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ASSESSMENT and QUALIFICATIONS ALLIANCE

General Certificate of Secondary Education

Science B 4462/ Physics 4451

PHY1F 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.

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Question 1

question	answers	extra information	mark
1(a)(i)	X-rays infra red (rays) radio (waves)	all three in correct order allow **1** mark for **1** correct	2
1(a)(ii)	to kill cancer cells		1
1(a)(iii)	energy		1
Total			**4**

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Question 2

question	answers	extra information	mark
2(a)(i)	shorter than		1
2(a)(ii)	increase slightly		1
2(b)(i)	go up in the same ratio **or** (directly) proportional **or** as speed (of the tennis ball) increases so does the (difference in) frequency	accept as one goes up, so does the other accept positive correlation	1
2(b)(ii)	20 (m/s)	allow **1** mark for showing correct method on graph (ie horizontal or vertical line anywhere on graph) if indicated by a cross, must be ± half square of correct value)	2
2(b)(iii)	frequency and speed are both continuous variables		1
Total			**6**

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Question 3

question	answers	extra information	mark
3(a)	light electrical	correct order only	1 1
3(b)(i)	0.2 **or** 1/5	accept 20% for both marks allow **1** mark for correct substitution answer of 0.2% **or** 20 gains **1** mark ignore units	2
3(b)(ii)	wasted	accept transformed to heat / other forms accept transferred to the air / surroundings sound = neutral	1
3(c)(i)	any **one** from: • can fly at night • can stay in the air for longer • can fly in the winter • can fly faster	 accept can fly when it is cloudy accept as a back-up increases power is neutral	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: • 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
3(c)(iii)	accept any sensible suggestion eg, map the Earth's surface / weather forecasting / spying / monitoring changes to the Earth's atmosphere, etc	do **not** accept ideas in terms of transporting accept use as a satellite	1
Total			**8**

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Question 4

question	answers	extra information	mark
4(a)	**C**		1
4(b)	beta	accept gamma if answer alpha can still gain marks for saying why not beta or gamma	1
	any **two** from: • range in air for beta is (at least) 50 cm • count-rate does not drop (much) in first 40 cm • count-rate does not fall much until distance is 60 cm • alphas cannot travel more than 5 cm in air / alphas could not travel 100 cm in air • alphas would not be detected • gammas not absorbed by 100 cm of air	must have at least one quantitative statement to get **2** marks accept alphas cannot travel that far accept gammas not stopped by air accept gammas travel further than alphas and betas strength of source is neutral references to penetrating power is neutral	2
4(c)(i)	increases		1

Question 4 continues on the next page

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Question 4 continued

question	answers	extra information	mark
4(c)(ii)	Group **A** think that (even a very small level of exposure) gives some risk Group **B** think that there is no risk (from a very low level of exposure)	accept there is always a risk, no matter how small the level of exposure accept below a certain level of exposure there is no risk no marks for a simple graph description	1 1
Total			**7**

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Question 5

question	answers	extra information	mark
5(a)(i)	any **one** from: • waves • tides • falling water • biofuel / biomass • solar • geothermal	 do **not** accept water accept hydroelectric accept sun / sunlight do **not** accept light accept solar cells / panels do **not** accept heat	1
5(a)(ii)	decrease		1
5(b)(i)	 increases from 4 am (to 8 am) remains constant from 8 am (to 10 am)	accept increases from 30 000 accept stays constant from 40 000 allow **1** mark for goes up then stays the same for full credit must be some indication of time or power	 1 1
5(b)(ii)	natural gas		1
Total			**5**

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Question 6

<table>
<tr><th>question</th><th>answers</th><th>extra information</th><th>mark</th></tr>
<tr><td>6(a)(i)</td><td>silvered surfaces

radiation

plastic cap

conduction

convection } both required

<table>
<tr><th></th><th>conduction</th><th>convection</th><th>radiation</th></tr>
<tr><td>vacuum</td><td>✓</td><td>✓</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>
</table></td><td>more than the correct number of ticks in a row negates the mark</td><td>1

1

(1)

(1)</td></tr>
<tr><td>6(a)(ii)</td><td>

because there are no particles in a vacuum

conduction and convection need particles / medium</td><td>any mention of air or any other substance in a vacuum scores zero

accept atoms / molecules for particles
accept vacuum is empty space
accept there is nothing in a vacuum
accept there is no air / gas in the vacuum

need reference to both conduction and convection
accept correct descriptions</td><td>1

1</td></tr>
</table>

Question 6 continues on the next page

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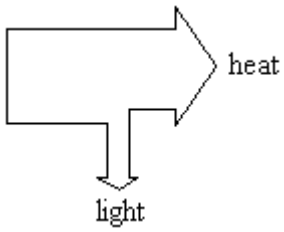
Question 6 continued

question	answers	extra information	mark
6(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
6(b)(ii)	correct diagram drawn with one output arrow narrower than the other arrows correctly labelled with energy form eg  	flow charts score zero ignore input	1 1
6(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**

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Question 7

question	answers	extra information	mark
7(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
7(b)	(3 kW) fan heater	accept 3 kW accept the middle one	1

Question 7 continues on the next page

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Question 7 continued

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

Total			**6**