



General Certificate of Secondary Education

*Additional Science 4463 /
Physics 4451*

PHY2H Unit Physics 2

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.

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Question 1

question	answers	extra information	mark
1(a)	brown		1
1(b)	outside/case is plastic / an insulator	accept is double insulated accept non-conductor for plastic do not accept it / hairdryer is plastic	1
1(c)(i)	(1) S ₁	and no other	1
	(2) S ₁ and S ₃	both required, either order	1
1(c)(ii)	S ₁ must be ON (for either heater to work)	do not accept reference to 'fan' switch	1
	S ₁ switches the fan on		1
1(d)	1495	allow 1 mark for correct substitution, ie 6.5×230	2
	watt(s) or W	an answer of 1.495 kW gains 3 marks although the unit is an independent mark for full credit the unit and numerical value must be consistent accept joules per second or J/s	1
Total			9

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Question 2

question	answers	extra information	mark
2(a)	572	<p>allow 1 mark for correct substitution, ie 220×2.6</p> <p>allow 1 mark for $220 \times 260 = 57\ 200$ or $220 \times 2600 = 572\ 000$ but to score this mark the entire calculation must be shown</p>	2
2(b)(i)	smooth curve drawn	<p>accept a line that is extrapolated back to 0 degrees, but not through the origin</p> <p>accept a straight line of best fit (point at 40 degrees can be treated as anomalous and line may stop at 30 degrees)</p> <p>do not accept straight lines drawn 'dot to dot' or directly from first to last point or a line going through the origin</p>	1
2(b)(ii)	increases	<p>accept a positive correlation</p> <p>do not accept proportional</p>	1

Question 2 continues on the next page

PHY2H**Question 2 continued**

question	answers	extra information	mark
2(b)(iii)	long plank	no mark for this, the marks are for the explanation	1
	makes the angle small(er) (than a short plank)	accept increases the distance accept small(er) slope	
or	a small(er) force is needed		1
	short plank	no mark for this, the marks are for the explanation	
	a large(r) force is used over a short(er) distance (1)		
	less work done (1)	accept less energy transfer	
Total			6

PHY2H**Question 3**

question	answers	extra information	mark
3(a)	L J K	all 3 in correct order allow 1 mark for 1 correct	2
3(b)	number of electrons = number of protons	accept amount for number	1
3(c)	neutrons	this answer only	1
3(d)	loses / gains electron(s)		1
Total			5

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Question 4

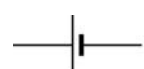
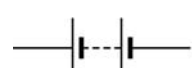
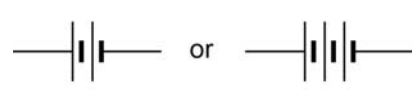
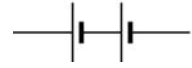
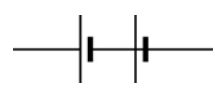
question	answers	extra information	mark
4	beta any two from: <ul style="list-style-type: none">• mass number does not change or total number of protons and neutrons does not change• atomic / proton number increases by 1 or number of protons increases by 1• number of neutrons goes down by 1	reason may score even if alpha or gamma given allow for 2 marks a neutron splits / changes into a proton and electron / beta candidates that answer correctly in terms of why alpha and gamma are not possible, gain both marks	1 2
Total			3

PHY2H**Question 5**

question	answers	extra information	mark
5(a)	48	allow for 1 mark correct method shown, ie 6×8 or correct area indicated on the graph	2
5(b)	diagonal line from (0,0) to (6,48) / (6, their (a))	if answer to (a) is greater than 50, scale must be changed to gain this mark	1
	horizontal line at 48m between 6 and 10 seconds	accept horizontal line drawn at their (a) between 6 and 10 seconds	1
Total			4

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Question 6

question	answers	extra information	mark
6(a)(i)	ammeter and battery in series with the gauge	symbols must be correct ignore a voltmeter drawn in series accept     not  or cells reversed to cancel out symbol must be correct accept a freestanding circuit diagram provided strain gauge is labelled or a resistor symbol used for the strain gauge	1 1
6(a)(ii)	d.c. flows only in one direction	a.c. changes direction is insufficient	1
6(b)(i)	75	this answer only allow 1 mark for correct substitution and transformation, ie resistance = $\frac{3.0}{0.040}$	2

Question 6 continues on the next page

PHY2H**Question 6 continued**

question	answers	extra information	mark
6(b)(ii)	increases		1
6(b)(iii)	elastic / strain <u>potential</u>	do not accept potential	1
Total			7

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Question 7

question	answers	extra information	mark
7(a)	4.2	<p>2 marks for correct substitution and transformation, ie 1155/275</p> <p>allow 1 mark for correct resultant force with a subsequent incorrect method, ie 1155</p> <p>allow 1 mark for an incorrect resultant force with a subsequent correct method, eg answers of 7.27 or 10.34 gain 1 mark</p>	3
7(b)(i)	<p>YES</p> <p>any two from:</p> <ul style="list-style-type: none"> • data (from police files) can be trusted • data answers the question asked • large sample used <p>NO</p> <p>any two from:</p> <ul style="list-style-type: none"> • the sample is not representative • the sample size is too small • accident files do not indicate age / experience of riders 	<p>marks are for the explanation</p> <p>allow a conclusion can be made from the data</p> <p>an answer YES and NO can score 1 mark from each set of mark points</p>	2

Question 7 continues on the next page

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Question 7 continued

question	answers	extra information	mark
7(b)(ii)	more accidents with motorbikes up to 125 cc	accept for 2 marks an answer in terms of number of under 125 cc to accidents ratio compared correctly with number of over 500 cc to accidents ratio	1
	even though there are fewer of these bikes than bikes over 500 cc		1
7(c)(i)	increases the time taken to stop	accept increases collision time	1
	decreases rate of change in momentum	accept reduces acceleration / deceleration accept $F = \frac{\Delta mv}{\Delta t}$	1
	reduces the <u>force</u> (on the rider)	reduces momentum is insufficient	1
7(c)(ii)	<p>YES any sensible reason, eg:</p> <ul style="list-style-type: none"> cannot put a price on life / injury fewer (serious) injuries reduces cost of health care / compensation <p>NO any sensible suggestion, eg:</p> <ul style="list-style-type: none"> money better spent on ... total number of riders involved is small 	<p>the mark is for the reason</p> <p>accept may save lives</p> <p>accept reduces risk of injury</p> <p>needs to be specific</p>	1
Total			11