



General Certificate of Secondary Education

*Additional Science 4463 / Physics
4451*

PHY2H

Unit Physics 2

Final Mark Scheme

2010 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.

3.8 Unexpected Correct Answers not in the Mark Scheme

The Examiner should use the ? area in the CMI+ software to forward such answers to a Senior Examiner.

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Question 1

question	answers	extra information	mark
1(a)(i)	75 000	accept correct substitution for 1 mark ie 7500×10	2
	newtons / N	do not accept n full credit for using $g = 9.8$ or 9.81	1
1(a)(ii)	60 000 000	accept for both marks their (a)(i) $\times 800$ correctly calculated accept correct substitution for 1 mark ie their (a)(i) $\times 800$	2
1(b)(i)	arrow drawn parallel (to) and down (the) slope	accept arrow drawn anywhere on the diagram	1
1(b)(ii)	increases	accept is accelerating however 'speed increasing' only scores if correctly linked to increasing kinetic energy	1
	GPE transformed to KE or speed increasing		1
1(c)	so more likely to wear one or they know wearing a helmet is likely to / will reduce (risk) head injury or so can make an (informed) choice (about wearing one)		1
Total			9

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Question 2

question	answers	extra information	mark
2(a)(i)	2.5		1
2(a)(ii)	The radiation dose from natural sources is much greater than from artificial sources.		1
2(b)(i)	other factors may be involved	accept a specific suggestion eg they may be exposed to other types of radiation accept cannot be sure (in many cases) that the cause of death is radon (poisoning)	1
2(b)(ii)	any one from: <ul style="list-style-type: none"> • different concentrations in different rooms • to average out daily fluctuations 	accept to find an average accept to make the result (more) reliable / valid do not accept to make more accurate on its own	1
2(b)(iii)	average level (much) higher (in C and D) some homes have very high level (in C and D) or maximum level in some homes (in C and D) is very high	accept converse accept maximum level in A and B is low accept higher radiation levels (in C and D) for 1 mark	1 1
Total			6

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Question 3

question	answers	extra information	mark
3(a)(i)	electrons transfer / removed	do not accept negatively charged atoms	1
	to the cloth / from the rod	this only scores if first mark given accept negative charge transfer to the cloth / removed from rod for 1 mark transfer of positive charge / positive electrons scores zero transfer of electrons to the rod scores zero	1
3(a)(ii)	TV screen becomes (positively / negatively) charged	if the sign of the charge is given then must be opposites to score both marks do not accept TV screen becomes static	1
	<u>attracts</u> (negatively / positively charged) dust	correct answer in terms of induced charge gains full credit	1
3(b)(i)	J O K P	3 marks for 4 correct 2 marks for 2 correct 1 mark for 1 correct	3
3(b)(ii)	to melt the toner	accept to make the toner stick unless a reason is given that infers this is due to attraction of charged particles	1
Total			8

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Question 4

question	answers	extra information	mark
4(a)	isotopes		1
4(b)	${}_{90}^{231}\text{Th}$	correct order only	1 1
4(c)(i)	(nuclear) fission	accept fision do not accept any spelling that may be confused with fusion	1
4(c)(ii)	neutron / neutrons		1
4(d)	plutonium (239)	accept MOX (mixed oxide) accept Pu do not accept uranium 238 / hydrogen	1
Total			6

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Question 5

question	answers	extra information	mark
5(a)(i)	longer reaction time or greater thinking distance or greater stopping distance	accept slower reactions do not accept slower reaction time unless qualified accept greater thinking time accept greater stopping time greater braking distance negates answer	1
5(a)(ii)	lines / slopes have the same gradient or velocity decreases to zero in same time / in 2.6 seconds	accept slopes are the same accept any time between 2.3 and 2.8 accept braking distances are the same	1
5(a)(iii)	12	accept extracting both reaction times correctly for 1 mark (0.6 and 1.4) or time = 0.8(s) for 1 mark accept 0.8×15 for 2 marks accept calculating the distance travelled by car A as 28.5 m or the distance travelled by car B as 40.5 m for 2 marks	3

Question 5 continues on next page...

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Question 5 continued...

question	answers	extra information	mark
5(b)	Z different force values give a unique / different resistance	only scores if Z chosen do not accept force and resistance are (directly) proportional accept answers in terms of why either X or Y would not be the best eg X – same resistance value is obtained for 2 different force values Y – all force values give the same resistance	1 1
Total			7

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Question 6

question	answers	extra information	mark
6(a)	125 hertz or Hz	allow 1 mark for obtaining time period = 0.008 (s) or frequency = 1 / time period (or their calculated time period) do not accept hz	2 1
6(b)	50 (hertz)		1
Total			4

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Question 7

question	answers	extra information	mark
7(a)	(rate of) <u>flow</u> of charge / electrons / ions	accept movement for flow do not accept flow of electricity	1
7(b)	7(.0)	accept 6.96 / 6.95 or an answer that would approximate to 6.96 if rounded allow 1 mark for obtaining correct power and changing to watts ie 1600 or allow 2 marks for correct substitution and transformation ie $1600 \div 230$ an answer 0.00696 / 0.007 gains 2 marks allow 1 mark for 1.6 / 230 or 1.7 / 230 an answer 7.39 or 7.4 gains 2 marks	3
	amp (ere)	accept A	1
Total			5