



General Certificate of Secondary Education

Science B 4462/ Physics 4451

PHY1H Unit Physics 1

Mark Scheme

2009 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.

Further copies of this Mark Scheme are available to download from the AQA Website: www.aqa.org.uk

Copyright © **2009**. AQA and its licensors. All rights reserved.

COPYRIGHT

AQA retains the copyright on all its publications. However, registered centres for AQA are permitted to copy material from this booklet for their own internal use, with the following important exception: AQA cannot give permission to centres to photocopy any material that is acknowledged to a third party even for internal use within the centre.

Set and published by the Assessment and Qualifications Alliance.

PHY1H

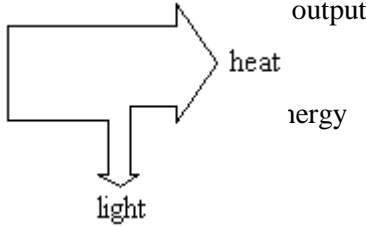
Question 1

question	answers	extra information	mark															
<p>1(a)(i)</p>	<p>silvered surfaces</p>	<p>more than the correct number of ticks in a row negates the mark</p>	<p>1</p>															
	<p>radiation</p>		<p>1</p>															
	<p>plastic cap</p>																	
	<p>conduction</p>	<p>} both required</p>																
	<p>convection</p>																	
<table border="1" data-bbox="331 824 1070 1077"> <thead> <tr> <th></th> <th>conduction</th> <th>convection</th> <th>radiation</th> </tr> </thead> <tbody> <tr> <td>vacuum</td> <td style="background-color: #cccccc;">✓</td> <td style="background-color: #cccccc;">✓</td> <td></td> </tr> <tr> <td>silvered surfaces</td> <td></td> <td></td> <td>✓</td> </tr> <tr> <td>plastic cap</td> <td>✓</td> <td>✓</td> <td></td> </tr> </tbody> </table>		conduction	convection	radiation	vacuum	✓	✓		silvered surfaces			✓	plastic cap	✓	✓			<p>(1)</p> <p>(1)</p>
	conduction	convection	radiation															
vacuum	✓	✓																
silvered surfaces			✓															
plastic cap	✓	✓																
<p>1(a)(ii)</p>	<p>because there are no particles in a vacuum</p>	<p>any mention of air or any other substance in a vacuum scores zero</p> <p>accept atoms / molecules for particles</p> <p>accept vacuum is empty space</p> <p>accept there is nothing in a vacuum</p> <p>accept there is no air / gas in the vacuum</p>	<p>1</p>															
	<p>conduction and convection need particles / medium</p>	<p>need reference to both conduction and convection</p> <p>accept correct descriptions</p>	<p>1</p>															

Question 1 continues on the next page

PHY1H

Question 1 continued

question	answers	extra information	mark
1(b)(i)	less heat lost (to air above the heater) light shiny surfaces are poor emitters (of radiation) or dull, matt surfaces are good emitters (of radiation)	do not accept no heat lost accept radiators for emitters references to reflection are neutral do not credit answers which infer reflection from the underside of the hood ignore correct reference to absorption	1 1
1(b)(ii)	correct arrow n arrows form eg 	flow charts score zero ignore input	1 1
1(b)(iii)	energy cannot be destroyed	accept (principle of) conservation of energy do not accept because energy cannot be lost without clarification	1
Total			9

PHY1H**Question 2**

question	answers	extra information	mark
2(a)	9	allow 1 mark for correct substitution (1.8×5) an answer of 9000 gains 1 mark an answer of 2 or 15 gains 1 mark	2
2(b)	(3kW) fan heater	accept 3kW accept the middle one	1

Question 2 continues on the next page

PHY1H

Question 2 continued

2(c)	<p><u>oil-filled</u></p> <p>low level heat</p> <p>cannot be knocked over / space saving / no trailing wires</p> <p>or</p> <p>more control over heat output</p> <p><u>fan</u></p> <p>warms (office) rapidly</p> <p>or</p> <p>can be used to cool air (in summer)</p> <p><u>ceramic</u></p> <p>can be switched on for set periods of time</p> <p>or</p> <p>can be switched on before office is used / switched off automatically at night</p>	<p>features common to more than one heater, treat as neutral</p> <p>do not accept just wall-mounted</p> <p>do not accept just 3 heat settings</p> <p>accept can be used as a fan</p> <p>accept cool air fan (setting)</p> <p>accept 'it has a cool air setting in case it gets too hot'</p> <p>do not accept a specific reference to cooling the heater</p> <p>do not accept just has a timer</p>	<p>1</p> <p>1</p> <p>1</p>
Total			6

PHY1H

Question 3

question	answers	extra information	Mark
3(a)	1/25 or 1:25 or 0.04	accept 4 % or $\frac{15}{375}$ or $\frac{3}{75}$ or 1 in 25 for both marks allow 1 mark for total of 375 allow 1 mark for a clearly correct method using a clearly incorrect total do not accept 1:26	2
3(b)(i)	B (only) burning fossil fuels produces carbon dioxide / carbon (emissions) or nuclear fuels don't produce carbon dioxide	do not credit reason if B is not chosen insufficient – smallest amount of fossil fuels accept less carbon dioxide	1 1
3(b)(ii)	accept anything reasonable eg increased level of insulation use energy efficient light bulbs do not leave appliances on standby switch thermostats down (1 °C) generate own electricity install solar panels	accept insulate accept specific examples eg loft	1

Question 3 continues on the next page

PHY1H

Question 3 continued

question	answers	extra information	Mark
3(c)(i)	any three from: <ul style="list-style-type: none"> • no power output until wind speed exceeds 4 m/s • output rises rapidly after 4 m/s • output begins to level out / rises less rapidly at / after 13 m/s • output peaks at 21 / 22 m/s • output constant between 21 / 22 and 25 / 26 m/s • output falls (rapidly) after 25 / 26 m/s 	accept for 1 mark goes up then comes down	3
3(c)(ii)	any one from: <ul style="list-style-type: none"> • unreliable energy source • dilute energy source • take up too much land 	accept wind does not always blow accept need thousands / lots of turbines ignore reference to visual / noise pollution ignore reference to kill birds	1
Total			9

PHY1H

Question 4

question	answers	extra information	mark
4(a)(i)	(atoms / elements with) the same number of protons but different numbers of neutrons	accept (atoms / elements with) different mass number but same atomic number	1
4(a)(ii)	substances that give out radiation	accept alpha, beta or gamma for radiation accept an unstable nucleus that decays radioactive decay takes place is insufficient	1
4(b)	85 years	± 2 years allow 1 mark for showing correct method on the graph	2
4(c)(i)	a helium nucleus	accept 2 neutrons and 2 protons accept ${}^4_2\text{He}$ do not accept helium atom	1
4(c)(ii)	the rate of decay (of plutonium) decreases	accept fewer (plutonium) nuclei (to decay) accept radioactivity decreases	1
	less heat produced	do not accept energy for heat	1

Question 4 continues on the next page

PHY1H**Question 4 continued**

question	answers	extra information	mark
4(d)(i)	(outside the body) alpha (particles) cannot penetrate into the body		1
	(inside the body) (heat produced from decay) damages / kills cells / tissues	accept causes cancer for damages / kills cells / tissues accept highly toxic	1
4(d)(ii)	any one from: <ul style="list-style-type: none"> • worried same could happen again • an accident may cause radiation to be spread around the Earth / atmosphere • idea of soil contamination resulting from accident / release of radioactive material • idea of negative effect on health resulting from accident / release of radioactive material 	accept any sensible suggestion	1
Total			10

PHY1H**Question 5**

question	answers	extra information	mark
5(a)(i)	radio(waves)		1
5(a)(ii)	energy	correct answer only	1
5(b)(i)	0.0125 (m)	allow 1 mark for correct transformation <u>and</u> substitution	2
5(b)(ii)	make it hot(ter)	do not accept cook it accept (air) particles inside ball will move faster accept water in the ball gets hotter	1
5(b)(iii)	wavelength decreases frequency increases	ignore reference to speed	1 1
5(c)(i)	both variables are continuous	accept the data is continuous	1

Question 5 continues on the next page

