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Examiners' Report
June 2016

GCSE Physics 5PH1F 01

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Introduction

This unit is divided into six topics and all six topics were tested in the examination.

1. Visible light and the Solar System - tested mainly in Q 1

2. The electromagnetic spectrum - tested mainly in Q 2

3. Waves and the Universe - tested mainly in Q 4

4. Waves and the Earth - tested mainly in Q 6

5. Generation and transmission of electricity - tested mainly in Q 5

6. Energy and the future - tested mainly in Q 3

Each examination paper allows every candidate to show what they know, understand and can do.

The paper contains a mixture of question styles, including objective questions, short answer questions and extended writing questions. The two 6 mark items (in Q5 and Q6) test both Physics and candidates' quality of written communication.

This report will provide exemplification of candidates' work, together with comments, for a selection of questions. The exemplification comes mainly from items which require more complex responses from candidates. It does not demonstrate all of the acceptable answers to each question. These can be found in the published mark scheme.

Question 1 (a) (i)

This question was intended to test understading of the term wavelength.

Candidates were required to count the number of wavelengths in the diagram then divide the length of the tank by this number.

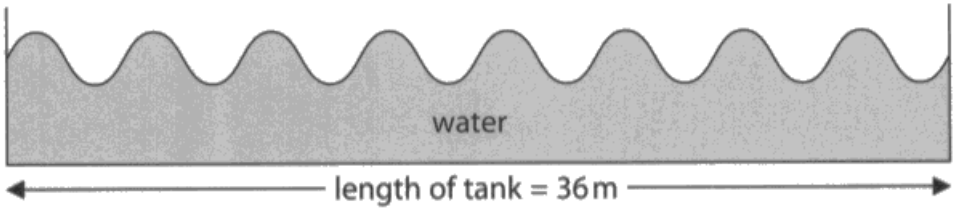
Answer ALL questions.

Some questions must be answered with a cross in a box ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

Water waves and light

1 (a) Scientists use wave tanks to show the behaviour of waves.

The diagram shows a wave tank from the side.



(i) Calculate the wavelength of the waves.

(1)

36 ÷ 8 = 4.5

wavelength = 4.5 m

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Examiner Comments

The correct answer showing the working.

Question 1 (a) (ii)

Most candidates were able to score at least 2 of the 3 marks by using the equation speed = distance/time. Those who scored only 2 usually did so because they got the wrong unit. Some of those who scored zero tried to use the equation speed = frequency x wavelength.

(ii) A crest of the wave takes 20 s to travel the whole length of the tank.

Calculate the speed of the wave.

State the unit.

(3)

$S = \frac{D}{T} = 36 \div 20 = 1.8$

speed of wave = 1.8 unit = cm

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Examiner Comments

A correct calculation but not the correct unit, scoring 2 marks.

(ii) A crest of the wave takes 20 s to travel the whole length of the tank.

Calculate the speed of the wave.

State the unit.

(3)

wave speed = distance / time

36 / 20

speed of wave = 1.8 unit = m/s

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Examiner Comments

This response uses the correct equation, evaluated correctly and with the correct units. The working is also shown clearly.

Question 1 (c) (ii)

This tested knowledge and understanding of practical work with lenses. The first part, use of a distant object, had been given in the question. All that was required was the production of an image and the measurement of the distance between the lens and the image.

This was the last part of a question increasing in demand so generally only the more able candidates scored marks for this part.

(ii) Describe how to estimate the focal length of a converging lens by using a distant object like the Moon.

(2)

Get the image to be projected on the wall so it looks clear and measure the distance between the wall and the lense.

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Examiner Comments

This is a very good response, indicating that the candidate may have had direct practical experience.

Question 2 (b)

The command word in this question was 'describe'. This indicates that more than a single statement is required.

(b) Describe one use of ultraviolet radiation.

(2)

Detecting forged banknotes - place banknote under U.V. light. If no water mark the not is forged.

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Examiner Comments

This response is sufficient in this case for a description.

Question 2 (e)

Another example of the last part of the question being the most testing. Credit could be gained by discussing the power of the radiations (as in previous papers) or the fact that microwaves can cause internal heating of body cells.

(e) High frequency electromagnetic radiation is potentially more dangerous to humans than low frequency electromagnetic radiation.

Infrared radiation has a higher frequency than microwave radiation.

However, microwave radiation can be more dangerous to humans than infrared radiation.

Explain why microwave radiation can be more dangerous to humans.

(2)

Because microwave radiation can heat up water in our ~~cells~~ body that cause damage ~~cells in our body~~ and kill cells if the temperature gets to high

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Examiner Comments

This is a good attempt to refer to the internal heating of body cells and was enough to score both marks.

Question 3 (b)

Parts (b) and (c) of Question 3 tested the application of some of the mathematical aspects of the energy topics.

In the main, candidates did very well in these parts, many producing their best scores in the paper. It was very encouraging to see working shown more regularly so that credit could be given even if the final answer was not correct.

Question 3 (c) (ii)

3cii was the most demanding of this group of items.

(ii) Calculate the efficiency of the electric motor.

(3)

(useful energy transferred by the device) / (total energy supplied to the device) x 100

150000 / 190000 x100%

78.95

efficiency = 78.9

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Examiner Comments

This is a good example of the effectiveness of a methodical approach to what can be a difficult calculation. It scores all 3 marks.

Question 3 (d) (ii)

Question 3d was testing knowledge and understanding of conservation of energy.

(ii) Explain why the maximum height reached by the pirate boat is less at point **C** than at point **A**.

(2)

It has lost energy to its surroundings in the form of heat and so can reach as high with less energy.

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Examiner Comments

This shows a sound grasp of the concept of conservation of enrgy and scores both marks.

Question 4 (b) (iii)

This question involved two logical steps. One of the two marks could be scored for just one of the steps.

(iii) The amount of radiation of wavelength 500 nm falling on the Earth on an area of 1 m^2 in 1 second is about 1250 J.

Estimate the amount of radiation of wavelength 500 nm falling on the Earth on an area of 10 m^2 in 60 s.

(2)

1250 J x 60 (60 s) = 750000

total amount of radiation = 750000 J

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Examiner Comments

This response shows an interesting but effective way of showing both steps and gaining both marks.

Question 4 (b) (iv)

Full marks could be gained here by realising from the graph that some wavelengths did not reach the Earth and that this was caused by the Earth's atmosphere.

(iv) Explain why the radiation from the Sun reaching the Earth's surface is different from the radiation reaching the Moon's surface.

(2)

the radiation from the sun reaching the earths surface is because is different from radiation reaching the moon's surface is because we have an atmosphere which reduces the amount of radiation that comes through and the moon doesn't have an atmosphere.

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Examiner Comments

This response is just sufficient to score both marks but it does not start answering the question until nearly the end.

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Examiner Tip

There is no need to repeat the question in your answer. It is a poor use of time and space.

Question 4 (c)

There was a range of possible acceptable responses to this question mainly, but not exclusively, based on the effects of the atmosphere on electromagnetic radiation.

Most were able to score at least 1 mark with a pleasing number scoring the maximum 2.

(c) Explain why some telescopes are sent into space instead of being used on the surface of the Earth.

(2)

Because the atmosphere will not distort the image if it is in space so you get a clearer image. Also means we can see more distant objects.

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Examiner Comments

This response shows that it was not necessary to talk about electromagnetic radiation being absorbed at certain frequencies to score full marks on this question.

Question 5 (a)

Candidates had to select the correct equation for power and substitute the correct values.

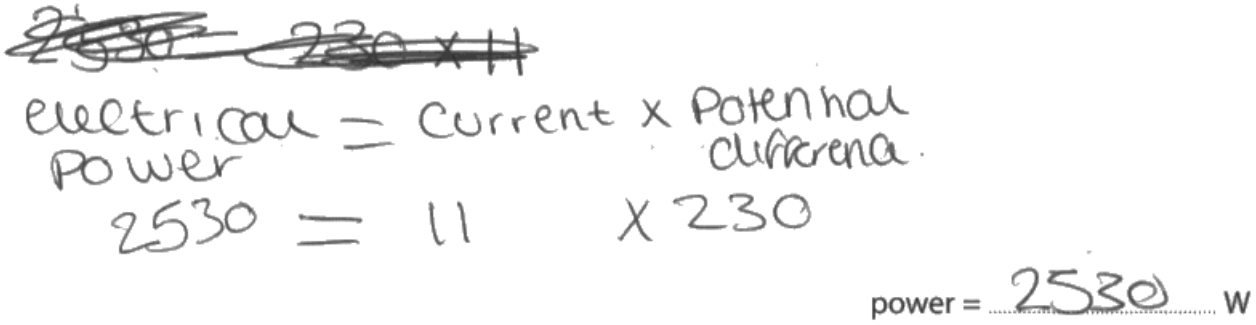
Most did this successfully and a pleasing number showed their working.

Electricity in the home

5 (a) An electric kettle is plugged into the 230 V mains.
The current in the heating element of the kettle is 11 A.

Calculate the power supplied to the kettle.

(2)



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Examiner Comments

This response is a good example of how to set out such a calculation.

Question 5 (b) (ii)

Few candidates were able to identify a transformer from its description in this question.

Question 5 (c)

Some candidates were able to start an explanation of the difference between a.c and d.c.. Some were able to score 1 mark for saying that d.c travelled in one direction only.

Answers in diagrams were acceptable if it was clear that the a.c. had a negative component.

(c) The current in the kettle is alternating current (a.c.).

The current in the toothbrush is direct current (d.c.).

Explain the difference between alternating current and direct current.

You may draw a diagram to help your answer.

(2)

An alternating current changes direction whereas a direct current stays the same direction.

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Examiner Comments

This response was all that was required for both marks.

Question 5 (d)

A level 3 response to this question would compare two sets of data from the table showing information about two fridges with one of the comparisons involving some processing of the data.

The vast majority of candidates were able to achieve at least a level 2 response on this question with many reaching level 3.

*(d) An electric fridge is kept cool by a compressor.

The compressor clicks on and off during the day to keep the inside of the fridge at a constant low temperature.

The table shows some information about two different fridges.

0.15 x 9 x 13.6 = 18.36
0.25 x 7 x 13.6 = 23.8

	Fridge A	Fridge B
cost	£ 500	£ 800
lifetime	3 years	6 years
power of compressor	0.15 kW	0.25 kW
time the compressor is on in one day	9 hours	7 hours
cost of 1 kWh of electrical energy	13.6 p	13.6 p

Describe the advantages and disadvantages of each fridge.

(6)

one advantage of Fridge A is that it is cheaper. This then is a disadvantage of fridge B. Fridge B has a longer lifetime However as said before this would be an issue for the other fridge (A). Fridge B is also better in terms of cost. As it's cost of electricity (23.8) per day. however Fridge A's cost is 18.36 per day. Fridge A last longer each day where as fridge B has more power.

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Examiner Comments

A very good response which involved calculating how much each fridge would cost to run for a day.

Question 6 (a) (i)

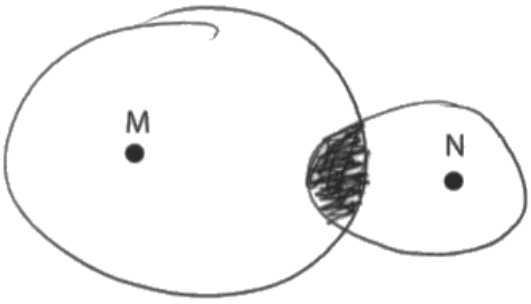
Full marks could be gained in this question by drawing a circle around each station and indicating that possible sites of the earthquake were where the circles crossed.

Making models of earthquakes

6 (a) (i) Describe how readings from two seismic stations, M and N, can be used to help find the position of an earthquake.

You may add to the diagram to help your answer.

(2)



If Station M says that the Earthquake was 5 miles away and Station N says the Earthquake was 2 miles away in the opposite direction then the Shaded area is where the Earthquake could have taken place.

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Examiner Comments

This is a good response to a testing question and although strictly speaking the possible earthquake sites are only where the circles cross it is good enough to score both marks.

Question 6 (b)

This calculation contained a familiar equation which had been rearranged and given in the question. A further difficulty involved a unit change from km to m before substituting into the equation.

Most candidates could successfully substitute into the equation but only a few coped with the unit change.

(b) The frequency of a wave is given by the equation:

frequency = wave speed / wavelength

A seismic wave has a speed of 6 km/s.

Its wavelength is 10 m.

Calculate the frequency of this wave.

(3)

6 ÷ 10

frequency = 0.6 Hz

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Examiner Comments

This response did not make the unit change but otherwise substituted correctly, scoring 2 of the 3 marks available.

This example scored full marks.

(b) The frequency of a wave is given by the equation:

frequency = wave speed / wavelength

A seismic wave has a speed of 6 km/s.

Its wavelength is 10 m.

Calculate the frequency of this wave.

(3)

$$\text{frequency} = \frac{6\ \text{km/s}}{10\ \text{m}} = \frac{6000\ \text{m/s}}{10\ \text{m}}$$

frequency = 600 Hz

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Examiner Comments

Each step in the working is clearly shown.

Question 6 (c)

Here candidates had to apply their knowledge and understanding of the structure of the Earth to a model given in the question. A level 3 explanation would link two aspects of the Earth with the model and one of the physical processes involved.

This proved to be the more demanding of the two six mark questions and the most common responses were level 1 and 2. However, a pleasing number were able to reach level 3.

There are two heaters at different places underneath the container.

These heaters affect the positions of the biscuit pieces.

The syrup, biscuit pieces and heaters can be used to model what happens inside the Earth and at the crust.

Explain how this model relates to the different parts of the Earth.

(6)

the syrup represents the magma under the earths surface, the heat causes the convectional current so the biscuit pieces move (tectonic plates)

the biscuit pieces represent the tectonic plates of the earth, the heat is supposed to be the earths core, and the syrup is the magma.

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Examiner Comments

The syrup and the biscuit pieces are related to the magma and the tectonic plates and the convection currents are discussed as a physical process.

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Examiner Tip

This is a very concise response. It does not repeat the question but answers it fully in less than the space allowed.

Paper Summary

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

- make sure that they have a sound knowledge of the fundamental ideas in all six topics
- practise applying their knowledge to new situations by attempting questions in support materials or previous examination papers
- learn SI prefixes such as m and k and recognise how to handle these in standard calculations
- show their working at each stage of a calculation
- use the marks at the side of a question as a guide to the form and content of their answer
- avoid repeating the question in their answer.

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