



**General Certificate of Secondary Education**

**Science B 4462 / Physics 4451**

**PHY1F      Unit Physics 1**

**Mark Scheme**

*2007 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 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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*Dr Michael Cresswell*, Director General.

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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 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.

**PHY1F Question 1**

	<b>answers</b>	<b>extra information</b>	<b>mark</b>
(a)(i)	grid	accept any way of indicating correct answer	1
(ii)	increases voltage	accept any way of indicating correct answer	1
(iii)	230 V	accept any way of indicating correct answer	1
(iv)	reduce	accept any way of indicating correct answer	1
(b)(i)	increases the temperature	accept make it hotter / heat goes into the air  accept convection currents  accept sensible comment eg sound energy / it buzzes  ignore pollutes the air	1
(ii)	less than 100%		1
total			6

**PHY1F Question 2**

	<b>answers</b>	<b>extra information</b>	<b>mark</b>
(a)	coal		1
(b)	fossil fuels can be used to generate electricity at any time	if more than 2 boxes ticked, mark incorrect boxes first	1
	a few large power stations can generate the electricity for a million homes		1
(c)(i)	no fuel is burnt	accept a named fuel accept nothing is burnt accept does not use (fossil) fuel	1
(ii)	kinetic		1
(iii)	any <b>two</b> from: <ul style="list-style-type: none"> <li>• cause <u>noise</u> pollution</li> <li>• cause <u>visual</u> pollution</li> <li>• need concrete for bases</li> <li>• new roads / infrastructure needed</li> <li>• may interfere with TV / radio / mobile phone signals</li> <li>• dangerous to birds</li> <li>• do not generate all of the time</li> </ul>	accept causes pollution for <b>1</b> mark  accept generates <u>only</u> when the wind blows do <b>not</b> accept 'generate when the wind blows'  do <b>not</b> accept 'take up a lot of space / land'	2
total			7

**PHY1F Question 3**

	<b>answers</b>	<b>extra information</b>	<b>mark</b>
(a)(i)	7pm	accept 19.00 / 1900	1
(ii)	8pm	accept 20.00 / 2000	1
	temperature drops more slowly	accept heat for temperature accept line is less steep	1
(b)	insulator		1
	conduction*	*answers can be either way around	1
	convection*		1
(c)(i)	4 (years)		1
(ii)	it is the cheapest / cheaper / cheap	do <b>not</b> accept answers in terms of heat rising or DIY	1
	has the shortest / shorter payback time	do <b>not</b> accept short payback time	1
total			9



**PHY1F Question 5**

	<b>answers</b>	<b>extra information</b>	<b>mark</b>
(a)	C		1
(b)(i)	easy to maintain / access <b>or</b> (currently) cheaper than a space telescope <b>or</b> can modify (easily) an existing telescope <b>or</b> telescopes can be larger <b>or</b> can test new types of telescope (easily)	do <b>not</b> accept 'easier to use'  do <b>not</b> accept easier to supply with power	1
(ii)	atmosphere does not block / distort the image	accept picture / data for image  accept 'more detailed / clearer image / data / picture'  accept 'no light pollution'  accept 'can look at the Earth'  do <b>not</b> accept 'can see further'  do <b>not</b> accept 'better view'  do <b>not</b> accept 'clear view'  do <b>not</b> accept 'can see more clearly'	1
total			3

**PHY1F Question 6**

	<b>answers</b>	<b>extra information</b>	<b>mark</b>
(a)(i)	<u>electromagnetic</u> (wave / radiation)	accept <u>em</u> (wave / radiation)  ignore reference to frequency	1
(ii)	gamma can penetrate the crate / box / packaging	accept converse (but must relate to both alpha <u>and</u> beta)  ignore just gamma radiation kills bacteria  accept can get through to food	1
(iii)	neutrons		1
(b)(i)	absorb gamma / radiation	accept it stops / reduces the radiation	1
(ii)	any <b>one</b> from: <ul style="list-style-type: none"> <li>• slow down the conveyor belt</li> <li>• food does more than one circuit</li> <li>• stay on the conveyor belt longer</li> <li>• food closer to the source / radiation</li> </ul>	ignore larger doses / use more of the source  ignore thinner packaging	1

**Continued on next page**

**Question 6 continued**

	<b>answers</b>	<b>extra information</b>	<b>mark</b>
(c)(i)	idea of testing food on humans / animals		1
	no (measured) ill effects <b>or</b> monitor their health	accept monitor people that have eaten the food  accept a measurement / comparison for <b>1</b> mark eg measure the amount of radiation in treated food  comparison plus a reason for the comparison would get <b>2</b> marks  eg idea of measuring level of radiation in treated food <b>with</b> no measurable increase in level = <b>2</b> marks <b>or</b> comparing it to untreated food = <b>2</b> marks	1
(ii)	so can make own decision about eating or not eating treated food	accept may be against their religious / moral views  accept some people prefer food that hasn't been tampered with  ignore in case they don't like the idea of eating treated food  accept don't want to eat treated food  ignore might be allergic to the food  eg think it will give them cancer = <b>0</b> marks think it will give you cancer so I need to know so that I can choose = <b>1</b> mark	1
total			8

**PHY1F Question 7**

	<b>answers</b>	<b>extra information</b>	<b>mark</b>
(a)	the outside colour of the cans		1
(b)(i)	18 (°C) <b>or</b> 88 to 70	ignore negative sign	1
(ii)	8 (°C) <b>or</b> 70 to 62	ignore negative sign	1
(c)	greater temperature difference between water and surroundings (at start)	must mention temperature difference  ignore just water hotter  accept energy used to heat cans initially	1
(d)	black		1
	temperature falls the fastest (in L)	accept (can L) loses more heat / cools quicker  accept heat for temperature	1
	black is a good / the best / better emitter (of heat / radiation)	accept converse  ignore black is best absorber	1
total			7