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General Certificate of Secondary Education

Additional Science 4463 / Physics 4451

PHY2F 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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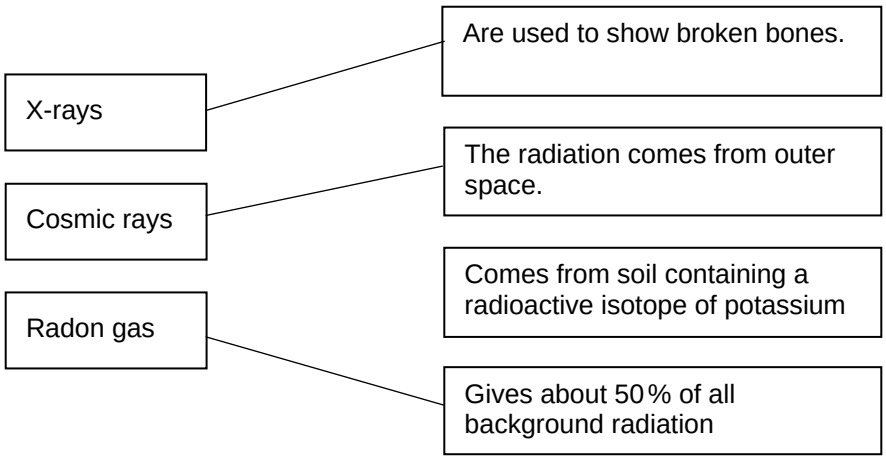
Question 1

question	answers	extra information	mark
1	**1** mark for each correct line  	If more than 1 line has been drawn from a box in **List A** then all those lines are marked incorrect.	3
Total			**3**

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Question 2

question	answers	extra information	mark
2(a)	proton electron neutron	all 3 in correct order allow **1** mark for 1 correct do **not** accept letters p, e, n	2
2(b)	4 number of protons	reason only scores if 4 is chosen accept number of electrons accept there are 4 protons and 4 electrons do **not** accept there are 4 protons and electrons	1 1
2(c)	The atom loses an electron.		1
Total			**5**

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Question 3

question	answers	extra information	mark
3(a)(i)	lorry greatest mass	reason only scores if lorry chosen accept weight for mass accept heaviest accept correct calculations for all 3 vehicles the biggest is insufficient	1 1
3(a)(ii)	2450	allow **1** mark for correct substitution ie 175 × 14	2
3(b)(i)	increases	accept any clear indication of the correct answer	1
3(b)(ii)	speed increases	accept velocity for speed accept gets faster do **not** accept it accelerates on its own moves more is insufficient	1
3(b)(iii)	straight line going to 6, 20 horizontal line from 6,20 to 8,20	allow **1** mark for a curve going to 6,20 **or** a straight line diagonally upwards but missing 6,20 allow a horizontal line from where their **diagonal** meets 20m/s to 8,20	2 1
Total			**9**

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Question 4

question	answers	extra information	mark
4(a)	fleece rubs against shirt **or** friction (between fleece and shirt)	it refers to the fleece	1
	(causing) <u>electrons</u> to transfer from one to the other	accept a specific direction of transfer do **not** accept charge for electrons positive electrons negates this mark movement of protons negates this mark	1
4(b)	Electrical charges move easily through metals.		1
	An electric current is a flow of electrical charge.		1
4(c)(i)	copper	reason only scores if copper chosen	1
	(good electrical) conductor	accept it is a metal any mention of heat conduction negates this mark	1
4(c)(ii)	lower than		1

Question 4 continues on the next page

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Question 4 continued

question	answers	extra information	mark
4(c)(iii)	accept any sensible suggestion, eg: • too many variables (to control) • lightning strikes / storms are random / unpredictable • do not know which building will be struck • do not know when a building will be struck • do not know when lightning will happen • (very) difficult to create same conditions in a laboratory • lightning storms are not the same	it is not safe is insufficient do **not** accept lightning does not strike the same place twice	1
Total			**8**

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Question 5

question	answers	extra information	mark
5(a)	The driver has been drinking alcohol.	reason only scores if this box is ticked	1
	drivers reaction time increases **or** thinking distance / stopping distance increases **or** driver less alert	accept slower reactions accept slower reaction time do not accept braking distance increases accept driver may fall asleep / be tired	1
5(b)	they are all variables that could affect outcome / results	accept specific effect of changing one of the variables accept to make the test valid ignore reliable	1
	so data / barriers can be compared	accept to see which is / works best / safest do **not** accept fair test on its own	1
5(c)	ticks in both the top and middle boxes		1
Total			**5**

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Question 6

question	answers	extra information	mark
6(a)	brown		1
6(b)	outside / case is plastic / an insulator	accept is double insulated accept non-conductor for plastic do **not** accept it / hairdryer is plastic	1
6(c)(i)	(1) S_1 (2) S_1 and S_3	and no other both required, either order	1 1
6(c)(ii)	S_1 must be ON (for either heater to work) S_1 switches the fan on	do **not** accept reference to 'fan' switch	1 1
6(d)	1495 watt(s) or W	 allow **1** mark for correct substitution ie, 6.5 × 230 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	2 1
Total			**9**

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Question 7

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

Question 7 continues on the next page

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Question 7 continued

question	answers	extra information	mark
7(b)(iii)	long plank	no mark for this, the marks are for the explanation	
	makes the angle small(er) (than a short plank)	accept increases the distance accept small(er) slope	1
	a small(er) force is needed		1
	or		
	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**