



General Certificate of Secondary Education

Science B 4462 / Physics 4451

PHY1F Unit Physics 1

Mark Scheme

2011 Examination – January Series

Mark schemes are prepared by the Principal Examiner and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation meeting attended by all examiners and is the scheme which was used by them in this examination. The standardisation meeting ensures that the mark scheme covers the candidates' responses to questions and that every examiner understands and applies it in the same correct way. As preparation for the standardisation meeting each examiner analyses a number of candidates' scripts: alternative answers not already covered by the mark scheme are discussed at the meeting and legislated for. If, after this meeting, examiners encounter unusual answers which have not been discussed at the meeting they are required to refer these to the Principal Examiner.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of candidates' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

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Marking Guidance for Examiners

GCSE Science Papers

1. General

The mark scheme for each question shows:

- the marks available for each part of the question
- the total marks available for the question
- the typical answer or answers which are expected
- extra information to help the Examiner make his or her judgement and help to delineate what is acceptable or not worthy of credit or, in discursive answers, to give an overview of the area in which a mark or marks may be awarded.

The extra information is aligned to the appropriate answer in the left-hand part of the mark scheme and should only be applied to that item in the mark scheme.

At the beginning of a part of a question a reminder may be given, for example:

where consequential marking needs to be considered in a calculation;

or the answer may be on the diagram or at a different place on the script.

In general the right hand side of the mark scheme is there to provide those extra details which confuse the main part of the mark scheme yet may be helpful in ensuring that marking is straightforward and consistent.

2. Emboldening

- 2.1** In a list of acceptable answers where more than one mark is available ‘any **two** from’ is used, with the number of marks emboldened. Each of the following lines is a potential mark.
- 2.2** A bold **and** is used to indicate that both parts of the answer are required to award the mark.
- 2.3** Alternative answers acceptable for a mark are indicated by the use of **or**. (Different terms in the mark scheme are shown by a / ; eg allow smooth / free movement.)

3. Marking points

3.1 Marking of lists

This applies to questions requiring a set number of responses, but for which candidates have provided extra responses. The general principle to be followed in such a situation is that ‘right + wrong = wrong’.

Each error/contradiction negates each correct response. So, if the number of error/contradictions equals or exceeds the number of marks available for the question, no marks can be awarded.

However, responses considered to be neutral (indicated as * in example 1) are not penalised.

Example 1: What is the pH of an acidic solution? (1 mark)

Candidate	Response	Marks awarded
1	4,8	0
2	green, 5	0
3	red*, 5	1
4	red*, 8	0

Example 2: Name two planets in the solar system. (2 marks)

Candidate	Response	Marks awarded
1	Pluto, Mars, Moon	1
2	Pluto, Sun, Mars, Moon	0

3.2 Use of chemical symbols / formulae

If a candidate writes a chemical symbol / formula instead of a required chemical name, full credit can be given if the symbol / formula is correct and if, in the context of the question, such action is appropriate.

3.3 Marking procedure for calculations

Full marks can be given for a correct numerical answer, as shown in the column 'answers', without any working shown.

However if the answer is incorrect, mark(s) can be gained by correct substitution / working and this is shown in the 'extra information' column;

3.4 Interpretation of 'it'

Answers using the word 'it' should be given credit only if it is clear that the 'it' refers to the correct subject.

3.5 Errors carried forward

Any error in the answers to a structured question should be penalised once only.

Papers should be constructed in such a way that the number of times errors can be carried forward are kept to a minimum. Allowances for errors carried forward are most likely to be restricted to calculation questions and should be shown by the abbreviation e.c.f. in the marking scheme.

3.6 Phonetic spelling

The phonetic spelling of correct scientific terminology should be credited **unless** there is a possible confusion with another technical term.

3.7 Brackets

(.....) are used to indicate information which is not essential for the mark to be awarded but is included to help the examiner identify the sense of the answer required.

PHY1F**Question 1**

question	answers	extra information	mark
1(a)(i)	solar and wind	both required for mark either order	1
1(a)(ii)	37(%)	accept their two sources in a(i) correctly added as an error carried forward (ecf)	1
1(b)	A		1
1(c)	<u>gas</u> is non-renewable	do not accept they are not all renewable statements such as gas produces CO ₂ is neutral	1
Total			4

PHY1F**Question 2**

question	answers	extra information	mark
2(a)	45(p)	accept £0.45 for both marks allow 1 mark for correct substitution ie 3×15 do not award any marks if 45 is used in a subsequent calculation to obtain a final answer	2
2(b)	straight line drawn from origin passing through (1,1)	line must reach 1,1 but does not need to continue beyond	1
Total			3

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Question 3

question	answers	extra information	mark
<p>3(a)</p>	<p>1 mark for each correct line</p> <p>List A Type of nuclear radiation</p> <div style="display: flex; justify-content: space-around; align-items: flex-start;"> <div style="text-align: center;"> <div style="border: 1px solid black; padding: 2px; width: 60px; margin-bottom: 10px;">Alpha</div> <div style="border: 1px solid black; padding: 2px; width: 60px; margin-bottom: 10px;">Beta</div> <div style="border: 1px solid black; padding: 2px; width: 60px;">Gamma</div> </div> <div style="text-align: center;"> <p>List B Property of radiation</p> <div style="border: 1px solid black; padding: 2px; width: 150px; margin-bottom: 10px;">Has the same mass as an electron</div> <div style="border: 1px solid black; padding: 2px; width: 150px; margin-bottom: 10px;">Very strongly ionising</div> <div style="border: 1px solid black; padding: 2px; width: 150px; margin-bottom: 10px;">Passes through 10 cm of aluminium</div> <div style="border: 1px solid black; padding: 2px; width: 150px;">Deflected by a magnetic field but not deflected by an electric field</div> </div> </div> <p style="text-align: right; margin-top: 20px;">if more than 1 line is drawn from any box in List A, none of those lines gain any credit</p>		<p>3</p>
<p>3(b)(i)</p>	<p>(the detector) reading had gone down</p> <p>more beta (particles / radiation) is being absorbed / stopped</p>	<p>'it' equals detector reading</p> <p>accept the reading in the table is the smallest</p> <p>accept 101 is (much) lower than other readings / a specific value eg 150</p> <p>do not accept this answer if it indicates the readings are the thickness</p> <p>accept radiation for beta particles / radiation</p> <p>accept fewer particles being detected</p>	<p>1</p> <p>1</p>
<p>3(b)(ii)</p>	<p>six years</p>		<p>1</p>

Question 3 continues on the next page . . .

PHY1F**Question 3 continued . . .**

question	answers	extra information	mark
3(b)(iii)	alpha would not penetrate the cardboard	accept the basic property- alpha (particles) cannot pass through paper / card accept alpha (particles) are less penetrating (than beta) range in air is neutral	1
Total			7

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Question 4

question	answers	extra information	mark
4(a)(i)	convection		1
4(a)(ii)	conduction		1
4(b)(i)	2 black is the best <u>absorber</u> (of thermal energy / heat)	accept black is the best emitter (of thermal energy / heat) note that a comparative is needed (eg better or best)	1 1
4(b)(ii)	the colour of the metal plates		1
4(b)(iii)	any one from: <ul style="list-style-type: none"> more precise / accurate / reliable can measure continuously take many readings in a small time removes (human) reading error can compare / draw graphs automatically records data automatically 	do not accept better reading do not accept thermometer is unreliable accept easier to read	1
4(c)(i)	radiation	accept radiates accept infra red (IR) waves do not accept heat waves	1

Question 4 continues on the next page . . .

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Question 4 continued . . .

question	answers	extra information	mark
4(c)(ii)	to reflect (heat away from the fire fighter)	accept it reflects accept it is a poor absorber (of thermal radiation / heat) do not accept deflect / bounce for reflect	1
4(d)	N transfers / absorbs less heat or gives smallest increase in temperature	the mark is for the reason which does not score if M is chosen accept will keep fire fighters cooler accept N is cooler (after 15 minutes) an answer N goes up to 52°C and M goes up to 100°C is insufficient	1
Total			9

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Question 5

question	answers	extra information	mark
5(a)	kinetic		1
5(b)	Z		1
5(c)(i)	generates a lot more energy / electricity / power or can supply (energy / electricity / power) to more homes	need fewer conventional large-scale hydroelectric power stations is neutral	1
5(c)(ii)	Large areas of land are flooded.		1
5(d)(i)	National Grid	this answer only	1
5(d)(ii)	less energy / heat loss (from the cables)	accept wasted for loss accept answers in terms of fewer transformers needed do not accept less electricity lost / wasted do not accept no energy lost	1

Question 5 continues on the next page . . .

PHY1F**Question 5 continued . . .**

question	answers	extra information	mark
5(e)	any one from: <ul style="list-style-type: none"> • fewer rivers (suitable for generators) • less mountainous (so rivers fall smaller distances) 	accept answers in terms of difficulty linking villages and towns to grid (in Nepal) accept answers in terms of more isolated communities accept answers in terms of UK having more resources for large-scale power stations	1
Total			7

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Question 6

question	answers	extra information	mark
6(a)	higher frequency or shorter wavelength or greater energy	general properties / uses are neutral do not accept different frequency / wavelength / energy	1
6(b)	the same (speed)	accept they travel at the speed of light	1
6(c)	pass through / transmitted by the plastic / casing <u>reflected</u> by the metal / plates	do not accept bounce / deflected etc for reflected if neither marking point scores an answer reflected (back to boat / from the device) scores 1 mark	1 1
6(d)(i)	waves are not <u>reflected</u> from the walls or only waves (reflected) from the device are detected	accept microwaves / radar for waves do not accept bounce / deflected etc for reflected accept to stop reflected waves affecting results	1

Question 6 continues on the next page . . .

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Question 6 continued . . .

question	answers	extra information	mark
6(d)(ii)	different types (of device) can be compared	fair test is insufficient accept idea that only one variable is then changed	1
6(d)(iii)	so (measurements / results / scientists) are not biased towards one type / manufacturer of device/s	accept to avoid bias accept so they are not biased	1
6(e)(i)	any two from: <ul style="list-style-type: none"> • (for any angle) A values < B values • A values increase with (increasing) angle • B values decrease with (increasing) angle • A values do not vary as much (as B values) 	if temperature is mentioned rather than angle a maximum of 1 mark can be scored or converse eg B values are higher / better / stronger accept weakest at 0° strongest at 15° values go up is insufficient accept strongest at 0° weakest at 15° values go down is insufficient	2
6(e)(ii)	D values are always over 2(.0)	mark is for the reason reason cannot score if D is not chosen	1
Total			10

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Question 7

question	answers	extra information	mark
7(a)	frequency / pitch decreases	accept wavelength increases accept it / the note becomes deeper / lower it / the note decreases is insufficient quieter is neutral	1
7(b)(i)	Models can help to explain an effect or theory.		1
7(b)(ii)	(moving) loudspeaker represents the (moving) galaxy	accept sound waves represent light waves	1
	the decrease in frequency of the sound is like red-shift	accept increase in frequency is like blue-shift accept answers in terms of wavelength change accept sound going away from you is like red-shift accept red-shift happens when galaxies / stars move away (from Earth) this accept only scores if first marking point scores	1
7(c)	big bang		1
Total			5