Version 1.0

General Certificate of Secondary Education
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Science B / Physics PHY1F

(Specification 4462 / 4451)

Unit 1: Physics 1

Final

Mark Scheme

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 events which all examiners participate in and is the scheme which was used by them in this examination. The standardisation process ensures that the mark scheme covers the students' responses to questions and that every examiner understands and applies it in the same correct way. As preparation for standardisation each examiner analyses a number of students' scripts: alternative answers not already covered by the mark scheme are discussed and legislated for. If, after the standardisation process, examiners encounter unusual answers which have not been raised 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 students' 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.

Information to Examiners

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 bullet points 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	green, 5	0
2	red*, 5	1
3	red*, 8	0

Example 2: Name two planets in the solar system. (2 marks)

Candidate	Response	Marks awarded
1	Neptune, Mars, Moon	1
2	Neptune, 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, 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 or by each stage of a longer calculation.

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 Ignore / Insufficient / Do <u>not</u> allow

Ignore or insufficient is used when the information given is irrelevant to the question or not enough to gain the marking point. Any further correct amplification could gain the marking point.

Do **not** allow means that this is a wrong answer which, even if the correct answer is given, will still mean that the mark is not awarded.

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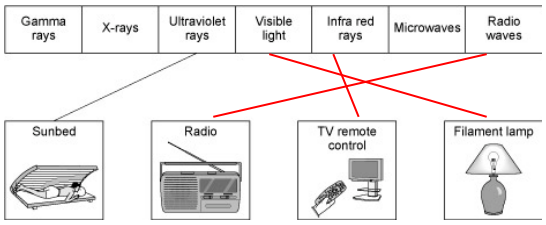
Question 1

question	answers	extra information	mark
1(a)	all three lines correct  	allow **1** mark for each correct line if more than one line goes from a device then all lines from that device are wrong	3
1(b)(i)	<u>skin</u> cancer	do **not** accept cancer do **not** accept sunburn correct answer only	1
1(b)(ii)	other factors may be involved	accept may have been in the Sun too long accept (over)-use of sunbeds and (over)-exposure to the Sun (both) give the same symptoms accept any other sensible factor that could lead to doubt do **not** accept irrelevant answers eg may be run over by a car do **not** accept killed by exposure to the Sun	1

Question 1 continues on the next page . . .

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Question 1 continued . . .

question	answers	extra information	mark
1(b)(iii)	can assess risk **or** make your own decision	answers should be in terms of assessing our own health risk accept so you limit its use / don't use one do **not** accept so you don't get skin cancer do **not** accept so you don't get sunburn	1
Total			**6**

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Question 2

question	answers	extra information	mark
2(a)	iron hairdryer kettle	answers can be in any order	1 1 1
2(b)(i)	**Y**		1
2(b)(ii)	bar drawn with any height greater than **Y**	ignore width of bar	1
2(c)	(bigger volume) takes more time (to boil) (so) more energy transferred (and) this costs more money	accept explanation using data from graph do **not** accept electricity for energy ignore reference to cost of water wasting more money because heating more water than needed is insufficient	1 1 1
Total			**8**

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Question 3

question	answers	extra information	mark
3(a)(i)	an unreliable energy source		1
3(a)(ii)	a renewable energy source		1
3(b)	plant / grow (at least) one new tree		1
3(c)	greater than 4%		1
Total			**4**

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Question 4

question	answers	extra information	mark
4(a)	light electrical	correct order only	1 1
4(b)	0.2 or 1/5	accept 20% for both marks allow **1** mark for correct substitution ie $\frac{35\,000}{175\,000}$ answers of 0.2% **or** 20 gain **1** mark only	2
4(c)	any **one** from: • produces no (pollutant) gases **or** no greenhouse gases • produces no / less noise • less demand for fuels	accept named gas accept no air pollution do **not** accept no pollution accept less global warming accept harmful for pollutant accept produces no carbon do **not** accept environmentally friendly accept any other sensible environmental advantage	1
Total			**5**

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Question 5

question	answers	extra information	mark
5(a)	£16.50	allow **1** mark for correct substitution ie 110 × 15 an answer of 1650 gains **both** marks an answer of 43.80 gains **both** marks allow **1** mark for 292 × 15	2
5(b)	292	allow **1** mark for correctly using the reading 53490 ie 53782 – 53490 accept £43.80 for **both** marks	2
Total			**4**

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Question 6

question	answers	extra information	mark
6	less / no <u>light</u> pollution	accept no / fewer streetlights	1
	less cloud cover / above clouds		1
	less <u>atmospheric</u> pollution	accept air for atmosphere accept idea of thinner atmosphere do **not** accept closer to stars	1
Total			**3**

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Question 7

question	answers	extra information	mark
7(a)	(both graphs show an initial) increase in count rate	accept both show an increase	1
7(b)	only the right kidney is working correctly		1
	any **two** from: • count-rate / level / line for <u>right</u> 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 • <u>left</u> kidney does not initially absorb as much technetium-99	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
Total			**4**

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Question 8

question	answers	extra information	mark
8(a)	conduction		1
8(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
8(b)(ii)	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
8(c)	the pipe has a larger (surface) area (so) hot / dirty water (inside pipe) is in contact with cold / clean water (outside pipe) for longer	accept pipe is longer	1 1
Total			**6**

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Question 9

question	answers	extra information	mark
9(a)	frequency / pitch decreases	accept wavelength increases accept it / the note becomes deeper / lower it / the note decreases is insufficient quieter is neutral	1
9(b)(i)	(moving) loudspeaker change in sound as loudspeaker moves away		1 1
9(b)(ii)	models can help to explain an effect or theory		1
9(c)	big bang		1
Total			**5**

UMS Conversion Calculator: www.aqa.org.uk/umsconversion