



# **General Certificate of Secondary Education**

## **Science B 4462 / Physics 4451**

**PHY1F      Unit Physics 1**

# **Mark Scheme**

*2007 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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## 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 / ; e.g. 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.

### 3.8 Unexpected Correct Answers not in the Mark Scheme

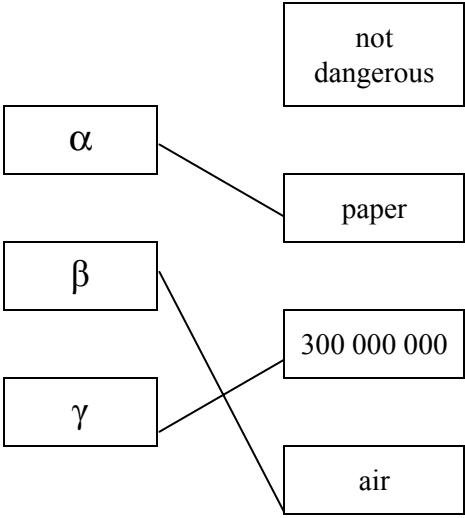
The Examiner should use professional judgement to award credit where a candidate has given an unexpected correct answer which is not covered by the mark scheme. The Examiner should consult with the Team Leader to confirm the judgement. The Team Leader should pass this answer on to the Principal Examiner with a view to informing all examiners.

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**Question 1**

<b>question</b>	<b>answers</b>	<b>extra information</b>	<b>mark</b>
(a)	B		1
(b)	G		1
(c)	D		1
(d)	A		1
total			4

**Question 2**

question	answers	extra information	mark
(a)	<p>3 correct lines drawn</p> 	<p>any box in list A with 2 or more lines, all lines for that box do <b>not</b> score</p>	3
(b)	radiation damages our cells	<p>accept radiation can cause cancer</p> <p>accept kills cells</p> <p>accept changes DNA / causes mutations</p> <p>accept dangerous / poisonous / harmful / toxic</p> <p>accept so precautions can be taken</p>	1
(c)	it can pass through the human body		1
(d)(i)	6 (hours)	no tolerance	1
(ii)	6 (hours)	accept their (d)(i)	1
total			7

**Question 3**

question	answers	extra information	mark
(a)(i)	diagram showing only on / off discrete values	'ON' pulses must be equal amplitude	1
(ii)	microwave		1
(b)(i)	identical		1
(ii)	<ul style="list-style-type: none"> <li>• increased risk of cancerous growth (between ear and brain)</li> <li>• complaints of headaches and tiredness</li> </ul>		1
			1
(iii)	any <b>two</b> from: <ul style="list-style-type: none"> <li>• tests in a laboratory did not give effects of tiredness or headaches</li> <li>• waves not strong enough to cause long term heat damage to cells</li> <li>• evidence to link mobile phones and ill health is not reliable</li> </ul>		2
total			7

**Question 4**

question	answers	extra information	mark
(a)(i)	red shift	accept Doppler effect	1
(ii)	the universe is expanding		1
(b)(i)	big bang		1
(ii)	at the moment it is the best way of explaining.....		1
(c)(i)	visible / light		1
(ii)	the atmosphere does not block.....		1
(iii)	difficult to maintain <b>or</b> high cost to get into space	accept any feasible reason do not accept expensive on its own	1
total			7



**Question 5**

question	answers	extra information	mark
(a)	kinetic	accept movement	1
(b)(i)	3 (kWh)	allow 1 mark for selecting the correct information	2
(ii)	transfers more energy	accept transform or use for transfer  accept electricity for energy  allow higher (average) power <b>and</b> switched on for more time	1
(iii)	any <b>one</b> from: <ul style="list-style-type: none"> <li>• use the internet</li> <li>• brochures</li> <li>• reading adverts</li> <li>• visiting shops</li> <li>• recommendation from friends / plumbers</li> </ul>		1
total			5

**Question 6**

question	answers	extra information	mark
(a)(i)	as a source of thermal <u>radiation</u>	accept heat for thermal radiation  accept to act as the Sun  do <b>not</b> accept sunlight alone	1
(ii)	any <b>one</b> from: <ul style="list-style-type: none"> <li>• volume of water</li> <li>• distance between lamp and boiling tube</li> <li>• initial / starting temperature of water</li> <li>• same room temperature</li> </ul>	accept amount for volume    do <b>not</b> accept time or same insulation material	1
(iii)	any <b>one</b> from: <ul style="list-style-type: none"> <li>• greater sensitivity / precision</li> <li>• could link to a computer for (automatic) data analysis</li> <li>• could take more frequent readings</li> <li>• reduces instrument reading error</li> </ul>	do <b>not</b> accept more reliable (negates mark)   accept more accurate  do <b>not</b> accept easier to use on its own	1
(b)(i)	acts as a control	accept to be able to make a comparison  accept to see the difference  do <b>not</b> accept 'to make it a fair test' OWTTE on its own	1
(ii)	(plastic) <u>foam</u> and aluminium foil		1

**Continued on next page**

question	answers	extra information	mark
(iii)	<p>(aluminium) <u>foil</u> is a <u>poor</u> absorber of thermal radiation <b>or</b>                      (aluminium) <u>foil</u> is a (good) reflector of thermal radiation</p> <p>(plastic) <u>foam</u> traps air which is a (good) insulator</p>	<p>accept heat / infra red for thermal radiation</p> <p>do <b>not</b> accept 'reflects sunlight' on its own</p> <p>accept (plastic) foam is a poor conductor / (good) insulator</p> <p>do <b>not</b> accept 'the material' is a good insulator / poor conductor</p>	<p>1</p> <p>1</p>
(c)	<p>particles vibrate with a bigger / stronger amplitude / faster / with more (kinetic) energy</p> <p>energy transferred by <u>collisions</u> with other particles</p>	<p>accept particles vibrate more</p> <p>do <b>not</b> accept <u>start</u> to vibrate only</p> <p>do <b>not</b> accept answers in terms of free/mobile electrons</p>	<p>1</p> <p>1</p>
total		9	

## Question 7

question	answers	extra information	mark
(a)	ultraviolet	accept UV	1
(b)(i)	360 (minutes) / 6 <u>hours</u>	unit if given must be consistent with numerical answer	1
(ii)	any <b>one</b> from: <ul style="list-style-type: none"> <li>• sunscreen not applied thickly enough</li> <li>• sunscreen not applied often enough</li> <li>• sunscreen not applied before sunbathing</li> <li>• water reduces the protection factor</li> <li>• intensity of Sun depends on time of day or cloud cover</li> <li>• intensity of Sun depends on where you are</li> </ul>	do <b>not</b> accept answer in terms of different types of skin alone  accept any answer that would lead to a reduction in protection factor  accept any answer to do with differences in the intensity	1
(iii)	more UV / radiation absorbed by dark skin	accept darker skin has more melanin / pigment	1
	less UV penetrates deep to <u>damage</u> (living) cells / tissue	do <b>not</b> accept sunlight or heat for ultraviolet	1
(c)	so people can make up their own minds about the potential risk to their health	accept 'so people know to take precautions'  do <b>not</b> accept 'might get skin cancer' on its own	1
total			6