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ASSESSMENT and QUALIFICATIONS ALLIANCE

General Certificate of Education

Physics 6451
Specification A

PHAP Practical Examination

Mark Scheme

2006 examination – June 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.

PHAP: Practical Examination

Question 1	AO3a: planning	
	measurements (to determine the mass (weight) of the rolling magnet), use a balance ✓ (to determine d, the distance between the two magnets) use a ruler ✓ (to determine θ, the angle between the glass plate and the desk), use a protractor (trigonometric method based on d and one other linear measurement made with ruler) ✓	**3**
	strategy determine R using $W \sin \theta$ [or $mg \sin \theta$] ✓ adjust value of θ by moving wedge ✓ measure d values corresponding to various values of θ ✓ plot R against $\frac{1}{d^2}$ and check for straight line through origin ✓ [or plot log R against log d and check for gradient = −2]	**4**
	control use magnets of same strength ✓ ensure that magnets remain parallel, or centres aligned ✓ isolate area from influence of magnetic materials ✓	**max 1**
	difficulties (*difficulty + how overcome = 2*) any **two** of the following: reduce uncertainty in m (✓) by checking that balance has been tared before use (✓) reduce uncertainty in θ (✓) by using large protractor (✓) or ensure surface on which wedge and plate rest is horizontal (✓) or by using trigonometry, linear measurements clear (✓) reduce uncertainty in d (✓) by using strong magnets (to increase d) (✓), or any sensible measure to check whether friction at the surface has affected equilibrium position of rolling magnet (✓) by repeating the reading to check for an anomalous result or to enable an average to be calculated (✓) reduce uncertainty in either d or θ by repeating experiment with apparatus rotated through 180º, averages calculated or anomalies detected (✓) or use of travelling microscope (✓) or credible technique to eliminate parallax error in any linear measurement (✓) ✓✓✓✓	**4**
	Total	**8**

Question 2			
(a)	**AO3b: implementing**		
	accuracy d to 0.01 mm, from repeated readings, in range 0.42 to 0.48 mm	✓	
(b)	*tabulation* h/m nT/s T/s	✓	
	readings 5 sets including h range ≥ 0.60 m	✓	
	T from nT where n or $\Sigma n \geq 20$	✓	**8**
	significant figures all nT to 0.1 s, all t to 0.01 s	✓	
	consistent recording of h to either cm or mm		
(c)	*tabulation* log h log T	✓	
	sig. fig. all log T to 3 sig. fig.	✓	
	quality 4 of the 5 points to ±2 mm of straight line (providing suitably scaled graph drawn)	✓	
	AO3c: applying evidence and drawing conclusions processing		
(c)	*axes* marked log h/(no unit) and log T/(no unit) (½ mark deducted for each missing)	✓✓	
	scale suitable (e.g. 8 × 8) [5 × 5, 2 × 8, 8 × 2 ✓]	✓✓	**8**
	points 5 points plotted correctly with straight best-fit line drawn	✓	
	deductions		
(d)	G from suitable Δ (e.g. 8 × 8)	✓	
	G in range 1.85 to 2.15 or 1.9, 2.0 2.1 [1.70 to 2.30 or 1.8, 2.2 ✓]	✓✓	
	AO3d : evaluating evidence and procedures		
(e) (i)	(values of T) increased by (factor of) 4	✓✓	
(ii)	no change\(in G)	✓	
(f)	use of suitable (angular or rotary) scale (✓) record the amplitude from successive oscillations (✓) plot a graph of amplitude vs number of swings (**not time**) (✓) check for constant ratio quality [measure half life] (✓) any three	✓✓✓	**6**
	[alternative for 3rd and 4th marking points: evaluate $\frac{A_{n+1}}{A_n}$ ✓ check ratios are consistent ✓]		
	Total		**22**