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ASSESSMENT and QUALIFICATIONS ALLIANCE

General Certificate of Secondary Education

Additional Science 4463 / Physics 4451

PHY2H Unit Physics 2

Standardisation

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.

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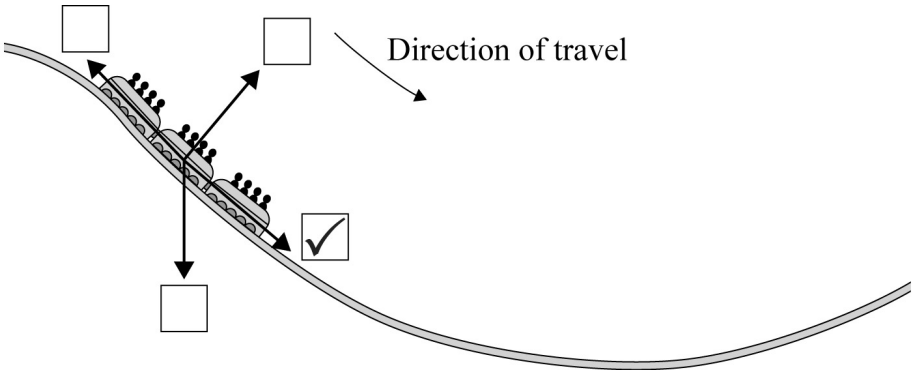
PHY2H

Question 1

question	answers	extra information	mark
1(a)	correct box ticked  		1
1(b)	each passenger has a different mass	accept weight for mass ignore other irrelevant factors about the person e.g. mass and height do **not** accept a list with incorrect factors e.g. mass and position accept passengers started with different (gravitational) potential energy	1
1(c)(i)	30	ignore added units	1
1(c)(ii)	2400	accept their (c)(i) × 80 correctly calculated for both marks allow **1** mark for correct substitution of their (c)(i) and 80 an answer of 800 gains **1** mark only if answer to (c)(i) is not 10	2
Total			**5**

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Question 2

question	answers	extra information	mark
2(a)(i)	4.5	allow **1** mark for correct substitution i.e. 9 ÷ 2	2
2(a)(ii)	m/s^2	accept answer given in (a)(i) if not contradicted here	1
2(a)(iii)	speed		1
2(a)(iv)	straight line from the origin passing through (2s, 9 m/s)	allow **1** mark for straight line from the origin passing through to t = 2 seconds allow **1** mark for an attempt to draw a straight line from the origin passing through (2,9) allow **1** mark for a minimum of 3 points plotted with no line provided if joined up would give correct answer. Points must include(0,0) and (2,9)	2
2(b)(i)	**B** smallest (impact) force on all/ every/ any surfaces	if **A** or **C** given scores **0** marks in total these marks are awarded for comparative answers	1 1 1

Question 2 continues on the next page

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Question 2 continued

2(b)(ii)	(conditions) can be repeated **or** difficult to measure forces with human athletes	 accept answers in terms of variations in human athletes e.g. athletes may have different weights area / size of feet may be different difficult to measure forces athletes run at different speeds accept any answer that states or implies that with humans the conditions needed to repeat tests may not be constant e.g. athletes unable to maintain constant speed during tests (or during repeat tests) do **not** accept the robots are more accurate human error is insufficient fair test is insufficient	1
Total			**10**

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Question 3

question	answers	extra information	mark
3(a)(i)	30	allow **1** mark for showing correct method i.e. 5 × 6 **or** 12 ÷ 0.4	2
3(a)(ii)	connected in <u>series</u>	insufficient they are not connected in parallel	1
3(a)(iii)	0.4		1
3(a)(iv)	equally/ evenly	the same is insufficient allow credit for candidates that correctly mention pd across the connecting wires accept (nearly) 2 V (each)	1
3(b)	48 coulombs	do **not** accept e.c.f. if (a) (iii) = 12 or 5 accept their (a) (iii) × 120 correctly calculated for both marks allow **1** mark for correct substitution and conversion of time to seconds i.e. charge = 0.4 × 120 an answer 0.8 scores **1** mark allow **1** mark for their (a) (iii) x 2 correctly calculated accept C do **not** accept c do **not** accept amp seconds	2 1
Total			**8**

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Question 4

question	answers	extra information	mark
4(a)	soot /ash/ waste gases pass (negatively) charged grid		1
	soot/ash given a negative charge	accept picks up electrons	1
	soot/ash repelled from (negative) grid **or** soot/ash attracted to (positively charged) metal plates		1
4(b)	charge must increase / build up	accept electrons for charge any reference to positive electrons negates this mark	1
	(producing) a large enough potential difference between dome and (earthed) conductor	accept voltage for pd any reference to positive earth negates this mark	1
Total			**5**

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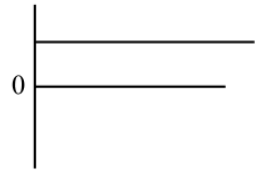
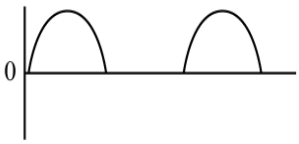
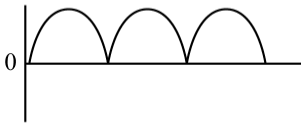
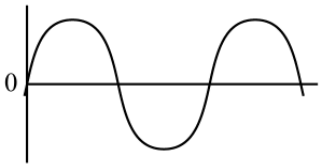
Question 5

question	answers	extra information	mark
5(a)	d.c. flows in (only) one direction		1
	a.c. changes direction (twice every cycle)	accept a.c. constantly changing direction ignore references to frequency accept answers presented as a clear diagram e.g. dc:    ac:  	1

Question 5 continues on the next page

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Question 5 continued

5(b)(i)	10	allow **1** mark for correct transformation and substitution i.e. $\frac{2.3}{230}$ or $\frac{2300}{230}$ an answer 0.01 gains **1** mark	2
5(b)(ii)	13 A	e.c.f. accept the fuse size that is the next listed value greater than answer (b)(i)	1
Total			**5**

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Question 6

question	answers	extra information	mark
6(a)	146		1
6(b)	atomic number		1
6(c)(i)	alpha		1
6(c)(ii)	number of protons changes	accept atomic number changes accept <u>loses or gains</u> protons do **not** accept protons with any other particle e.g. number of protons and neutrons changes incorrect do **not** accept any reference to mass number	1
Total			**4**

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Question 7

question	answers	extra information	mark
7(a)	any **two** pairs from:	to gain credit it must be clear which model is being described do **not** accept simple descriptions on the diagram without comparison	4
	• nuclear model mass is concentrated at the centre / nucleus	accept the nuclear model has a nucleus/ the plum pudding model does not have a nucleus for 1 mark	(1)
	plum pudding model mass is evenly distributed		(1)
	• nuclear model positive charge occupies only a small part of the atom		(1)
	plum pudding model positive charge spread throughout the atom		(1)
	• nuclear model electrons orbit some distance from the centre / nucleus	accept electrons in shells/ orbits provided a valid comparison is made with the plum pudding model do **not** accept on its own	(1)
	plum pudding electrons embedded in the (mass) of positive (charge)	do **not** accept electrons at edge of plum pudding	(1)
	• nuclear model the atom mainly empty space		(1)
	plum pudding model is a 'solid' mass		(1)
7(b)	nucleus must be <u>positive</u> to deflect/ repel alpha particles	answers in terms of electrons/negative charge causing deflection negates mark answers in terms of reflection negates mark	1 1
	nucleus (very) small so few alpha particles deflected backwards	accept most of atom empty space so <u>most</u> pass through	

Question 7 continues on the next page

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Question 7 continued

question	answers	extra information	mark
7(c)	many/ 100 000 measurements taken	accept results for measurements accept data valid / reliable	1
	findings could not be explained by plum pudding model	accept a specific finding that could not be explained eg some alpha particles were deflected backwards	1
Total			**8**