



General Certificate of Secondary Education

Physics 4451

PHY3F Unit Physics 3

Mark Scheme

2011 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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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.

PHY3F**Question 1**

question	answers	extra information	mark
1	red supergiant		1
	supernova		1
	black hole		1
Total			3

PHY3F**Question 2**

question	answers	extra information	mark
2(a)	below		1
2(b)	boss nail string	do not allow boss	1 1 1
2(c)(i)	line from mid-point of either side to the mid-point of the opposite side	intention correct as judged by eye, use of ruler not essential do not allow either diagonal	1
2(c)(ii)	X in the centre of the rectangle		1
Total			6

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Question 3

question	answers	extra information	mark
3(a)	vibrate	allow move more (vigorously) but not just move	1
	dirt / muck / grit / rust / dust etc.	do not accept bacteria	1
3(b)	any one medical use eg <ul style="list-style-type: none">• scanning unborn babies• destroying (kidney) stones	ignore incorrect biological detail	1
3(c)(i)	2		1
3(c)(ii)	C		1
Total			5

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Question 4

question	answers	extra information	mark
4(a)	24 (hours)		1
4(b)	... orbits the Earth at the same rate at which the Earth revolves.		1
4(c)	any two from: <ul style="list-style-type: none"> • in contact for 24 hours • (always in) same direction • same distance (apart) • signal (always) takes same time • receiving dish does not have to move 	accept always in contact do not accept examples in terms of monitoring	2
4(d)	communication	do not accept any response using observation accept a specific example satellite TV accept TV signals / mobile phones do not accept global positioning system (GPS)	1
Total			5

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Question 5

question	answers	extra information	mark
5(a)(i)	an electrical conductor		1
5(a)(ii)	increase current or use stronger magnets	accept increase p.d. / voltage accept move magnets closer do not accept use larger magnets	1
5(a)(iii)	reverse the poles / ends (of the magnet)	either order	1
	reverse the connections (to the power supply)		1
5(b)(i)	environmental		1
5(b)(ii)	ethical	allow political (instability) allow economic (migration)	1
Total			6

PHY3F**Question 6**

question	answers	extra information	mark
6(a)(i)	(concave) mirror / reflector	do not allow convex mirror / reflector	1
6(a)(ii)	refraction		1
6(b)(i)	converging		1
6(b)(ii)	4	allow 1 mark for correct substitution ie 20 / 5 or 4 / 1 ignore any units	2
Total			5

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Question 7

question	answers	extra information	mark
7(a)	microphone		1
7(b)(i)	vertical line from any maxima or minima to axis	do not penalise minor errors but do not allow unless intention is clear	1
7(b)(ii)	loudness / volume / intensity / energy	do not accept noise	1
7(c)	17	this answer only	1
7(d)	<p>the greater the distance, the smaller the amplitude</p> <p>or</p> <p>there is a (strong) negative correlation between distance and amplitude</p> <p>or</p> <p>there is an inverse square relationship between distance and amplitude</p>	<p>accept volume / intensity / energy / loudness for amplitude</p> <p>do not accept distance and amplitude are inversely proportional</p>	1
7(e)	20 Hz 20,000 Hz	<p>either order</p> <p>accept 20 kHz provided unit has been clearly changed</p>	1 1
Total			7

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Question 8

question	answers	extra information	mark
8(a)(i)	turning effect	accept turning force accept force x distance (accept symbols only if correctly defined) do not accept newtons x metres	1
8(a)(ii)	stop apparatus falling over	accept holds the stand in place accept make it safer / stable references to balanced / equilibrium are insufficient	1
8(a)(iii)	as x increases y increases in same proportion / ratios	allow both marks for they are <u>directly</u> proportional or a specific example eg doubling y, doubles x allow both marks for a correct answer giving figures eg they increase in the ratio of 1 to 7 allow for 1 mark positive correlation	1 1
8(a)(iv)	the centre of mass of the ruler is at the axis of rotation		1
8(b)	108 newton metres / Nm	allow 1 mark for correct substitution ie 240×0.45 symbols must be correct for full credit the unit must be consistent with the numerical answer	2 1
Total			8