

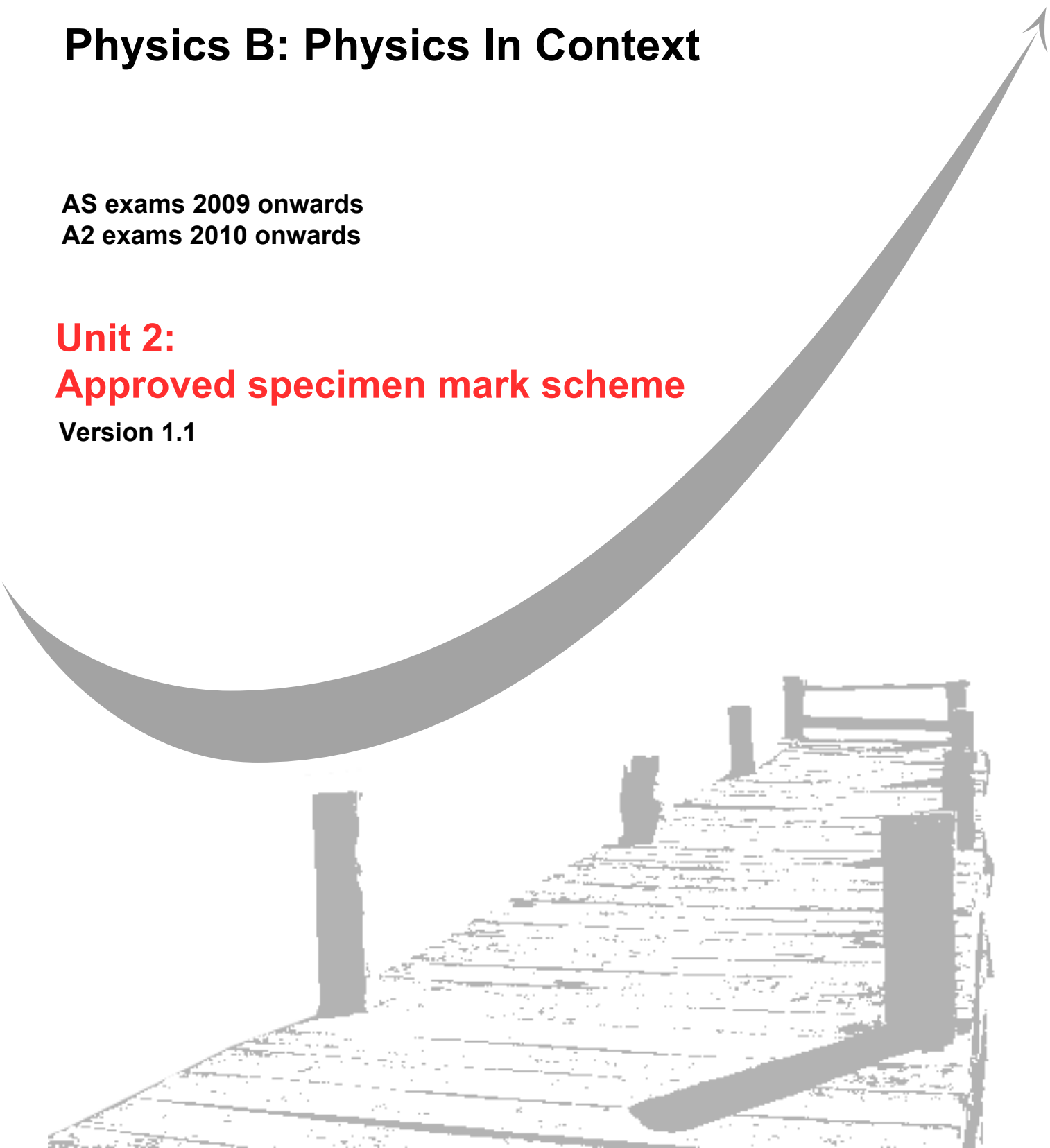
GCE
AS and A Level

Physics B: Physics In Context

AS exams 2009 onwards
A2 exams 2010 onwards

Unit 2: **Approved specimen mark scheme**

Version 1.1





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 the planned 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 ✓	AO1	2
	a floating body displaces its own mass of water ✓	AO1	
		Total	2

Question 4			
	use of $R = \frac{\rho l}{A}$ ✓	AO1	3
	227 ✓	AO2	
	Ω ✓	AO1	
		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	
(c)	increases the time taken for the athlete to come to rest/reduced deceleration force = mass $\times$ acceleration/mass $\times$ change in velocity/time ✓ or momentum argument or energy argument ✓	AO1 AO2	2
		Total	6

Question 6			
(a)	$\text{efficiency} = \frac{12}{63} \times 100 \checkmark$ 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 = $1.2 \times 0.75 \times 12 \checkmark$ 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 ✓ no acceleration ✓	AO1 AO1	4
(ii)	$1.5 \sin 50 = D \cos 55 \checkmark$ 2.0 kN ✓	AO2 AO2	
(b) (i)	1.15 kN ✓	AO2	5
(ii)	total resistance to motion = 1200 + 1150 N ✓	AO2	
	use of power = $Fv \checkmark$	AO1	
	20 ✓ kW ✓	AO2 AO1	
(c)	boat now has resultant force of 1200 N acting on it ✓ boat will accelerate (until resistance of water = 2350 N) ✓	AO2 AO2	2
		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 ✓ if one lamp blows others are still on ✓	AO1 AO1	2
(b)	use of $power = VI$ ✓ current through each headlight = $60/12 = 5.0$ A or current through each tail light = $8/12 = 0.67$ A ✓ total current = $2 \times 5.0 + 2 \times 0.6667 = 11(.3)$ A ✓	AO1 AO2 AO2	3
(c)	the lamp with the highest power rating has the least resistance ✓ the resistance is greater because the temperature of the filament is lower ✓ and resistance increases with temperature ✓	AO1 AO1 AO1	3
(d)	(i) (use of energy = power $\times$ time) energy dissipated = $(8.5) \times 2 \times 12 \times 3600$ (any power $\times$ time) ✓ energy dissipated = $1.1(2) \times 10^6$ J ✓ (ii) stored energy in battery = $12 \times 1.2 \times 24 \times 3600 = 1.24 \times 10^6$ ✓ energy to start = $12 \times 100 \times 1 = 1200$ J ✓ energy left = $(1.24 - 1.12) \times 10^6 = 120\,000$ J so hence car will start ✓ (conclusion assuming all working correct)	AO1 AO2 AO1 AO2 AO2	5
			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	
		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