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Examiners' Report
June 2014

GCSE Physics 5PH1F 01

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Introduction

The unit was divided into six topics and all six topics were tested in the examination.

The topics were:

- visible light and the Solar System
- the electromagnetic spectrum
- waves and the Universe
- waves and the Earth
- generation and transmission of electricity
- energy and the future.

It was intended that the examination paper would allow every candidate to show what they knew, understood and were able to do. To achieve this, each question increased in difficulty as the question progressed.

Within the question paper, a variety of question types were included, such as objective questions, short answer questions worth 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 (QWC).

It was encouraging to note the positive way in which the vast majority of candidates approached the paper, particularly in the six mark questions.

Successful candidates were:

- well-grounded in the fundamental knowledge required
- willing to think, use their knowledge to solve new problems and apply their knowledge to unfamiliar situations
- able to analyse and interpret data
- able to tackle calculations methodically and show the stages in their working
- able to construct their explanations in a logical order, using the marks at the side of the questions as a guide.

Less successful candidates:

- had gaps in their knowledge
- found difficulty in applying their knowledge to new situations
- found difficulty in analysing and interpreting data
- did not do well in calculations
- did not think through their answers before writing.

The quality of written communication was generally appropriate to the level of response. When it was not, the mark within that level was reduced, if possible.

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)

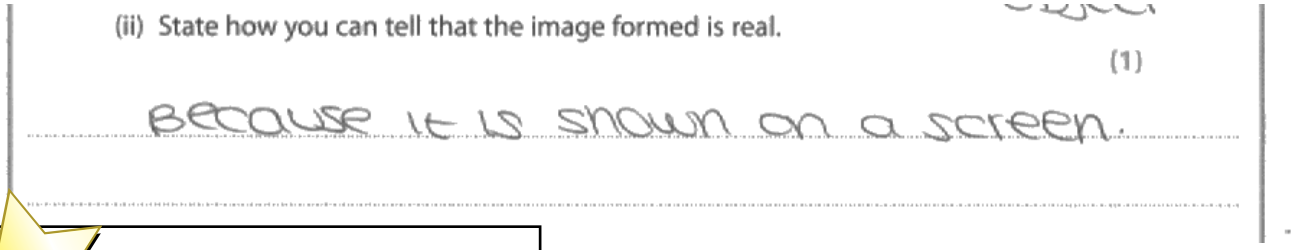
Candidates had to choose words from a box to describe the image of a distant object formed on a screen by a converging lens. There was a diagram showing the lens and the screen.

Well over half were able to score one of the two marks available with about half of these going on to score both marks.

Having seen this in a practical situation would be an advantage when answering the question.

Question 1 (a) (ii)

Correct answers were rare here. Examiners were looking for the idea that the image is real because it can be captured on a screen. This concept was tested in the last series as a multiple choice question.


(ii) State how you can tell that the image formed is real.

(1)

because it is shown on a screen.

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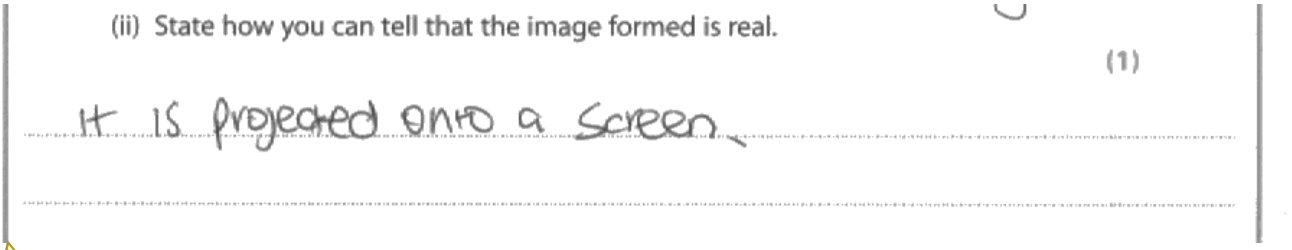
Examiner Comments

This is a perfectly acceptable response.


(ii) State how you can tell that the image formed is real.

(1)

it is projected onto a screen.

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Examiner Comments

This is another acceptable answer.

Question 1 (b)

The majority of candidates were able to provide perfectly acceptable answers to this question.

(b) State how the invention of the telescope improved the way scientists observed the Universe.

(1)

Because it made the image more clear and magnified the image.

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Examiner Comments

This response discusses the greater detail available.

(b) State how the invention of the telescope improved the way scientists observed the Universe.

(1)

Because it made the image more clear and magnified the image.

ResultsPlus
Examiner Comments

This response considers new as well as more detailed information.

Question 1 (c)

Well over half of the candidates scored both marks with their knowledge of the geocentric and heliocentric models.

(c) The invention of the telescope helped to change ideas about the Solar System.
The heliocentric model replaced the geocentric model.
Describe the difference between the geocentric model and the heliocentric model.
(2)

The heliocentric model was thought that everything orbited the sun and the geocentric model was thought that everything orbited the earth.

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Examiner Comments

This response is clear and to the point and scores both marks.

(c) The invention of the telescope helped to change ideas about the Solar System.
The heliocentric model replaced the geocentric model.
Describe the difference between the geocentric model and the heliocentric model.
(2)

The heliocentric is when all the planets orbit the Earth.
Geocentric is when everything orbits the sun.

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Examiner Comments

This candidate knew that it was to do with the Earth or the Sun being at the centre but got them the wrong way round so scored one of the two marks.

Question 2 (b)

The vast majority of candidates scored at least one of the two marks available with almost half of these scoring both marks. Good descriptions would include a method for searching for signs of life on Mars plus some relevant detail as shown in the following examples.

(b) Scientists search for signs of life on the planet Mars.
Describe **one** method they use to search for signs of life on the planet Mars.

(2)

They use a lander which picks up the soil and tests to see for any monocules

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Examiner Comments

This has a Mars lander collecting soil samples.

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Examiner Tip

Descriptions worth two marks can often be a statement with some relevant detail.

(b) Scientists search for signs of life on the planet Mars.
Describe **one** method they use to search for signs of life on the planet Mars.

(2)

The Mars rover, this is a [redacted] little car that moves around mars with a camera on it, NASA stations control it and see the video.

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Examiner Comments

This has a Mars rover sending pictures back to Earth.

Question 2 (c) (i)

Answers explaining how the atmosphere affects the brightness or clarity of an image from space were required here. Only a few candidates scored both marks for their explanation, but the majority scored at least one mark.

(i) Many telescopes are used on the Earth but the Kepler space telescope orbits above the Earth's atmosphere.
Explain why telescopes that search for planets are not on the Earth's surface.

(2)

Because Here is not Cus atmospheric interferance in space. so they can get a clearer image.

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Examiner Comments

The grammar is not quite right here but the meaning is clear enough to score both marks.

(i) Many telescopes are used on the Earth but the Kepler space telescope orbits above the Earth's atmosphere.
Explain why telescopes that search for planets are not on the Earth's surface.

(2)

Telescopes that search for planets are not on Earth because, atomospheric gasses and light polution give us an unclear image which could lead to a false conclusion.

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Examiner Comments

This response has a better structure and scores both marks.

Question 2 (c) (ii)

Slightly less than half of the candidates were able to link the dip in brightness of the star with the orbit time of the planet.

Question 3 (a) (ii) 1

Most candidates were able to score at least one mark in the energy chain diagram in question 3(a)(ii).

Question 3 (a) (ii) 2

See question 3(a)(ii) 1.

Question 3 (b) (i)

Most candidates were able to interpret the energy transfer diagram correctly to give an answer of 140 J.

Question 3 (b) (ii)

Data had to be taken from the energy transfer diagram and substituted in the equation given at the front of the paper. Answers were accepted in percentage or decimal form. Slightly less than half of the candidates scored both marks. The number of candidates scoring one mark might have increased if they had shown their working clearly.

(ii) Calculate the efficiency of the lamp.

(2)

$$\text{efficiency} = \frac{60}{200} \times 100\ \%$$

efficiency = 30 %

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Examiner Comments

Working is clearly shown leading to the correct answer.

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Examiner Tip

This is an excellent example of how to set out your working.

(ii) Calculate the efficiency of the lamp.

(2)

efficiency = 30%

ResultsPlus
Examiner Comments

This correct answer with no working scores full marks.

(ii) Calculate the efficiency of the lamp.

(2)

efficiency = 0.3

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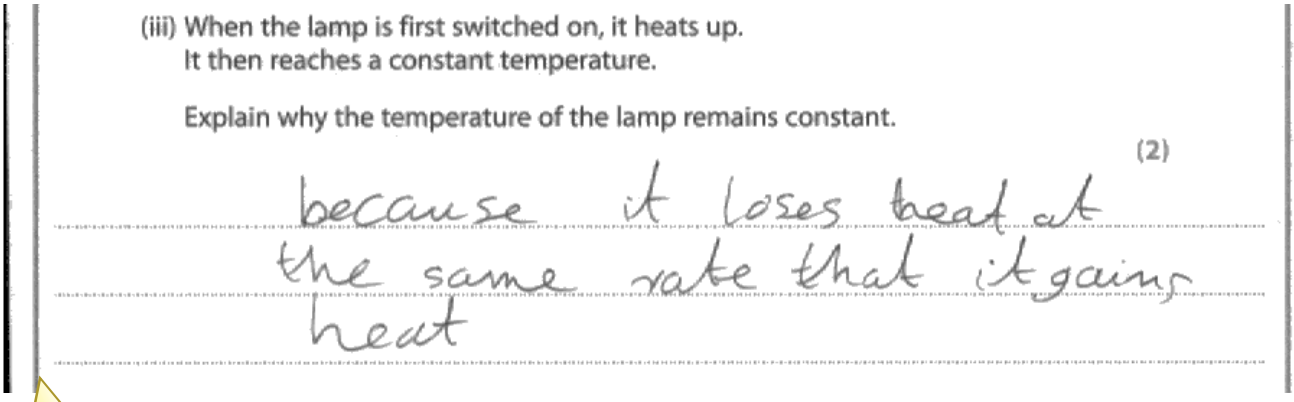
Examiner Comments

The correct answer here is shown as a decimal.

Question 3 (b) (iii)

Examiners were looking for the idea that energy was supplied and radiated at the same rate at this temperature. 'Input power = output power' was an acceptable alternative. It is recognised that this is a difficult concept which is reflected by the fact that fewer than 10% of candidates scored even 1 of the 2 marks available.



(iii) When the lamp is first switched on, it heats up.
It then reaches a constant temperature.

Explain why the temperature of the lamp remains constant.

(2)

because it loses heat at the same rate that it gains heat

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Examiner Comments

This is one of the rare full mark responses.

Question 3 (c)

The vast majority of candidates were able to calculate payback time, even though an equation for this is not given at the front of the paper.

Question 4 (a) (i)

Both marks could be scored here for explaining that the note was of too high a frequency to be heard by the man. Answers expressed in terms of the correct frequencies (with units) would also score both marks. Most candidates made a good attempt at this question, the best answers being well-structured.

Silent waves

4 (a) A man uses a dog whistle to call his dog.
The whistle uses ultrasound.

(i) The dog can hear the whistle but the man cannot.
Explain why the dog can hear the whistle but the man cannot hear the whistle.

(2)

Humans' listening range of frequency is 20Hz - 20000Hz
The whistle uses ultrasound, which means it's a higher frequency than 20 000 Hz.
Dogs are able to hear above the 20 000 Hz frequency

ResultsPlus
Examiner Comments

This is a well-structured answer covering all of the points and scoring full marks.

Silent waves

4 (a) A man uses a dog whistle to call his dog.
The whistle uses ultrasound.

(i) The dog can hear the whistle but the man cannot.
Explain why the dog can hear the whistle but the man cannot hear the whistle.

(2)

As the frequency is above 20000 Hz which is above the frequency a human can hear but a dog can.

ResultsPlus
Examiner Comments

This is not such a well-structured answer but it is still worth 2 marks.

Question 4 (a) (ii)

Most candidates were able to use the given equation to calculate the speed of ultrasound but less than half of these gave the correct unit for speed.

(ii) The dog is 140 m away from the man.
The ultrasound takes 0.42 s to travel from the man to the dog.
Calculate the speed of ultrasound.
State the unit.

140 ÷ 0.42 (3)

speed of ultrasound = 333̇ unit = m/s

ResultsPlus
Examiner Comments

This has the correct numerical answer and the correct unit, scoring all 3 marks.

(ii) The dog is 140 m away from the man.
The ultrasound takes 0.42 s to travel from the man to the dog.
Calculate the speed of ultrasound.
State the unit.

(3)

$\frac{140\ (m)}{0.42\ (s)}$

speed of ultrasound = 333.3 unit = Hz

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Examiner Comments

This has the correct numerical answer but it has wrong unit. Using Hz as the unit was a common error in this question.

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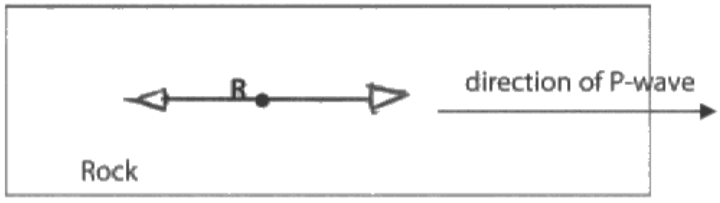
Examiner Tip

If you are asked for the unit at the end of a calculation, do the calculation then check back into the question to remind yourself about what is being asked for. Here the key line in the question is 'Calculate the speed of ultrasound'.

Question 4 (b) (ii)

This was a difficult question. Candidates had to know that a P-wave is a longitudinal wave and then be able to show this on the diagram. Less than half the candidates scored even 1 mark with only about a third of these going on to score both marks.

(ii) The diagram shows the direction of an earthquake P-wave in some rock.



Draw arrows on the diagram to show how the piece of rock, labelled **R**, moves.

(2)

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Examiner Comments

Two arrows show vibration parallel to the wave direction.

Question 4 (c)

This was also a difficult question but many candidates explained how earthquakes were formed instead of what causes the plates to move, as the question asked.

The convection current in the mantle cause the place to drift.

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Examiner Comments

This is one of the rare full mark responses.

the mantle below the Earths crust moves causing the plates to collide being pushed together until one of them is realsed.

ResultsPlus
Examiner Comments

This scores 1 mark for the movement in the mantle but needed to mention the convection currents to get the other mark.

When a tectonic Prate collides with another the Presse is to much and the Prates grind togethe which formes tsonamies, Earthquakes and so on.

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Examiner Comments

This explains why earthquakes happen rather than what causes the plates to move and so scores no marks.

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Examiner Tip

Read the question carefully. Make sure you know what is being asked of you.

Question 5 (a) (i)

The vast majority of candidates were able to identify X-rays as the missing wave from the electromagnetic spectrum.

Question 5 (a) (ii)

The majoriy of candidates could identify visible light as the electromagnetic wave which can be split into different colours.

Question 5 (a) (iii)

The majority of candidates were able to identify radio waves as having the longest wavelength.

Question 5 (a) (iv)

Most candidates could name a wave that was ionising. The most common incorrect choices were infrared and microwaves.

Question 5 (b)

About a third of candidates said that these waves travelled at the same speed and so scored 1 mark. Only a small number of these then went on to say that this was in a vacuum.

(b) The Sun emits all the waves in the electromagnetic spectrum.
Explain why all these waves take the same time to travel to Earth from the Sun.

(2)

EM spectrum waves all travel at the same speed in a vacuum, and space is a vacuum so the waves reach the Earth at the same time.

ResultsPlus
Examiner Comments

This is a very clear response, showing a good understanding of the situation and scoring full marks.

(b) The Sun emits all the waves in the electromagnetic spectrum.
Explain why all these waves take the same time to travel to Earth from the Sun.

(2)

All waves in the electromagnetic Spectrum have the same speed so they will travel the same.

ResultsPlus
Examiner Comments

This neglects to say that the waves have the same speed in a vacuum so scores only 1 mark.

Question 5 (c)

Candidates were asked to describe the harmful effects of ultraviolet and infrared waves and relate them to frequency. Most candidates were able to score some marks and there was a spread of marks across the range. About 40% of candidates gave level 2 or level 3 answers. Only a few candidates did not attempt the question.

*(c) Infrared and ultraviolet waves have different frequencies.
Both types of wave can have harmful effects on human beings.

Describe the harmful effects of infrared and ultraviolet waves, relating them to the frequencies of the waves.

(6)

Ultraviolet waves have a nigh frequency This is dangerous because the nigher one frequency, the mare damage it causes to your body. UV waves are ionising which means they break chemical bonds which causes mutation to DNA and can also sometimes cause cancer.
infrared waves also have a nigh frequency but not as nigh as UV waves. the higher the frequency the more energy it emits. infrared waves emit a lot of heat which means it can cause burning to cells on skins surface which is dangerous because it can cause cancer

ResultsPlus
Examiner Comments

The harmful effects of both waves are correctly related to frequency and this scores full marks.

*(c) Infrared and ultraviolet waves have different frequencies.
Both types of wave can have harmful effects on human beings.

Describe the harmful effects of infrared and ultraviolet waves, relating them to the frequencies of the waves.

(6)

Depending on the frequencies of the waves it depends how harmful they can be. The higher the frequency of the wave the more harm they cause. For example, Ultraviolet waves are becoming more and more harmful to use as the ozone layer is being broken down by pollution and the gases we let off in the air making it weaker and therefore more easy for the ultraviolet waves to come through at a higher frequency. The harm it may cause to us it that it can cause many skin diseases and be harmful to our skin and our environment it will heat the world up making the environment tougher for us to live in.

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Examiner Comments

This response correctly relates frequency and potential harm but does not describe any of the harmful effects of infrared. This is a level 2 response, scoring 4 marks.

*(c) Infrared and ultraviolet waves have different frequencies.
Both types of wave can have harmful effects on human beings.

Describe the harmful effects of infrared and ultraviolet waves, relating them to the frequencies of the waves.

(6)

the harmful effects infrared and ultravi-
olet waves have are that they can
can cause ~~ea~~ skin cancer, and change
the DNA in the body because they
born have high frequencies.

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Examiner Comments

Some harmful effects of the waves are mentioned without saying which are associated with which wave. There is only a general reference to frequency. This is a level 1 response, scoring 2 marks.

Question 6 (a)

These were the most difficult calculations on the paper. In part (i) candidates had to take readings from the meters to calculate the number of units used and multiply the difference by the cost per unit. In part (ii) they had to divide the energy used (in kWh) by the time. Less than half the candidates scored any marks on this question and only about 10% scored 3 or 4 marks.

(i) Calculate the cost of the electricity used between the two readings. (2)

15399 → 15459

15459 − 15399 = 60

60 × 20 = 1200p

cost = 1200 p

(ii) The time between these two readings is 15 hours.

Calculate the average power supplied. (2)

~~20 X~~ 60 ÷ 15 = 4kwh per how

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Examiner Comments

The difference in the two meter readings is clearly multiplied by the cost per unit in (i) and divided by the time in (ii). This gains full marks.

Question 6 (b)

It was expected that few candidates would score both marks here as the concept of reducing power loss using transformers is not an easy one to grasp. However, the number of candidates who did not even say that step-up transformers were used to increase voltage was disappointingly small.

(b) Explain why step-up transformers are used in the transmission of electricity in the National Grid.

(2)

So that they can increase the voltage but decrease the current

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Examiner Comments

Decreasing the current is an acceptable alternative to reducing power loss. This scores both marks.

(b) Explain why step-up transformers are used in the transmission of electricity in the National Grid.

(2)

step up transformers are used to increase the voltage in the National grid.

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Examiner Comments

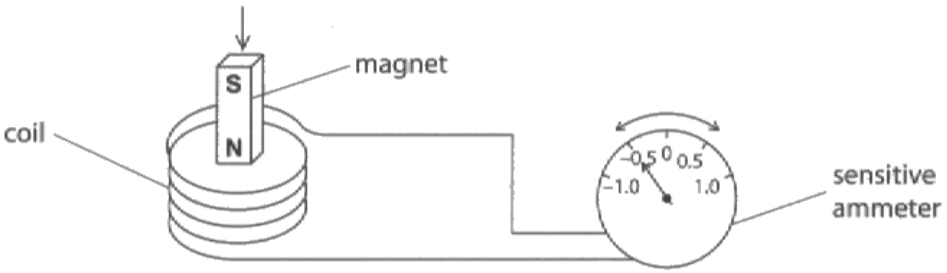
This scores the first mark for stepping up the voltage.

Question 6 (c)

The diagram shows a moving magnet inducing a current in a coil of wire. Candidates were asked to describe how to change the current. Full marks could be gained by describing two changes and the effect of one of them on the induced current. There was a spread of marks across the 3 levels with an encouraging number of candidates giving level 3 responses.

*(c) The diagram shows a magnet moving into a coil of wire.

The coil of wire is attached to a sensitive ammeter.



The moving magnet and the coil of wire are producing an electric current.

The size and direction of the current can be changed in a number of ways.

Describe changes that can be made to produce different currents and the effect of each change.

(6)

One way to produce different currents is to move the magnet faster through the coil of wires. Or you could add more coils to produce a higher current. Another way to produce a different current is by using an iron core.

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Examiner Comments

This is a well-thought out, logical answer. This candidate has described two changes (moving the magnet faster, adding more coils) and the effect of adding more coils.

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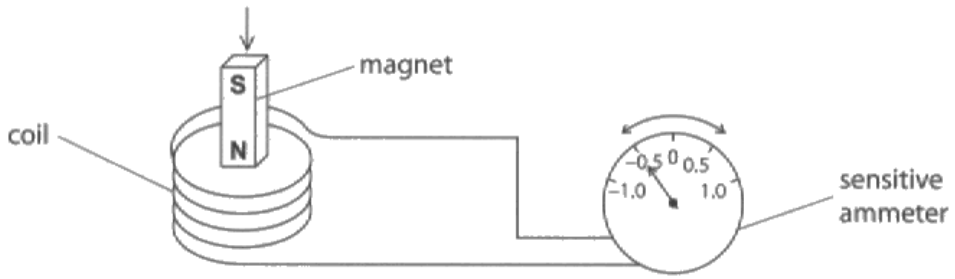
Examiner Tip

It is not necessary to fill all the answer space. Do not repeat the question in your answer.

*(c) The diagram shows a magnet moving into a coil of wire.

The coil of wire is attached to a sensitive ammeter.



The moving magnet and the coil of wire are producing an electric current.

The size and direction of the current can be changed in a number of ways.

Describe changes that can be made to produce different currents and the effect of each change.

(6)

Increasing the speed in which the ~~coil~~ magnet is moved in the coil can have a drastic increase on the current. Also changing the number of coils can help increase ~~the~~ or decrease ~~size~~ the current. Less coils = Less current, more coils = more current. You may change the size of the magnet so that the current increase or decrease. Bigger magnet = stronger current, Smaller magnet = weaker current. These will all help to increase the current to make it positive or decrease it to make it negative.

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Examiner Comments

This answer scores full marks in the first two sentences and then goes on to talk about increasing the size of the magnet. This should say 'strength of the magnet' rather than 'size' but in this case full marks had already been scored and this did not contradict anything that had gone before.

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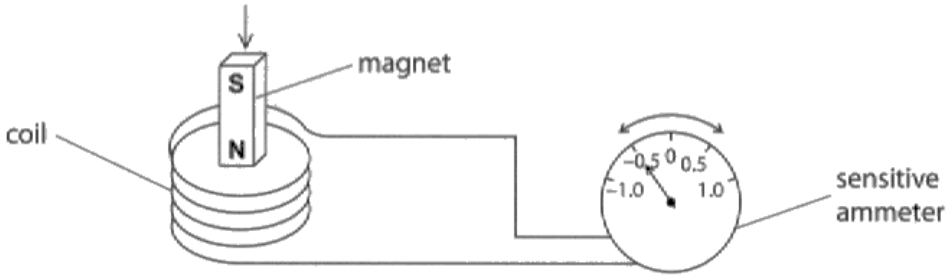
Examiner Tip

In general, words like 'size' will be too vague in physics answers. It could apply to mass, volume, strength etc. It is important to be specific.

*(c) The diagram shows a magnet moving into a coil of wire.

The coil of wire is attached to a sensitive ammeter.



The moving magnet and the coil of wire are producing an electric current.

The size and direction of the current can be changed in a number of ways.

Describe changes that can be made to produce different currents and the effect of each change.

(6)

The stronger the magnet the more current produced.

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Examiner Comments

This is one change and its effect.
Level 2, scoring 4 marks.

Paper Summary

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

- make sure they have a sound knowledge of the fundamental ideas in all six topics
- get used to the idea of applying their knowledge to new situations by attempting questions in support materials or past papers
- 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.

Grade Boundaries

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

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