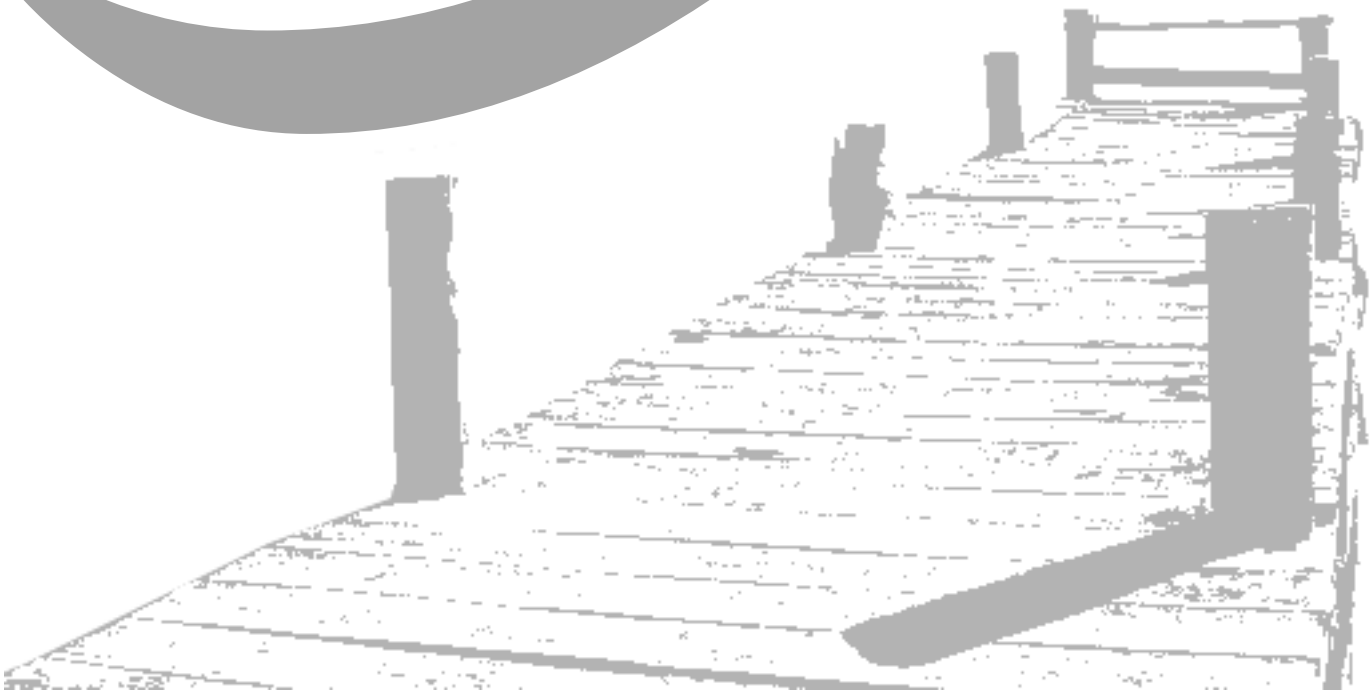
GCE
AS and A Level

Physics B: Physics In Context

AS exams 2009 onwards
A2 exams 2010 onwards

Unit 2:
Approved specimen mark scheme

Version 1.1



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ASSESSMENT and QUALIFICATIONS ALLIANCE

General Certificate of Education

Physics 1456

Specification B: Physics In Context

PHYB2 Physics Keeps Us Going

Mark Scheme

Specimen Draft

The specimen assessment materials are provided to give centres a reasonable idea of the general shape and character of theplanned question papers and mark schemes in advance of the first operational exams.

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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PHYB2: Physics Keeps us Going

Section A

Question 1			
	3600 000 J ✓	AO2	**1**
		Total	**1**

Question 2			
	D ✓	AO2	**1**
		Total	**1**

Question 3			
	only melting ice on land raises sea level ✓ a floating body displaces its own mass of water ✓	AO1 AO1	**2**
		Total	**2**

Question 4			
	use of $R = \frac{\rho l}{A}$ ✓ 227 ✓ Ω ✓	AO1 AO2 AO1	**3**
		Total	**3**

Question 5			
(a)	use of E = mgh ✓ 2680 J ✓	AO1 AO2	**2**
(b)	use of $v^2 = 2$ as ✓ 9.1 m s^{-1} ✓	AO1 AO2	**2**
(c)	increases the time taken for the athlete to come to rest/reduced deceleration force = mass × acceleration/mass × change in velocity/time ✓ or momentum argument or energy argument ✓	AO1 AO2	**2**
		Total	**6**

Question 6			
(a)	efficiency = $\frac{12}{63} \times 100$ ✓ 19% ✓	AO1 AO2	**2**
(b)	greater power output to wheels so wider here ✓ less thermal energy transfer to surrounding so narrower here ✓	AO1 AO2	**2**
		Total	**4**

Question 7			
(a)	energy transmitted per second = 1.2 × 0.75 × 12 ✓ energy transmitted per second = 11 W ✓	AO1 AO2	**2**
(b)	decrease as the trapped air is a bad conductor ✓	AO1	**1**
		Total	**3**
		Section A Total	**20**

Section B

Question 8				
(a)	(i)	velocity is constant ✓	AO1	**4**
		no acceleration ✓	AO1	
	(ii)	1.5 sin 50 = *D* cos 55 ✓	AO2	
		2.0 kN ✓	AO2	
(b)	(i)	1.15 kN ✓	AO2	**5**
	(ii)	total resistance to motion = 1200 + 1150 N ✓	AO2	
		use of power = Fv ✓	AO1	
		20 ✓	AO2	
		kW ✓	AO1	
(c)		boat now has resultant force of 1200 N acting on it ✓	AO2	**2**
		boat will accelerate (until resistance of water = 2350 N) ✓	AO2	
			Total	**11**

Question 9			
(a) (i)	use of appropriate data from graph ✓	AO3	4
	answer in acceptable range (to be decided) ✓	AO3	
(ii)	zero at 0, 0.2 0.58, 0.8 and 1 s (approx) ✓	AO3	
	reasonable attempt to show relative magnitudes ✓	AO3	
(b)	appreciation of area under the graph ✓	AO3	4
	appropriate counting of squares ✓	AO3	
	distance per square ✓	AO3	
	correct answer in acceptable range ✓	AO3	
		Total	**8**

Question 10			
(a)	so that each lamp is connected directly across the battery ✓	AO1	2
	if one lamp blows others are still on ✓	AO1	
(b)	use of *power* = *VI* ✓	AO1	3
	current through each headlight = 60/12 = 5.0 A		
	or current through each tail light = 8/12 = 0.67 A ✓	AO2	
	total current = 2 × 5.0 + 2 × 0.6667 = 11(.3) A ✓	AO2	
(c)	the lamp with the highest power rating has the least resistance ✓	AO1	3
	the resistance is greater because the temperature of the filament is lower ✓	AO1	
	and resistance increases with temperature ✓	AO1	
(d) (i)	(use of energy = power × time)		5
	energy dissipated = (8.5) × 2 × 12 × 3600 (any power × time) ✓	AO1	
	energy dissipated = 1.1(2) × 10^6 J ✓	AO2	
(ii)	stored energy in battery = 12 × 1.2 × 24 × 3600 = 1.24 × 10^6 ✓	AO1	
	energy to start = 12 × 100 × 1 = 1200 J ✓	AO2	
	energy left = (1.24 – 1.12) × 10^6 = 120 000 J **so** hence car will start ✓	AO2	
	(conclusion assuming all working correct)		
			13

Question 11			
(a)	knows P/d^3 should be constant ✓	AO3	**3**
	2 calculations correct ✓	AO3	
	at least three calculations correct ✓	AO3	
(b)	power output would increase for same wind speed ✓	AO3	**3**
	area swept out by turbine blades would be four times greater ✓	AO3	
	mass of air striking blades per second would be four times greater ✓	AO3	
		Total	**6**

Question 12			
(a)	use of power = V^2/R ✓	AO1	**2**
	300 Ω ✓	AO2	
(b) (i)	quotes potential divider formula or uses ratios ✓	AO1	**5**
	correct substitution ✓	AO2	
	329 (330) Ω ✓	AO2	
(ii)	power dissipated proportional to resistance or calculates powers ✓	AO2	
	52% ✓	AO2	
(c)	power increases so current increases ✓	AO2	**3**
	overheating/melting can occur (in wires or fuse) ✓	AO3	
	possible fire or fuse blows ✓	AO3	
(d)	current = 2.86 A ✓	AO2	**2**
	time for which it operates = 0.45 hs ✓	AO2	
		Total	**12**