



**General Certificate of Education
June 2010**

Physics B: Physics in Context PHYB2

Physics Keeps Us Going

Unit 2

Final

Mark Scheme

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 © 2010 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.

NOTES

Letters are used to distinguish between different types of marks in the scheme.

M indicates OBLIGATORY METHOD MARK

This is usually awarded for the physical principles involved, or for a particular point in the argument or definition. It is followed by one or more accuracy marks which cannot be scored unless the M mark has already been scored.

C indicates COMPENSATION METHOD MARK

This is awarded for the correct method or physical principle. In this case the method can be seen or implied by a correct answer or other correct subsequent steps. In this way an answer might score full marks even if some working has been omitted.

A indicates ACCURACY MARK

These marks are awarded for correct calculation or further detail. They follow an M mark or a C mark.

B indicates INDEPENDENT MARK

This is a mark which is independent of M and C marks.

ecf is used to indicate that marks can be awarded if an error has been carried forward (ecf must be written on the script). This is also referred to as a 'transferred error' or 'consequential marking'.

Where a correct answer only (**cao**) is required, this means that the answer must be as in the Marking Scheme, including significant figures and units.

cnao is used to indicate that the answer must be numerically correct but the unit is only penalised if it is the first error or omission in the section (see below).

Marks should be awarded for **correct** alternative approaches to numerical question that are not covered by the marking scheme. A correct answer from working that contains a physics error (PE) should not be given credit. Examiners should contact the Team Leader or Principal Examiner for confirmation of the validity of the method, if in doubt.

GCE Physics, Specification B: Physics in Context, PHYB2, Physics Keeps Us Going

Question 1			
	resolving one force correctly – 410 sin (65) seen	C1	3
	doubling the force (eg 743.1 or 346.5 seen)	C1	
	2 sf answer (740 (N) or 370 (N))	A1	
		Total	3

Question 2			
(a)	light output of CFL = 3.0 W seen or implied in working efficiency of CFL (= 3/18) = 0.167 or 16.7%; 0.17 or 17%	C1 A1	2
(b)	shows appreciation of what efficiency means TFL operates at much higher temperature (than CFL) greater energy losses	B1 B1	
		Total	4

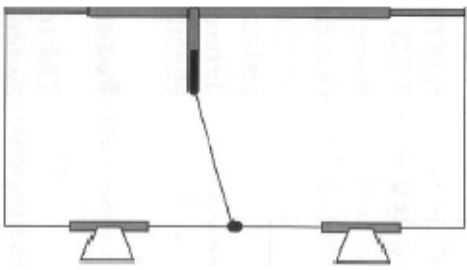
Question 3			
(a)	visible	B1	1
(b)	read-off peak 480 – 520 nm	B1	
	$500 (\times 10^{-9}) \times T = 0.0029$ seen $T = 5800$ (K) allow 5686 – 5920	B1 B1	
		Total	4

Question 4			
(a)	conversion to seconds seen (60×40) or velocity = $300/40$ seen or energy gain in 40 mins = $750 \times 300 = 2.25 \times 10^5$ (J) use of $p = Fv$ power = $750 \times (300)/(2400)$ or $750 \times$ their velocity (eg seen $750 \times 300/40$) 94 (93.8) (W) cnao	C1 C1 A1	3
(b)	$k = \frac{750}{15 \times 10^{-3}}$ (allow use of m or mm) use of $k = F/\Delta L$ 5.0×10^4 N m^{-1} (allow if calculation not attempted or incomplete)	C1 A1 A1	
		Total	6

Question 5			
	use of area \times temperature difference \times U-value (calculates either 95.04 W or 23.76 correctly)	C1	3
	$(2.2 \times 1.2) \times 15 \times (2.4 - 0.6)$ or two separate sums and attempt at subtraction	C1	
	71 (71.3)(W) or (J s^{-1}) cnao	A1	
		Total	3

Question 6			
(a) (i)	$\frac{1}{2} v^2 = gh$ seen (condone mass included on <i>both</i> sides of equation) $8.4^2/2g$ 3.6 or 3.60 (m) allow 3.5 (from rounding off ke early)	C1 C1 A1	3
(a) (ii)	height of centre of mass 0.9 m seen 4.5 (m) ecf answer (a)(i) + 0.9	C1 A1	
(b) (i)	any three from energy dissipated/work done overcoming air resistance during upward movement energy lost in the pole PE given to pole itself (as it rises) kinetic energy required to move forward over bar	B1 B1 B1 B1	3
(b) (ii)	technique exert downwards force on pole during upward movement or reference to use of own stored energy effect of technique to provide (extra) upward acceleration/momentum/ke/energy arches body (owtte) to have centre of body mass below bar	B1 B1 B1	
		Total	11

Question 7			
(a)	any three from voltmeter resistance is high current in circuit is 0 or low no (low) energy lost in voltmeter no lost volts/volts lost overcoming internal resistance 'load'/voltmeter resistance \gg internal resistance voltage across voltmeter \gg voltage across int. resistance	B1 B1 B1 B1 B1	3
(b) (i)	current = $14.5/470$ 0.031 or 0.0309 (A) amps penalise 1 sf	C1 A1	2
(b) (ii)	'lost' pd in cell = 0.5 V internal resistance = $0.5 \times 470/14.5$ or $(0.5/0.031)$ etc) 16 (Ω) (16.2) (16.7) or 13.9(14) using 0.031 A to calculate total circuit resistance 15.4(15) using 0.0309 A 30 using 0.3	C1 C1 A1	3
		Total	8

Question 8			
(a)	potential divider or potentiometer	B1	1
(b)	minimum 4 (V) variable R 8Ω max I 12 V variable R $0 (\Omega)$	B1 B1 B1 B1	4
(c) (i)		B1	1
(c) (ii)	full amplitude/voltage/volume range in each speaker/ only limited range in Figure 6 Figure 6 circuit would have different ranges in each speaker allow arguments related to relative values of resistors and speakers	B1 B1	2
		Total	8

Question 9			
(a)	peak = 107/108 mW and load resistance = 290–310 Ω use of $I = (\text{power/resistance})^{1/2}$ with candidate values 0.0186 – 0.0193 (A) (0.0190 or 0.019 (A) if 108 mW and 300 Ω used)	C1 C1 A1	3
(b)	area of cell = $3.6 \times 10^{-3} \text{ m}^2$ or 0.06×0.06 seen solar power arriving = $730 \times (\text{an area}) \text{ W}$ 0.108/2.63) seen or $0.108/(730 \times 0.06 \times 0.06)$ 0.041 cnao lose if ratio given a unit	C1 C1 C1 A1	4
(c)	max two from absorption in atmosphere sunlight strikes cell obliquely cloudy/night time/times when no sun/cell in shadow due to...	B1 B1 B1	2
		Total	9

Question 10			
(a) (i)	$(F =) 1200g \sin(9^\circ)$ 1839.7 – 1841.5 (allow 1840)	B1 B1	2
(a) (ii)	1840 (N) (ecf) up the slope ecf from (a) (i)	B1 B1	2
(b)	$a = F/m$ or a recognisable force/1200 seen acceleration = 1.53 m s^{-2} or their (a) (ii)/1200 time = $18/1.53$ or $18/\text{their acceleration}$ or $t = 18/a$ 12/11.7 (s) cnao	C1 C1 C1 A1	4

	<p>A typical answer would include</p> <ul style="list-style-type: none"> • risk is due to force on the passenger during deceleration • force = $\Delta(mv)/\Delta t$ • momentum change is mass of person x velocity (constant) • force reduced by increasing Δt • time reduced by: • mention of seat belts/air bags • mention of structural features of car or barrier eg bumper/ engine • cage sliding under car/crash barrier design etc • mention of external softer part/avoidance of sharp metal structure/soft facia • crash barriers deform on impact 		
		Total	14