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General Certificate of Secondary Education

Science B 4462 / Physics 4451

PHY1F Unit Physics 1

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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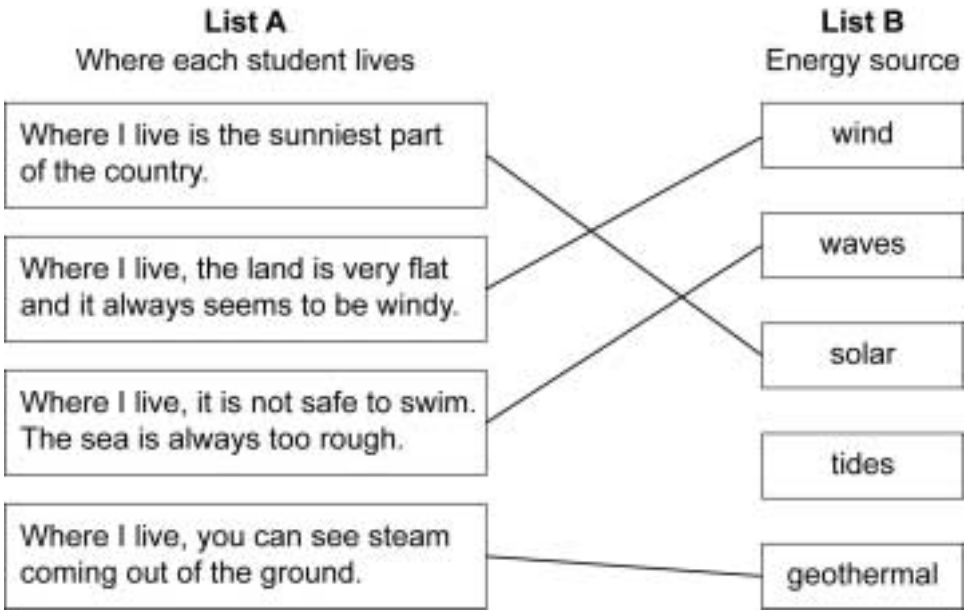
Question 1

question	answers	extra information	mark
1(a)	all 4 lines correct  	allow **1** mark for each correct line if more than 1 line goes from a box in **List A** then all those lines are incorrec	4
1(b)	all renewable	accept a correct description of renewable eg replaced faster than used **or** never run out do **not** accept can be used again accept any other common feature eg do not produce pollution / polluting (gases) no fuel is burnt (energy input) is free eco-friendly / environmentally friendly / natural resources / sustainable sources are insufficient	1
1(c)	large areas of land are flooded		1
Total			**6**

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Question 2

question	answers	extra information	mark
2(a)(i)	infra red (rays) **or** radio (waves)	accept IR do **not** accept heat waves do **not** accept TV waves	1
2(a)(ii)	<u>radio</u> (waves)	this answer only	1
2(b)	frequency		1
2(c)(i)	need to know if it is harmful / makes you ill	answer should be in terms of establishing if harmful or not harmful ie trying to clear up any uncertainty do **not** accept answers that assume it is harmful eg Wi-Fi systems will make you ill accept idea that safety issue may worry people accept idea that (more) research may reassure people accept idea of finding out (the truth)	1
2(c)(ii)	an opinion		1
Total			**5**

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Question 3

question	answers	extra information	mark
3(a)(i)	2(.0)	accept 2000 W or 2000 watt(s) accept answer given in table do **not** accept 2000	1
3(a)(ii)	4.5	 allow **1** mark for correct substitution ie 1.5 × 3 allow **1** mark for the answers 1.5 or 6(.0)	2
3(a)(iii)	54 **or** their (a)(ii) × 12 correctly calculated	 allow **1** mark for correct substitution ie 4.5 × 12 **or** their (a)(ii) × 12 allow **1** mark if correct answer is given in pounds eg £54	2

Question 3 continues on the next page . . .

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Question 3 continued . . .

question	answers	extra information	mark
3(b)(i)	6 pm temperature starts to rise faster **or** graph (line) is steeper / steepest	 only scores if 6 pm given it refers to graph gradient or temperature accept answers in terms of relative temperature rise eg 5 to 6 pm 2 °C rise, 6 to 7 pm 6 °C rise accept temperature rises sharply / rapidly / quickly do **not** accept temperature starts to rise	1 1
3(b)(ii)	middle box ticked		1
Total			**8**

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Question 4

question	answers	extra information	mark
4(a)(i)	walls	accept sides (of house)	1
4(a)(ii)	fit double glazing **or** close / fit curtains / fit shutters	 accept close windows accept keep house at a lower temperature accept fit (foam) draft excluders around the windows / in the jams accept put plastic (film) across the windows do **not** accept fit thicker glass	1
4(b)(i)	cavity (wall insulation)	accept the middle one	1
4(b)(ii)	fit hot water jacket **and** draught-proofing (together) saves most money	both required only scores if first mark scores accept saves more than fitting (energy efficient) light bulbs accept saves £40 accept gives the shortest payback time an answer fit energy efficient light bulbs (on its own) gains **1** mark only	1 1
Total			**5**

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Question 5

question	answers	extra information	mark
5(a)	any **one** from: • above the atmosphere • no clouds in the way • no light pollution	 accept no atmospheric pollution answers in terms of being closer to space negate answers in terms of looking at the Earth negate	1
5(b)(i)	red-shift		1
5(b)(ii)	expanding		1
5(c)(i)	as one gets bigger the other gets bigger	accept (directly) proportional accept positive correlation	1
5(c)(ii)	**C** it is furthest from the Earth **or** it is furthest away **or** has the largest red-shift **or** it is moving (away) the fastest	 only scores if **C** is chosen	1 1
Total			**6**

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Question 6

question	answers	extra information	mark
6(a)	conduction		1
6(b)(i)	any **one** from: • starting temperature (of cold water) • pipe length • pipe diameter • pipe (wall) thickness • volume of cold water • temperature of hot water (in) • time	 temperature is insufficient accept size of pipe accept amount for volume	1
6(b)(ii)	(type of) material is categoric	accept one variable is categoric accept variable(s) are categoric accept it is categoric accept variable(s) are not continuous descriptions of variables ie names and numbers is insufficient	1
6(b)(iii)	copper greatest temperature change	 only scores if copper chosen accept heat for temperature accept heated water the fastest accept it was hottest (after 10 minutes) accept it is the best / a good conductor	1 1

Question 6 continues on the next page . . .

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Question 6 continued . . .

question	answers	extra information	mark
6(c)	larger (surface) area	accept the pipe is longer accept hot (dirty) water (inside pipe) is in contact with the cold water (outside pipe) for a longer time the pipe is a spiral is insufficient	1
Total			**6**

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Question 7

question	answers	extra information	mark
7(a)	gamma will pass through the body **or** alpha will not pass through the body	it refers to gamma answers must relate to the body accept skin for body	1
	gamma is only slightly ionising **or** alpha is heavily ionising	accept gamma causes less damage to cells / tissue do **not** accept gamma causes no damage to cells less harmful is insufficient	1
7(b)(i)	(both graphs show an initial) increase in count-rate	accept both show an increase	1
7(b)(ii)	only the right kidney is working correctly		1
	any **two** from: • count-rate / level / line for right kidney decreases (rapidly) • count-rate / level / line for <u>left</u> kidney does not change • radiation is being passed out / into urine - if referring to right kidney • radiation is not being passed out - if referring to the left kidney	if incorrect box chosen maximum of **1** mark can be awarded reference to named kidney can be inferred from the tick box it decreases is insufficient it does not change is insufficient	2

Question 7 continues on the next page . . .

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Question 7 continued . . .

question	answers	extra information	mark
7(c)(i)	time taken for number of nuclei to halve **or** time taken for the count-rate to halve		1
7(c)(ii)	short half-life - the level of radiation (in the body) decreases rapidly	it refers to short life isotope	1
	to a safe / very small level **or** a long half-life - the radiation remains in the body / for a long time		1
	level of radiation remains high	answers in terms of damage eg cancer are insufficient	
Total			**9**