



**General Certificate of Secondary
Education**

Science B 4462 / Physics 4451

PHY1F Unit Physics 1

Mark Scheme

2012 examination – June 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 students' 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 students' 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 students' 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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MARK SCHEME

Information to Examiners

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 students 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)

Student	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)

Student	Response	Marks awarded
1	Neptune, Mars, Moon	1
2	Neptune, Sun, Mars, Moon	0

3.2 Use of chemical symbols / formulae

If a student 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.

Quality of Written Communication and levels marking

In Question 8 students are required to produce extended written material in English, and will be assessed on the quality of their written communication as well as the standard of the scientific response.

Students will be required to:

- use good English
- organise information clearly
- use specialist vocabulary where appropriate.

The following general criteria should be used to assign marks to a level:

Level 1: Basic

- Knowledge of basic information
- Simple understanding
- The answer is poorly organised, with almost no specialist terms and their use demonstrating a general lack of understanding of their meaning, little or no detail
- The spelling, punctuation and grammar are very weak.

Level 2: Clear

- Knowledge of accurate information
- Clear understanding
- The answer has some structure and organisation, use of specialist terms has been attempted but not always accurately, some detail is given
- There is reasonable accuracy in spelling, punctuation and grammar, although there may still be some errors.

Level 3: Detailed

- Knowledge of accurate information appropriately contextualised
- Detailed understanding, supported by relevant evidence and examples
- Answer is coherent and in an organised, logical sequence, containing a wide range of appropriate or relevant specialist terms used accurately.
- The answer shows almost faultless spelling, punctuation and grammar.

PHY1F**Question 1**

question	answers	extra information	mark
1	Fan C		1
	Kettle B		1
	Lamp D		1
	Radio E		1
Total			4

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Question 2

question	answers	extra information	mark
2(a)(i)	0.6 or 60%	allow 1 mark for correct substitution ie $\frac{720}{1200}$ provided no subsequent step shown an answer of 0.6 / 60 with a unit gains 1 mark only an answer of 60 gains 1 mark only	2
2(a)(ii)	heat	allow thermal	1
2(b)	K smallest amount of wasted energy or largest amount of useful energy	reason only scores if K is chosen reasons must be comparative accept waste arrow is narrowest accept useful arrow is widest waste arrow is smallest is insufficient	1 1
2(c)	12 000p or £120	to score both marks the unit must be consistent with the numerical answer answers 12 000 and 120 gain 1 mark only allow 1 mark for correct substitution ie 800×15 or 800×0.15 provided no subsequent step shown	2
Total			7

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Question 3

question	answers	extra information	mark
3(a)(i)	The volume of boiling water.		1
3(a)(ii)	any one from: <ul style="list-style-type: none"> • (more) precise • accurate • reliable • removes human / reading error 	do not accept better (reading) do not accept thermometer is unreliable accept easier to read accept take temperature more frequently	1
3(b)	B temperature falls faster because black is a better / good emitter	marks are for the explanation this mark point cannot score if A chosen ignore reference to better absorber accept for both marks an answer in terms of why A is the white can	1 1
3(c)(i)	faster than		1
3(c)(ii)	darker / black surfaces absorb heat faster	accept black is a better / good absorber dark surfaces attract heat negates this mark	1

Question 3 continues on the next page

PHY1F**Question 3 continued**

question	answers	extra information	mark
3(c)(iii)	air is a <u>bad / poor</u> conductor or air is a good <u>insulator</u>	accept air is an insulator	1
Total			7

PHY1F**Question 4**

question	answers	extra information	mark
4(a)	electromagnetic		1
4(b)	B continuously varying (amplitude)	reason only scores if B is chosen accept others are only on or off accept others only have 2 values do not accept answers that simply describe shape	1 1
4(c)	economic		1
Total			4

PHY1F**Question 5**

question	answers	extra information	mark
5(a)(i)	any one from: <ul style="list-style-type: none"> • easier to maintain • can be built larger / heavier • cost less to maintain 	cheaper is insufficient	1
5(a)(ii)	red-shift		1
5(b)	on a satellite	accept in orbit / space accept in a high altitude balloon accept above the atmosphere do not accept on a plane do not accept on top of a mountain ignore any reason given, correct or incorrect	1
Total			3

PHY1F**Question 6**

question	answers	extra information	mark
6(a)(i)	200 to 50	accept either order	1
6(a)(ii)	5.3	accept values between 5.2 and 5.4 inclusive	1
6(a)(iii)	5.3 or their (a)(ii)	accept values between 5.2 and 5.4 inclusive	1
6(b)(i)	Make the conveyor belt move more slowly		1
6(b)(ii)	lead		1
6(c)	Exposure increased the content of some types of vitamin.		1
Total			6

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Question 7

question	answers	extra information	mark
7(a)	can be replaced as fast / faster than it is used	accept will not run out can be used again negates this mark	1
7(b)	any one from: <ul style="list-style-type: none"> • reduce demand on power stations / National Grid (system) • to <u>increase</u> the amount of electricity generated (from renewable energy) • to conserve fossil fuels • plenty of animal waste / fuel (available) 	accept use less fossil fuels accept so animal waste can be used usefully accept to save money / sell the electricity produces less harmful gases / SO ₂ is insufficient better for environment is insufficient	1
7(c)	60 (months) / 5 (years)	ignore any unit given	1

Question 7 continues on the next page

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Question 7 continued

question	answers	extra information	mark
7(d)	any two from: <ul style="list-style-type: none"> • reliable energy source or does not depend on the weather • uses up waste products • not visually polluting • concentrated energy source • quieter 	answers must be in terms of the biogas generator accept works all of the time accept animal waste readily available ignore it is renewable do not accept generates more electricity (than wind turbine)	2
Total			5

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Question 8

question	answers	extra information	mark
8(a)(i)	UVC	reason only scores if UVC is chosen	1
	it is absorbed / stopped by the ozone layer	accept atmosphere / air for ozone layer	1
		accept does not reach the Earth	
8(a)(ii)	increases the risk	accept more likely to get (skin) cancer / sun burn	1
	due to higher levels of UV (radiation) or less UV (radiation) absorbed	accept more people likely to be harmed (by UV radiation) specific reference to UVA / all three increasing negates this mark	1
8(b)(i)	(type of) surface	accept snow and sand accept place / location do not accept position (of dummy head)	1
8(b)(ii)	repeat measurements / investigation <u>and</u> take average(s) / mean	both parts required repeat measurements / experiment is insufficient	1

Question 8 continues on the next page

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Question 8 continued

question	answers	extra information	mark
8(b)(iii)	<p>snow the intensity (facing the Sun) is higher, (so more must be reflected)</p> <p>or intensity hardly reduces when facing away from the Sun (so most UV entering sensor must be reflected)</p>	<p>mark is for reason, only scores if snow chosen</p> <p>accept results are higher (for snow than sand)</p> <p>accept white surfaces are good reflectors</p> <p>accept it's white</p>	1
8(c)	<p>No for all wavelengths shown some UV is reaching the sensor</p>	<p>this mark point can score even if yes is chosen</p> <p>accept some UV is passing through (the goggles)</p> <p>accept the reading should be zero (but it isn't)</p>	1 1
Total			9

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