General Certificate of Secondary Education

Science B 4462 / Physics 4451

PHY1H **Unit Physics 1**

Mark Scheme

2012 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 students' 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 students' 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 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.

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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 students 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)

Student	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)

Student	Response	Marks awarded
1	Neptune, Mars, Moon	1
2	Neptune, Sun, Mars, Moon	0

3.2 Use of chemical symbols / formulae

If a student 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.

Quality of Written Communication and levels marking

In Question 8 students are required to produce extended written material in English, and will be assessed on the quality of their written communication as well as the standard of the scientific response.

Students will be required to:

- use good English
- organise information clearly
- use specialist vocabulary where appropriate.

The following general criteria should be used to assign marks to a level:

Level 1: Basic

- Knowledge of basic information
- Simple understanding
- The answer is poorly organised, with almost no specialist terms and their use demonstrating a general lack of understanding of their meaning, little or no detail
- The spelling, punctuation and grammar are very weak.

Level 2: Clear

- Knowledge of accurate information
- Clear understanding
- The answer has some structure and organisation, use of specialist terms has been attempted but not always accurately, some detail is given
- There is reasonable accuracy in spelling, punctuation and grammar, although there may still be some errors.

Level 3: Detailed

- Knowledge of accurate information appropriately contextualised
- Detailed understanding, supported by relevant evidence and examples
- Answer is coherent and in an organised, logical sequence, containing a wide range of appropriate or relevant specialist terms used accurately.
- The answer shows almost faultless spelling, punctuation and grammar.

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Question 1

question	answers	extra information	mark
1(a)	can be replaced as fast / faster than it is used	accept will not run out can be used again negates this mark	1
1(b)	any **one** from: • reduce demand on power stations / National Grid (system) • to <u>increase</u> the amount of electricity generated (from renewable energy) • to conserve fossil fuels • plenty of animal waste / fuel (available)	 accept use less fossil fuels accept so animal waste can be used usefully accept to save money / sell the electricity produces less harmful gases / SO_2 is insufficient better for environment is insufficient	1
1(c)	60 (months) / 5 (years)	ignore any unit given	1

Question 1 continues on the next page

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Question 1 continued

question	answers	extra information	mark
1(d)	any **two** from: • reliable energy source **or** does not depend on the weather • uses up waste products • not visually polluting • concentrated energy source • quieter	answers must be in terms of the biogas generator accept works all of the time accept animal waste readily available ignore it is renewable do **not** accept generates more electricity (than wind turbine)	2
Total			**5**

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Question 2

question	answers	extra information	mark
2(a)(i)	UVC it is absorbed / stopped by the ozone layer	reason only scores if UVC is chosen accept atmosphere / air for ozone layer accept does not reach the Earth	1 1
2(a)(ii)	increases the risk due to higher levels of UV (radiation) **or** less UV (radiation) absorbed	accept more likely to get (skin) cancer / sun burn accept more people likely to be harmed (by UV radiation) specific reference to UVA / all three increasing negates this mark	1 1
2(b)(i)	(type of) surface	accept snow and sand accept place / location do **not** accept position (of dummy head)	1
2(b)(ii)	repeat measurements / investigation and take average(s) / mean	both parts required repeat measurements / experiment is insufficient	1

Question 2 continues on the next page

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Question 2 continued

question	answers	extra information	mark
2(b)(iii)	**snow** the intensity (facing the Sun) is higher, (so more must be reflected) **or** intensity hardly reduces when facing away from the Sun (so most UV entering sensor must be reflected)	mark is for reason, only scores if snow chosen accept results are higher (for snow than sand) accept white surfaces are good reflectors accept it's white	1
2(c)	**No** for all wavelengths shown some UV is reaching the sensor	 this mark point can score even if yes is chosen accept some UV is passing through (the goggles) accept the reading should be zero (but it isn't)	 1 1
Total			**9**

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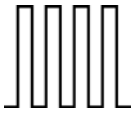
Question 3

question	answers	extra information	mark
3(a)	electromagnetic	accept em	1
3(b)	correct example of an analogue signal eg 	ignore whether AM or FM	1
	correct example of a digital signal eg 	ignore different wave heights and widths as long as square wave drawn if both diagrams are correct but drawn in the wrong box allow **1** mark	1
3(c)(i)	not proven that microwave radiation is safe **or** may yet be shown to be harmful	 accept long-term effect yet to be proven accept evidence (may be) unreliable	1
3(c)(ii)	ethical and economic		1
Total			**5**

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Question 4

question	answers	extra information	mark
4(a)	clearer / more detailed / sharper / less distorted image any **one** from: • no light pollution • light is not scattered by the atmosphere	image is better is insufficient ignore image is bigger accept no clouds to prevent observations accept air for atmosphere accept (image) not distorted by the atmosphere accept (light) does not have to pass through the atmosphere do **not** accept in terms of distance	1 1
4(b)(i)	bigger the red-shift, further the galaxy is from the Earth	accept red-shift and distance are directly proportional accept there is a positive correlation	1
4(b)(ii)	origin / start / beginning / creation	accept expansion	1
Total			**4**

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Question 5

question	answers	extra information	mark
5(a)(i)	7.6	allow **1** mark for correct substitution and / or transformation ie $0.95 = \frac{x}{8}$ 0.95×8.0	2
5(a)(ii)	25 (hours)	allow **1** mark for obtaining number of kWh = 200 an answer of 26(.3) gains both marks	2
5(b)	any **two** from • transferred to the surroundings / air / atmosphere • becomes spread out • shared between (many) molecules • (wasted as) heat / sound		2
Total			**6**

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Question 6

question	answers	extra information	mark
6(a)	any **two** from: • (air) particles / molecules / atoms gain energy • (air) particles / molecules / atoms move faster • (air) particles / molecules / atoms move apart • air expands • air becomes less dense • warm / hot air / gases / particles rise	do **not** accept move more do **not** accept move with a bigger amplitude / vibrate more ignore particles expand ignore particles become less dense do **not** accept heat rises answers in terms of heat particles negates any of the mark points that includes particles	2
6(b)(i)	any **two** from • free / mobile electrons gain (kinetic) energy • free electrons collide with other (free) electrons / ions / atoms / particles • atoms / ions / particles collide with other atoms / ions / particles	accept free / mobile electrons move faster accept vibrate faster for gain energy answers in terms of heat particles negates this mark point	2
6(b)(ii)	(faster) energy / heat transfer to room(s) / house	accept room(s) / house gets warm(er) accept lounge / bedroom / loft for rooms	1
Total			**5**

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Question 7

question	answers	extra information	mark
7(a)	cobalt-(60)		1
	gamma (radiation) will pass through food / packaging	this can score if technetium chosen	1
	long half-life so level of radiation (fairly) constant for (a number) of years	this can score if strontium / caesium is chosen accept long half-life so source does not need frequent replacement accept answers in terms of why alpha and beta cannot be used gamma kills bacteria is insufficient	1
7(b)(i)	people may link the use of radiation with illness / cancer	accept (they think) food becomes radioactive accept (they think) it is harmful to them 'it' refers to irradiated food	1
7(b)(ii)	not biased / influenced (by government views)		1

Question 7 continues on the next page

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Question 7 continued

question	answers	extra information	mark
7(b)(iii)	any **two** from: • data refers only to (cooked) chicken • data may not generalise to other foods • the content of some vitamins increases when food / chicken is irradiated • no vitamins are (completely) destroyed • (only) two vitamins decrease (but not significantly)	marks are for the explanation only accept irradiated chicken / food contains a higher level of vitamins	2
7(b)(iv)	so can choose to eat / not eat that (particular) food	accept irradiated food may cause health problems (for some people) accept people may have ethical issues (over eating irradiated food)	1
7(c)(i)	electron from nucleus / neutron	**both** parts required	1
7(c)(ii)	90 years	allow **1** mark for showing 3 half-lives	2
Total			**11**

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