



General Certificate of Secondary Education

Science B 4462/ Physics 4451

PHY1F Unit Physics 1

Mark Scheme

2010 examination - January 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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MARK SCHEME

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 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.

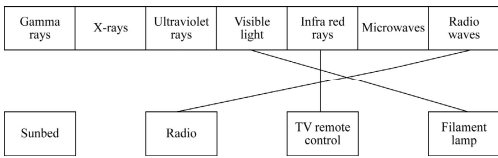
3.6 Phonetic spelling

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)	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 large numbers killed by exposure to the Sun	1
1(b)(iii)	can assess risk or make your own decision	answers should be in terms of assessing your 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)(i)	gas		1
2(a)(ii)	one variable is categoric, the other is continuous		1
2(a)(iii)	fuel is not burned	accept nothing is burned do not accept they don't use fossil fuels	1
2(b)(i)	boiler steam turbine generator		1 1 1 1
2(b)(ii)	any one from: <ul style="list-style-type: none"> • wind • waves • tidal • geothermal • solar • <u>falling</u> water 	accept wind turbines accept tide accept the Sun / sunlight accept solar panels / cells do not accept light accept hydroelectric do not accept water do not accept any named biofuel	1
2(b)(iii)	18 000	allow 1 mark for showing a correct method ie $36\,000\,000 \div 2\,000$ an answer of 0.018 gains 1 mark	2
Total			10

PHY1F**Question 3**

question	answers	extra information	mark
3(a)	85		1
3(b)(i)	<u>thickness</u> (of glass)	accept how thick the glass is do not accept light intensity	1
3(b)(ii)	transmits less infra red	accept radiation / or heat for infra red accept transmits less energy (at all wavelengths) accept (glass B) absorbs more infra red accept infra red is the same as heat ignore reference to visible light	1
	infra red has a heating effect or infra red warms the room	ignore references to conservatory keeping cool	1
3(c)	Z		1
Total			5

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Question 4

question	answers	extra information	mark
4(a)	alpha particles cannot pass through... or alpha particles can pass through a very thin sheet of paper / card	do not accept gamma particles . . . credit answers where correct amendments are made to boxed statement	1
4(b)(i)	horizontal and vertical line drawn at correct positions on the graph	accept a cross drawn at 4500 / 500 on the curve or two pairs of lines drawn, for example, at 600 and 300 accept a horizontal line drawn at 500 on its own do not accept vertical lines only	1
4(b)(ii)	4500 million years		1
4(b)(iii)	half-life too long no (measurable) change in count rate	do not accept simply its half-life is 4500 million years do not accept have not got the equipment do not accept it's harmful (to children) if neither of the above points scored, accept not enough time to measure it for 1 mark	1 1
Total			5

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Question 5

question	answers	extra information	mark
5(a)(i)	(visible) light		1
5(a)(ii)	any one from: <ul style="list-style-type: none"> • less / no light pollution • less atmospheric distortion / interference • less / no cloud cover • image / picture is clearer 	accept no street lights accept less / thinner atmosphere do not accept no atmosphere accept less atmospheric pollution do not accept less pollution accept above the clouds do not accept gives a clearer view / signal	1
5(b)	on a satellite	accept in orbit / space accept in a high altitude balloon accept above the atmosphere do not accept on top of a mountain do not accept on a plane ignore any reason given correct or otherwise	1
5(c)	The Universe began from a very small point.		1
Total			4

PHY1F**Question 6**

question	answers	extra information	mark
6(a)(i)	radiation		1
6(a)(ii)	traps (small pockets of) air	do not accept it's an insulator do not accept reduces conduction and / or convection do not allow it doesn't allow heat to escape	1
6(b)(i)	bigger temperature difference (between the water and surroundings) at the start (than at the end)	do not accept water is hotter	1
6(b)(ii)	starting temperature (of the water)	accept thickness of fleece do not accept same amount of fleece do not accept thermometer / can do not accept time is the same	1
6(b)(iii)	18(°C)	correct answer only	1
6(b)(iv)	M smallest temperature drop (after 20 mins)	cannot score if M is not chosen accept it's the best insulator accept smallest loss in heat accept keeps heat / warmth in for longer	1 1
Total			7

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Question 7

question	answers	extra information	mark
7(a)(i)	kinetic	do not accept movement	1
7(a)(ii)	thermal sound	accept heat for thermal do not accept noise for sound both answers required in either order	1
7(b)	transferred to surroundings / surrounding molecules / atmosphere or becomes dissipated / spread out	'it escapes' is insufficient accept warms the surroundings accept degraded / diluted accept a correct description for surroundings eg to the washing machine do not accept transformed into heat on its own	1
7(c)	a smaller <u>proportion / percentage</u> of the energy supplied is wasted	owtte accept a statement such as 'less energy is wasted' for 1 mark do not accept costs less to run ignore references to uses less energy	2
7(d)(i)	2.4 (p)	accept 2 p if it is clear from the working out this is rounded from 2.4 p allow 1 mark for correct substitution of correct values ie 0.2×12 allow 1 mark for calculating cost at 40°C (13.2p) or cost at 30°C (10.8p)	2

Question 7 continues on the next page . . .

PHY1F**Question 7 continued . . .**

question	answers	extra information	mark
7(d)(ii)	any one from: <ul style="list-style-type: none">• less electricity needed• fewer power stations needed• less fuel is <u>burned</u>	ignore answers in terms of the washing machine releasing less energy an answer in terms of the washing machine releasing CO ₂ negates the mark do not accept less energy is produced accept a correctly named fuel do not accept less fuel is needed	1
Total			8