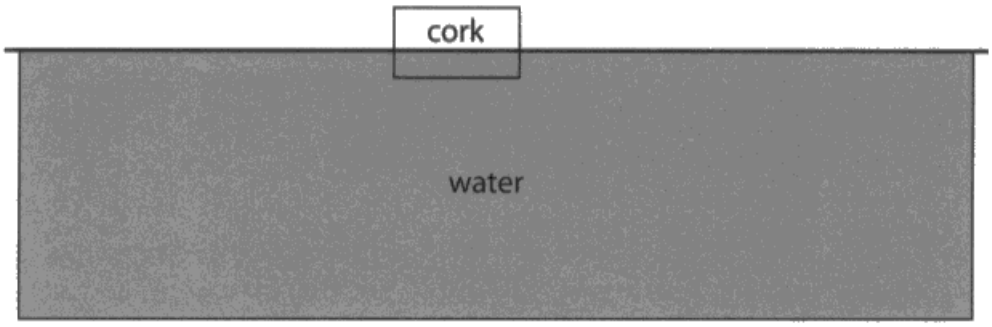
Examiner Comments

This answer mentions the production of the wave, the way of observing (cork moves) and the way in which the up and down movement establishes the transverse nature of the wave. It scored all three marks.

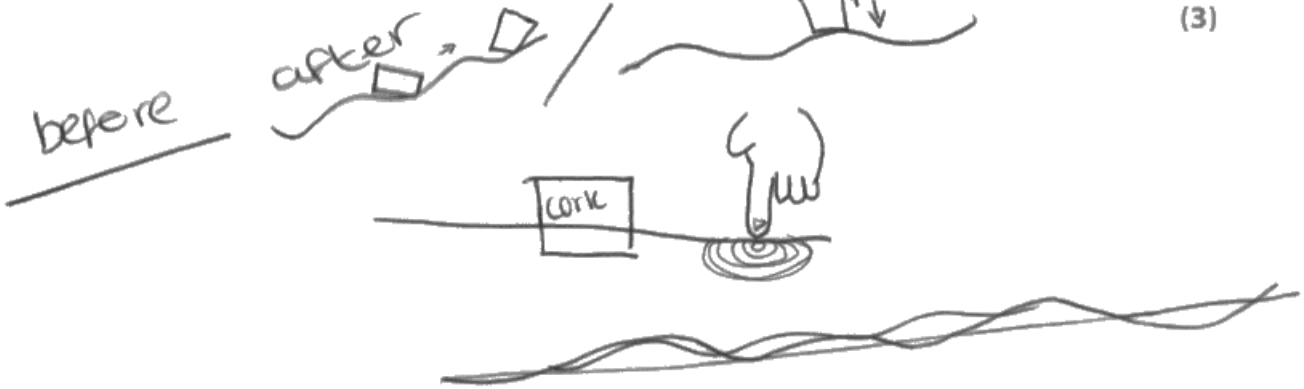
(b) (i) A cork floats on some water.



Describe how this arrangement can be used to show whether waves on the water surface are transverse or longitudinal.

You may add to the diagram to help your answer.

(3)



The cork will move about and go up and ~~down~~ down because the waves go up and down.

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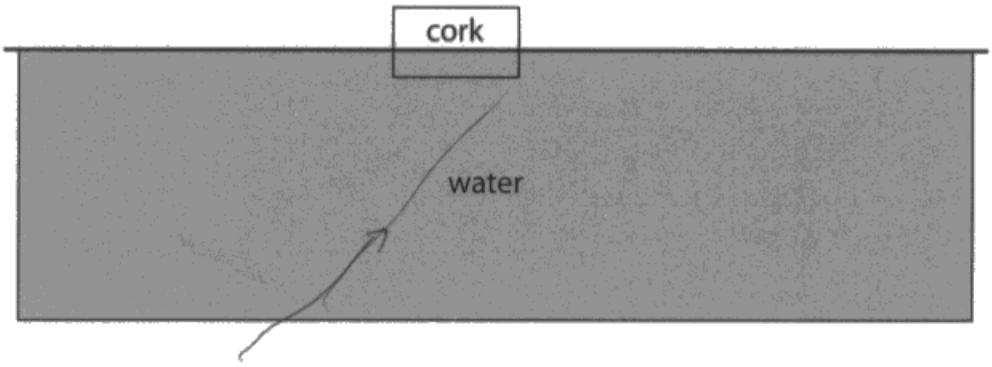
Examiner Comments

Some people scored 2 marks just from the experimental part of making the wave and observing the cork movement. Others scored the same number of marks just by defining transverse as compared to longitudinal waves (i.e without any experimental ideas). This scored 2 marks experimentally partly from the making of waves in the diagram!

(b) (i) A cork floats on some water.



Describe how this arrangement can be used to show whether waves on the water surface are transverse or longitudinal.

You may add to the diagram to help your answer.

(3)

The longitudinal waves travel faster so whichever wave reaches first - the cork - longitudinal. Also a longitudinal wave travels vertically so if the cork is unmoved it is a longitudinal, transverse travel straight up so is the cork is moved it is a transverse ray.

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Examiner Comments

This response scored 1 mark for the idea that the movement of the cork will provide the evidence even though the way in which the cork moves is unclear.

Question 5 (b) (ii)

This was an 'explain' question. An explanation is based on some fact(s). The facts are then developed or linked in a logical way. It was possible to achieve a level 1 response based on some idea of the 'facts' but full marks for level 2 and 3 responses required a link between the facts and the change in speed.

A few years ago, a question asked candidates to complete a diagram just like the one shown in this item. This time candidates were asked to explain what happens to the direction and wavelength of the waves. Marks for the diagram here were also limited to three.

If there was a conflict between diagram and written description, the latter in this quality of written communications question was paramount.

There was a clear statement, in the stem, showing how the wave speed changed in going from one depth of water to the other. A distinction was made between a change (e.g. wavelength **changes**) and a detailed change (e.g. wavelength **decreases**) in shallow water.

*(ii) The diagram shows water waves approaching a boundary between deep water and shallow water. The arrow shows the direction of travel of the water waves.

The wave speed in the shallow water is less than the wave speed in the deep water.

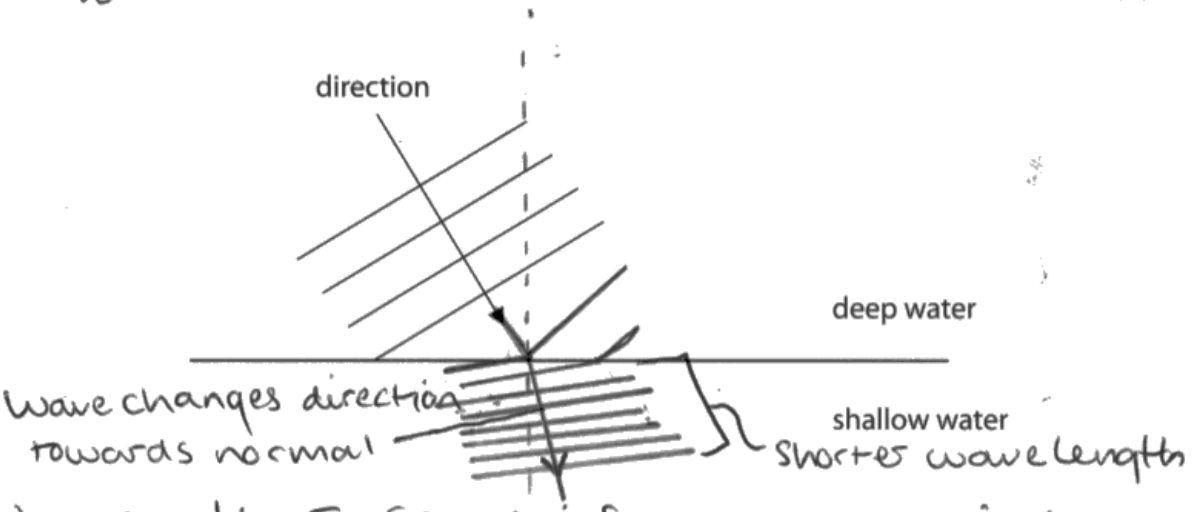
The frequency of the waves in the shallow water is the same as their frequency in the deep water.

Explain what happens to the direction and the wavelength of these waves when they pass from the deep water into the shallow water.

You may add to the diagram to help with your answer.

(6)

S = F x W



Wavelength = speed ÷ frequency so if the speed decreases in shallow water say from 10 to 5 and the frequency stayed the same e.g. 5 the wavelength would decrease e.g. 5 ÷ 5 = 1 which is less than 10 ÷ 5 which is 2 so in shallow water the wavelength will decrease. As the speed is slower this suggests shallow water is a denser medium so the ~~direction~~ wave should ~~bend~~ refract towards the normal as shown above as it moves into shallow water

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Examiner Comments

This example could have scored 3 marks from the diagram, just as it would have done in the pure physics question before. The diagram without words shows two detailed changes. The annotations include the word normal and the idea that the wavelength becomes shorted. The first three and half lines provide sufficient explanation even without the e.g. section. The link to speed was clear. It was not expected that candidates would enter into discussion about density, since this is the same material and so density does not change. Nevertheless, this good explanation was clearly worth the full 6 marks.

*(ii) The diagram shows water waves approaching a boundary between deep water and shallow water. The arrow shows the direction of travel of the water waves.

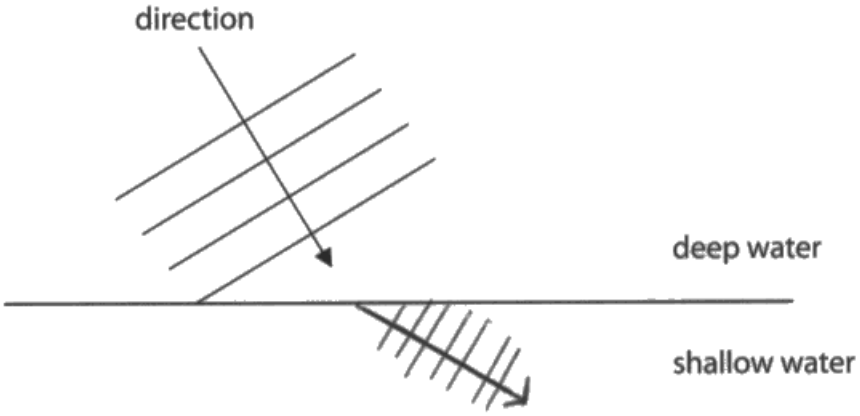
The wave speed in the shallow water is less than the wave speed in the deep water.

The frequency of the waves in the shallow water is the same as their frequency in the deep water.

Explain what happens to the direction and the wavelength of these waves when they pass from the deep water into the shallow water.

You may add to the diagram to help with your answer.

(6)



As the waves pass from deep to shallow water the amount of waves to pass that point each second stays the same. The direction of which the waves are ~~also~~ travelling will also change. The wavelength will decrease.

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Examiner Comments

In this response, the diagram provides one simple (direction even though wrong) change and one detailed (wavelength) change. There is no explanation as speed is not even mentioned so this is a level 1 response . The language elements are fine so it scores 2 marks.

*(ii) The diagram shows water waves approaching a boundary between deep water and shallow water. The arrow shows the direction of travel of the water waves.

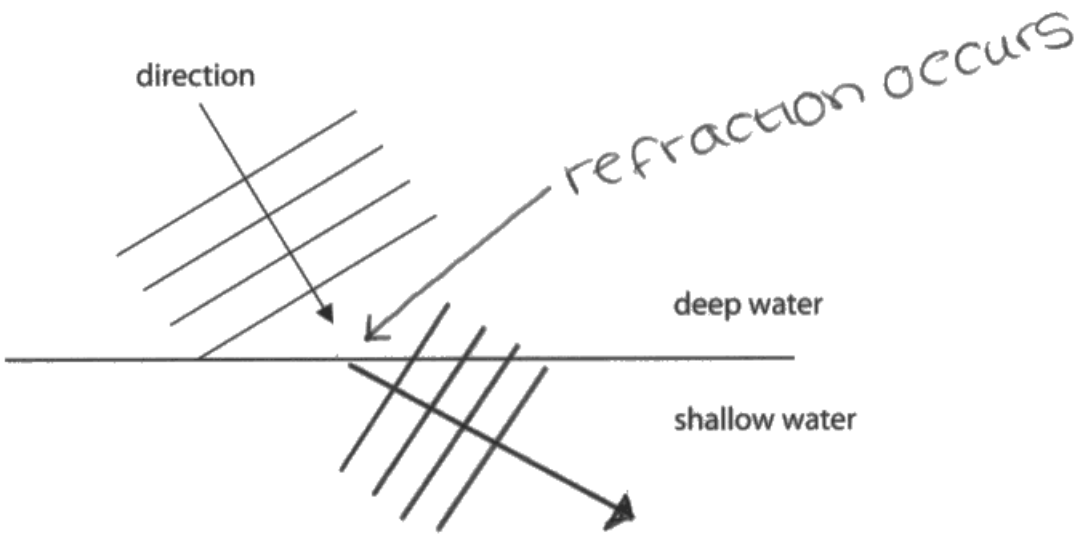
The wave speed in the shallow water is less than the wave speed in the deep water.

The frequency of the waves in the shallow water is the same as their frequency in the deep water.

Explain what happens to the direction and the wavelength of these waves when they pass from the deep water into the shallow water.

You may add to the diagram to help with your answer.

(6)



When the wave enters the shallow water refraction occurs this happens as it enters a different boundary therefore the speed and direction of the wave will change. The speed of the waves will decrease and slow down this will also effect the wavelength of the wave as it will slow down causing the wavelength to become shorter.

ResultsPlus
Examiner Comments

This response scored 4 marks as it gave one simple change (wrong direction), one detailed change and a linked reason. The link raised this to a level 2 response and the language level was sufficient for level 2 giving a score of 4 marks.

Question 6 (b)

A tsunami is caused by some catastrophic event such as an earthquake, volcano, or landslip underwater or by the arrival of a meteorite in the sea. The uncertainty of this event is what makes the tsunami unpredictable.

(b) Explain why it is difficult to predict when a tsunami will occur.

(2)

It is difficult to predict when Tsunamic will occur because it doesn't have a vibration or warning sign for us to allow us to know when its going to happen.

ResultsPlus
Examiner Comments

This is insufficient for the catastrophic event and scores zero.

(b) Explain why it is difficult to predict when a tsunami will occur.

(2)

It difficult to predict when tsunamis will occur as tsunamis are caused by a jolt in the movement of two tectonic plates. We cannot predict when the pressure build up will release.

ResultsPlus
Examiner Comments

This scores the full two marks. The tsunami is linked to the plate movement (first mark) and the unpredictability is linked to uncertainty of when the pressure will release (second mark).

(b) Explain why it is difficult to predict when a tsunami will occur.

(2)

This is because tsunamis happens it doesn't release any waves which makes it hard for us to predict when it will occur.

ResultsPlus
Examiner Comments

Here it is unclear exactly what a tsunami is. Also, it is referring to the tsunami being unpredictable which is in the question. The unpredictability must be linked to the catastrophic event which causes the movement of water. It scored zero.

(b) Explain why it is difficult to predict when a tsunami will occur.

(2)

because no-one knows how much movement* it will take for the tectonic plates to shift and cause a tsunami

ResultsPlus
Examiner Comments

There is a sufficient description of an earthquake here to score 1 mark for the relationship between the tsunami and the plate movement but its insufficient to hint at unpredictability or where the tectonic plate movement occurs.

Question 6 (c)

This item involved three main steps:

Following the instructions to find the magnitude (3) of the quake with amplitude 0.1 mm at a distance of 300 km.

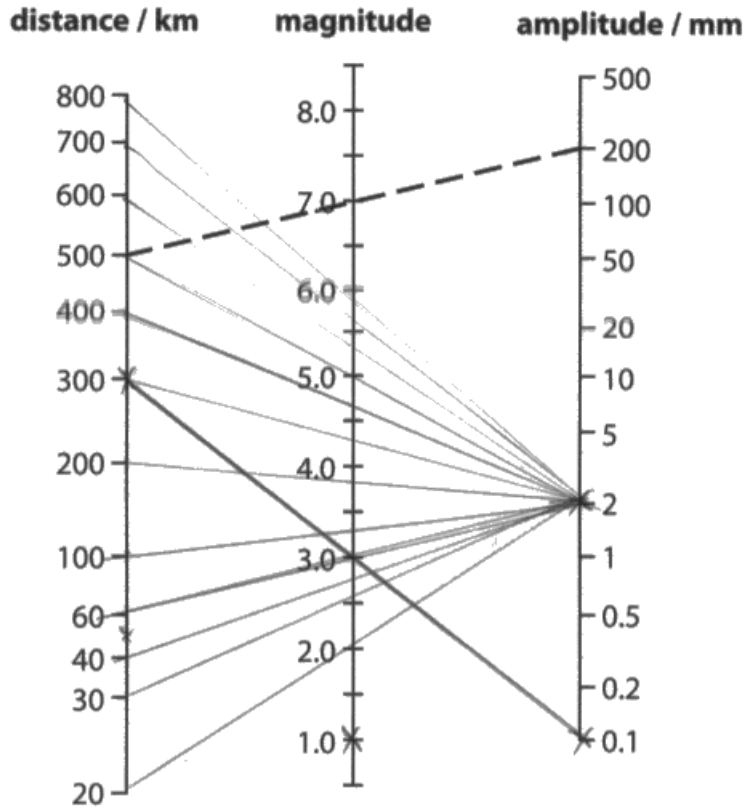
Spotting the pattern for/or noticing that both lines passed through the same magnitude even though at different distances.

Employing the reverse instructions to find the distance (60 km) for this magnitude quake with an amplitude of 2 mm.

(c) The chart is based on the Richter scale.

To work out the magnitude of an earthquake on the Richter scale:

- mark the **distance** and **amplitude** of the earthquake on the scales
- join these with a straight line
- read off the **magnitude** on the central scale.



The seismic wave from an earthquake has an amplitude of 200 mm at a distance of 500 km from a seismic station.

This gives a magnitude of 7.0 on the Richter scale.

The table shows information about **one** other, different, earthquake.

Complete this table.

(3)

distance from earthquake / km	amplitude / mm	magnitude
100	1	3
300	0.1	3
20	2	2

ResultsPlus
Examiner Comments

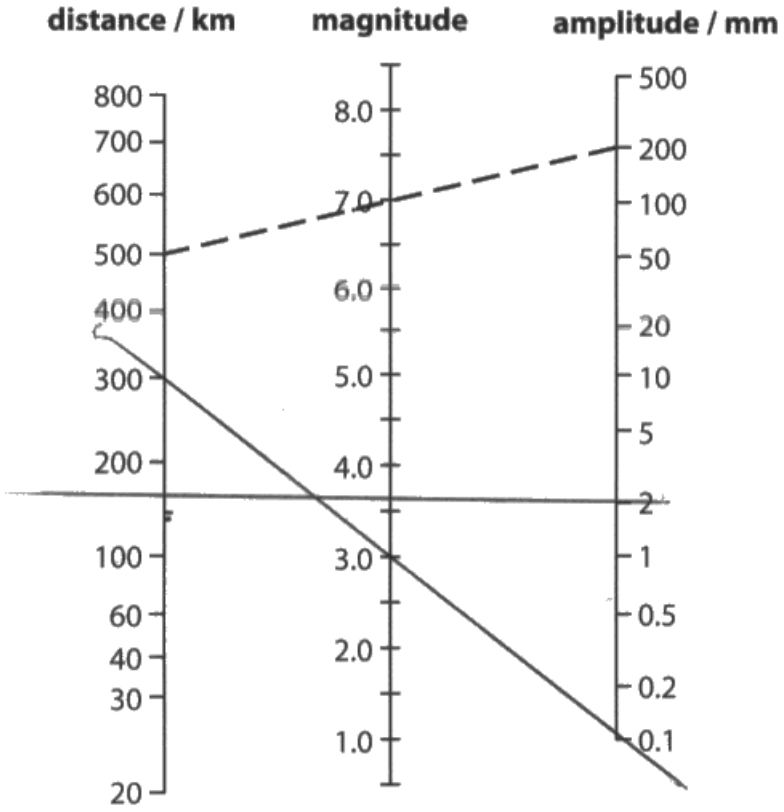
A quick glance at the mark scheme might indicate that the response could not score further. This candidate, however, then drew many other lines and clearly understood the principle of using the chart by starting from the amplitude of 2 mm given in the table and finding the distance (20 km) for a different (magnitude 2) earthquake . Rather than doubly penalise for not spotting the pattern but then using the reverse argument to find this (or any other correct) distance/magnitude combination was allowed for the third-step mark. This candidate therefore scored 2 of the 3 marks available even though only one of the three numbers was correct.

Some candidates erred in reading scales.

(c) The chart is based on the Richter scale.

To work out the magnitude of an earthquake on the Richter scale:

- mark the **distance** and **amplitude** of the earthquake on the scales
- join these with a straight line
- read off the **magnitude** on the central scale.



The seismic wave from an earthquake has an amplitude of 200 mm at a distance of 500 km from a seismic station.

This gives a magnitude of 7.0 on the Richter scale.

The table shows information about **one** other, different, earthquake.

Complete this table.

(3)

distance from earthquake / km	amplitude / mm	magnitude
100	1	3
300	0.1	3.0
170	2	4.6

ResultsPlus
Examiner Comments

If the candidate had read the magnitude for the line drawn as 3.6, the lower line combination would have scored a mark. As it is, the response scored 1 for the amplitude value of 3.

Question 6 (d)

The basic facts for this explanation were the properties of P- and S-waves. Level 2 and 3 responses needed candidates to link these to ideas about the Earth's interior.

*(d) Scientists have used the properties of seismic waves to develop various models of the Earth's interior.

Explain how some of the properties of P-waves and S-waves lead to the present model of the Earth's interior.

(6)

Tectonic plates
mantle
crust
core (inner & outer)
waves
wavelength
vibrations
richter scale
amplitude
earthquak
seismic activity
seismic stati
magnitude
transverse
longitudinal

ResultsPlus
Examiner Comments

It was clearly insufficient to present a list of terms relevant to earthquakes. None of these shows a property related to either wave.

This scored 0 marks.

THis candidate has included four properties of the waves.

*(d) Scientists have used the properties of seismic waves to develop various models of the Earth's interior.

Explain how some of the properties of P-waves and S-waves lead to the present model of the Earth's interior.

(6)

P waves are longitudinal waves and can pass through both solids and liquids.

S waves are transverse waves and only travel through liquids.

ResultsPlus
Examiner Comments

But they are still only properties. So this is a level 1 response no matter how many properties are listed.

This scored 2 marks.

To move to level 2, some link must be made between the properties and the model of the Earth's interior.

*(d) Scientists have used the properties of seismic waves to develop various models of the Earth's interior.

Explain how some of the properties of P-waves and S-waves lead to the present model of the Earth's interior.

(6)

Seismic waves ~~are both~~ have both P and S waves. P-waves travel faster than S-waves. P waves can travel through solids and liquids, whereas S-waves can travel through ONLY solids. ~~Sinan~~ S-waves are transverse and P-waves are longitudinal.

The Earth consists of 4 parts: the crust, mantle, outer and inner core. The outer core is liquid, therefore S-waves cannot travel through.

ResultsPlus
Examiner Comments

The first paragraph gives sufficient properties and the last sentence makes a valid link between property and model. This is therefore a level 2 response worth 4 marks.

It was fascinating to read through this response and see the gradual realisation by the candidate of what the question was demanding.

*(d) Scientists have used the properties of seismic waves to develop various models of the Earth's interior.

Explain how some of the properties of P-waves and S-waves lead to the present model of the Earth's interior.

(6)

P-waves stand for premary waves. They reach the earth's surface first and they are longitudinal so they travel moe quickly through solids than transverse waves. These seismic waves are less devastig, they cause particles to move about their fixed positions. These P waves, ~~can~~ due to them being longitudinal, can travel through liquid so they can travel through the earth's outer core and they can be detected all over the world by seismometers and or seismographers. S-waves are secondary seismic waves which are transverse so travel moe slowly through the earth. This has led to discovery that the earth is completely solid as the longitudenal waves travel more quickly which they do in ~~solids~~ matter. The S-waves move side to side so have less devastating effects. The S-waves can't travel through liquids so can only be detected by seismometers in certain areas of the world.

The features mentioned above led to discoveries of the earth's interior as it allowed scientists to discover that the outer core of the earth is a liquid and it is made of molten iron and nickel. They worked this out along with the fact as the S-waves can't travel through this liquid and so are only detected at certain areas of the world. The longitudinal waves travel all the way through and they can travel in liquids ~~They also~~ so were detected all over the earth so scientists knew the outer core was liquid. Both waves are also refracted slightly which is why the curve shown below is observed. This is because the different sections of the earth's interior have different densities so the waves change direction and speed. This was observed by the seismometers. The crust was discovered as ~~they~~ it is made up of tectonic plates which are affected by the seismic waves and so cause them to move. It was once believed the earth had a solid core but this is no longer believed for the outer core the inner core is solid. And the mantle is sometimes a viscous liquid.

(Total for Question 6 = 12 marks)

TOTAL FOR PAPER = 60 MARKS

S waves

P waves

ResultsPlus
Examiner Comments

At this point, the excitement becomes almost tangible as, since this is the last question, the candidate rushes to write as much as possible in the short time left without waiting for extra paper to be brought.

This was sufficient for 6 marks.

Paper Summary

Based on their performance on this paper, in order to improve, students should regularly

- revise the specified experiments/investigations and associated results including the use of memory games /quizzes.
- be challenged to use SI prefixes such as m and k and how to handle these in standard calculations.
- perform calculations to the class/groups emphasising the showing of working (and inclusion of units).
- analyse and interpret between, for example, words and graphs and draw conclusions from data presented in a variety of forms.
- make notes of the science to include in a written answer as the teacher reads out a prepared passage/set of data to construct a response.
- use the marks at the side of a question as a guide to the form and content of their answer.
- apply their knowledge to new situations by attempting questions in support materials or previous examination papers during normal classroom.
- use new work an opportunity to practise applying existing knowledge.

Grade Boundaries

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

http://www.edexcel.com/iwantto/Pages/grade-boundaries.aspx

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