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General Certificate of Secondary Education

Physics 4451

PHY3F Unit Physics 3

Mark Scheme

2011 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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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.

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Question 1

question	answers	extra information	mark
1(a)	iron	accept any unambiguous correct indication	1
1(b)(i)	step-down (transformer)	do **not** accept down step or a description	1
1(b)(ii)	less than	accept any unambiguous correct indication	1
1(c)(i)	2000		1
1(c)(ii)	There is no pattern.		1
Total			**5**

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Question 2

question	answers	extra information	mark
2(a)(i)	centripetal force	accept any unambiguous correct indication	1
2(a)(ii)	**B**		1
2(b)(i)	decrease	accept any unambiguous correct indication	1
2(b)(ii)	increase	accept any unambiguous correct indication	1
2(c)	Bull pit smallest (inside) radius	 accept smallest diameter / circumference	1 1
Total			**6**

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Question 3

question	answers	extra information	mark
3(a)	**C**		1
3(b)	moment	accept any unambiguous correct indication	1
3(c)	bigger than	accept any unambiguous correct indication	1
3(d)	120 (Ncm)	allow **1** mark for correct substitution ie 12 × 10	2
Total			**5**

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Question 4

question	answers	extra information	mark
4(a)	all correct **M** **L** **L**	allow **1** mark for 2 correct	2
4(b)	speed	accept 'velocity'	1
4(c)(i)	any **one** from: • it's natural • slowest • furthest (from the centre of the Earth)	accept 'others are artificial / made by humans'	1
4(c)(ii)	as the (average) distance decreases the speed increases	accept 'there is a negative correlation (between them)' do **not** accept 'they are inversely proportional'	1
4(c)(iii)	as the speed increases the time (taken) decreases	accept 'there is a negative correlation (between them)' do **not** accept 'they are inversely proportional'	1
Total			**6**

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Question 5

question	answers	extra information	mark
5	1.4	allow **1** mark for correct substitution ie 14 ÷ 10 **or** 28 ÷ 20	2
Total			**2**

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Question 6

question	answers	extra information	mark
6(a)(i)	an electric motor		1
6(a)(ii)	force		1
6(b)	any **two** from: • more powerful magnet • reduce the gap (between magnet and coil) • increase the area of the coil • more powerful cell • more turns (on the coil)	 do **not** allow 'bigger magnet' do **not** allow 'bigger cell' accept battery for cell accept add a cell accept increase current / potential difference allow 'more coils on the coil' do **not** allow 'bigger coil'	2
6(c)	reverse the (polarity) of the cell reverse the (polarity) of the magnet	allow 'turn the cell the other way round' accept battery for cell allow 'turn the magnet the other way up'	1 1
Total			**6**

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Question 7

question	answers	extra information	mark
7(a)	converging (lens)	accept 'convex (lens)' accept biconvex	1
7(b)	(principal) foci	accept 'focus' / 'focuses' / 'focis' focal point(s)	1
7(c)(i)	formed where (real) rays (of light) intersect / meet / cross	accept rays (of light) pass through the image accept 'image is on the opposite side (of the lens to the object)' accept (construction) lines cross over a response relating to a screen or similar is neutral lines are solid and not dotted is neutral	1
7(c)(ii)	inverted	accept any unambiguous correct indication	1
7(d)(i)	smooth curve which matches the points	judge by eye but do **not** accept point to point by ruler or otherwise	1
7(d)(ii)	continuous		1

Question 7 continues on the next page . . .

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Question 7 continued . . .

question	answers	extra information	mark
7(d)(iii)	as distance increases, magnification decreases	accept negative correlation a statement 'inversely proportional' is incorrect and limits maximum mark for this part question to **1**	1
	further detail eg magnification falls steeply between 40 and 50 cm **or** magnification begins to level out after / at 70 cm		1
Total			**8**

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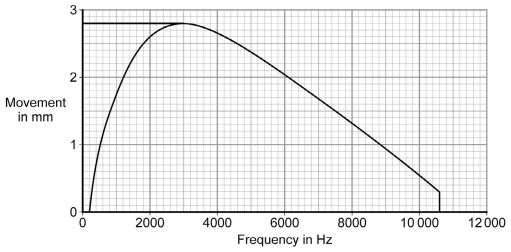
Question 8

question	answers	extra information	mark
8(a)	10 600 (Hz)	accept 10.6 kHz	1
8(b)	3000 (Hz)	allow **1** mark for a line drawn to show greatest movement (allow only if frequency is between 2800 and 3200) accept other indication of correctly using the graph  	2
8(c)	(No)	no marks for just the ticked box reasons can score even if yes is ticked	
	(human hearing) range is 20 – 20 000 (Hz)	accept (most) people hear up to 20 000 (Hz) / 20 kHz	1
	any **one** from: • range on graph is within this range • range on graph starts after 20 Hz • range on graph is from to 200 – 10 600 (Hz) • range on graph finishes before 20 000 Hz		1

Question 8 continues on the next page . . .

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Question 8 continued . . .

question	answers	extra information	mark
8(d)	reliability	this answer only	1
8(e)	only 1 variable affects dependent variable / size of movement **or** there is only one independent variable **or** to be able to compare (effect of different frequencies)	accept 'results' for 'size of movement' fair test is insufficient do **not** accept to control the experiment	1
Total			**7**