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ASSESSMENT and QUALIFICATIONS ALLIANCE

General Certificate of Secondary Education

Science B 4462 / Physics 4451

PHY1F Unit 1 Physics

Mark Scheme

2009 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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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)	electrical sound	correct order only	1 1
1(b)	the energy transformed by the TV will be destroyed		1
1(c)	a higher efficiency than		1
Total			**4**

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Question 2

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

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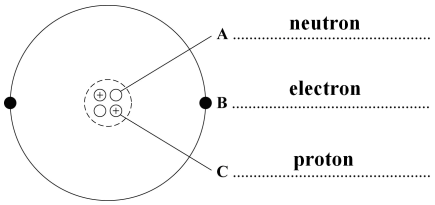
Question 3

question	answers	extra information	mark
3(a)(i)		all 3 labels correct allow **1** mark for 1 correct label	2
3(a)(ii)	has no electrons	it = alpha allow alpha has a positive(charge) allow a helium (atom) has no (charge) do **not** accept general properties of alpha do **not** accept general answers in terms of size / density / mass etc	1
3(b)(i)	15 (hours)	accept any answer between 14.8 and 15.2 inclusive	1
3(b)(ii)	15 (hours) or their (b)(i)		1
3(c)(i)	americium-241 has a long half life		1

Question 3 continues on the next page . . .

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Question 3 continued . . .

question	answers	extra information	mark
3(c)(ii)	any **one** from: • alpha (particles) are harmful to … • so they dispose of it safely / appropriately • so they don't break it open / open it • so they can make a choice about having a radioactive source (in the house)	it = radioactive material accept radiation / radioactive material is harmful to … accept specific example of harm eg can cause cancer accept radiation is poisonous if ingested / inhaled do **not** accept it is poisonous / in case of leakage accept do **not** touch the radioactive source	1
Total			**7**

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Question 4

question	answers	extra information	mark
4(a)	the bigger the surface area, the faster the water cools down / temperature falls	answers must imply rate accept heat for temperature provided rate is implied do **not** accept cools down more unless qualified	1
4(b)	any **two** from: the ears: • have large surface / area • radiate heat • keep blood cooler	 not just has large ears accept loses heat, but does not score if the reason given for heat loss is wrong	2
4(c)(i)	radiation		1
4(c)(ii)	conduction		1
Total			**5**

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Question 5

question	answers	extra information	mark
5(a)(i)	France		1
5(a)(ii)	any **one** from: • different homes have different appliances • different homes have different numbers of appliances • standby power not the same for all appliances • some people will switch appliances off • homes have different numbers of residents • can't measure every (individual) home	accept all homes are different accept named appliances accept people waste different amounts of energy accept any sensible suggestions do **not** accept answers in terms of accurate / precise etc	1
5(b)(i)	increases amount of energy wasted	accept (encourages) people to leave appliances on (standby) accept increases it	1

Question 5 continues on the next page . . .

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Question 5 continued . . .

question	answers	extra information	mark
5(b)(ii)	any **two** from: • less electricity needed / generated • fewer power stations needed • less coal is burned • less pollutant gases produced	 do **not** accept coal is non-renewable / running out answers in terms of fuel stocks neutral accept named gases accept harmful for pollutant accept greenhouse gases accept reduce / slow / stop global warming accept reduces acid rain	2
5(c)	joule		1
5(d)(i)	6800	accept £68 for **3** marks an answer of 68 gains **2** marks allow **2** marks for correct substitution ie 400 × 17 allow **1** mark for obtaining 400 answers of 7480, 4760, 12920, 4080 gain **2** marks	3
5(d)(ii)	a small . . . . . electricity		1
Total			**10**

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Question 6

question	answers	extra information	mark
6(a)(i)	HESS	accept gamma	1
6(a)(ii)	infra red	accept IR accept answers written in table do **not** accept heat	1
6(b)	clearer / more detailed / sharper / less distorted image any **one** from: • no light pollution • light is not scattered by the atmosphere	do **not** accept image is bigger accept no clouds to prevent observations accept light is scattered by the atmosphere (implies William Herschel) accept light does (not have to) pass through the atmosphere accept air for atmosphere do **not** accept answers in terms of distance	1 1

Question 6 continues on the next page . . .

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Question 6 continued . . .

question	answers	extra information	mark
6(c)	any **two** from: • microwaves absorbed by water (molecules) • signal strength greater (in dry environment) • more sensitive (in dry environment) • detect weaker signals (in dry environment) • more detailed / clearer image (in dry environment)	accept more microwaves reach telescope accept harder to detect signals in a humid environment accept image contains more information do **not** accept better image	2
6(d)	a fourth / extra galaxy / star	accept a planet / another object / source	1
Total			**7**

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Question 7

question	answers	extra information	mark
7(a)(i)	any **one** from: • less (prone to) interference • can be (easily) processed by computers • better (quality) signal • signal can be restored	 accept interference causes less / no permanent damage accept no interference accept noise / distortion for interference accept can be processed without an analogue to digital converter accept clearer signal do **not** accept faster / sends more information	1
7(a)(ii)	cooking **or** satellite communication	do **not** accept microwave (oven) accept radar accept (microwave) telescopes accept Wi-Fi do **not** accept radio	1
7(b)(i)	compare (the health of) mobile phone users with non-mobile phone users	must be an implied comparison between users and non-users any idea of doing an experiment negates the mark	1
7(b)(ii)	increase the sample size	accept use more people accept have a large sample size repeat the research / test is neutral	1

Question 7 continues on the next page . . .

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Question 7 continued . . .

question	answers	extra information	mark
7(b)(iii)	ethical		1
7(c)(i)	so the phones can be compared (fairly)	a fair test is insufficient accept different tests (may) give different results do **not** accept to make the results reliable, unless qualified eg all variables are controlled do **not** accept bias unless qualified	1
7(c)(ii)	yes all are below the legal limit / 2 (W/kg) **or** no and any **one** from: • even absorbing a small amount of energy may be harmful • no proof that small amounts of energy are not harmful	 accept microwaves for energy accept emits energy absorbed by head / other parts of body accept because the SAR value is not 0 (W/kg)	1
7(d)	any **one** from: • to get an independent opinion • company scientists may be biased	 accept company scientists may manipulate results	1
Total			**8**