



**General Certificate of Secondary
Education**

Physics 4451

PHY3F Unit Physics 3

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.

Further copies of this Mark Scheme are available to download from the AQA Website: www.aqa.org.uk

Copyright © 2012 AQA and its licensors. All rights reserved.

COPYRIGHT

AQA retains the copyright on all its publications. However, registered schools / colleges for AQA are permitted to copy material from this booklet for their own internal use, with the following important exception: AQA cannot give permission to schools / colleges to photocopy any material that is acknowledged to a third party even for internal use within the school / college.

Set and published by the Assessment and Qualifications Alliance.

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.

PHY3F**Question 1**

question	answers	extra information	mark
1	A	If more than 3 boxes are ticked, mark incorrect ones first. Mark only 3 boxes.	1
	B		1
	E		1
Total			3

PHY3F**Question 2**

question	answers	extra information	mark
2(a)	concave		1
2(b)	(x) 1.5	allow 1 mark for showing correct method ie $\frac{15}{10}$; $3/2$; $\frac{30}{20}$ ignore any units	2
2(c)	upright virtual	both required	1
2(d)	anything practical that requires a magnified image eg shaving mirror make-up mirror	accept telescopes, solar furnaces	1
Total			5

PHY3F**Question 3**

question	answers	extra information	mark
3(a)(i)	core		1
3(a)(ii)	increase number of turns on <u>secondary</u> (coil) or reduce number of turns on <u>primary</u> (coil)	do not accept coils for turns	1
3(b)(i)	J		1
3(b)(ii)	Scientists should publish the evidence from an investigation only when they have found out as many facts as possible		1
Total			4

PHY3F**Question 4**

question	answers	extra information	mark
4(a)	1250	allow 1 mark for correct substitution ie 500×2.5 provided there is no subsequent calculation	2
4(b)(i)	smaller than		1
4(b)(ii)	force (exerted) further from axis of rotation (than the weight)	accept pivot for axis of rotation	1
4(c)	increase the force (exerted)	do not accept increase distance of force from axis of rotation	1
Total			5

PHY3F

Question 5

question	answers	extra information	mark
5(a)(i)	pitch		1
5(a)(ii)	quality		1
5(b)	gets quieter or no sound (heard) sound cannot travel through a vacuum	accept an explanation in terms of fewer (air) particles do not accept there is no air	1 1
5(c)(i)	B can hear the <u>lowest</u> sound levels / quiet <u>est</u> sounds		1 1
5(c)(ii)	loud shout lawnmower		1 1
5(d)	any sensible suggestion that would reduce loudness eg turn volume down use 'external' earphones and not earbuds stop using (device)	accept use less often / for less time	1
Total			9

PHY3F**Question 6**

question	answers	extra information	mark
6(a)	magnet	correct order only	1
	coil		1
	induced		1
6(b)(i)	up		1
6(b)(ii)	magnetic field cuts through coil faster	accept magnet turns faster	1
Total			5

PHY3F

Question 7

question	answers	extra information	mark
7(a)(i)	towards the centre of the circle	accept inwards accept a correct description 'along the string' is insufficient	1
7(a)(ii)	tension (in the string) or weight (on the end of the string)	accept pull of the string 'the string' is insufficient 'the student' is insufficient 'turning action' is insufficient	1
7(b)(i)	each may (also) affect the speed so only one independent variable	accept results for speed accept only one variable affects dependent variable 'fair test' is insufficient 'they are control variables' is insufficient	1 1
7(b)(ii)	continuous dependent	both required	1
7(b)(iii)	reduces (absolute) timing error (for one rotation) or increases / improves reliability / accuracy (for one rotation)	accept too fast to time one ignore checking for anomalous results to work out an average is insufficient	1
7(c)	speed increases with centripetal force	accept positive correlation do not accept proportional	1
7(d)(i)	gravitational pull (of the Earth)	accept gravity	1

Question 7 continues on the next page

PHY3F**Question 7 continued**

question	answers	extra information	mark
7(d)(ii)	No geostationary orbits once every 24 hours	both parts required – however this may have been subsumed within the reason accept a correct comparative description	1
Total			9

UMS Conversion Calculator www.aqa.org.uk/umsconversion