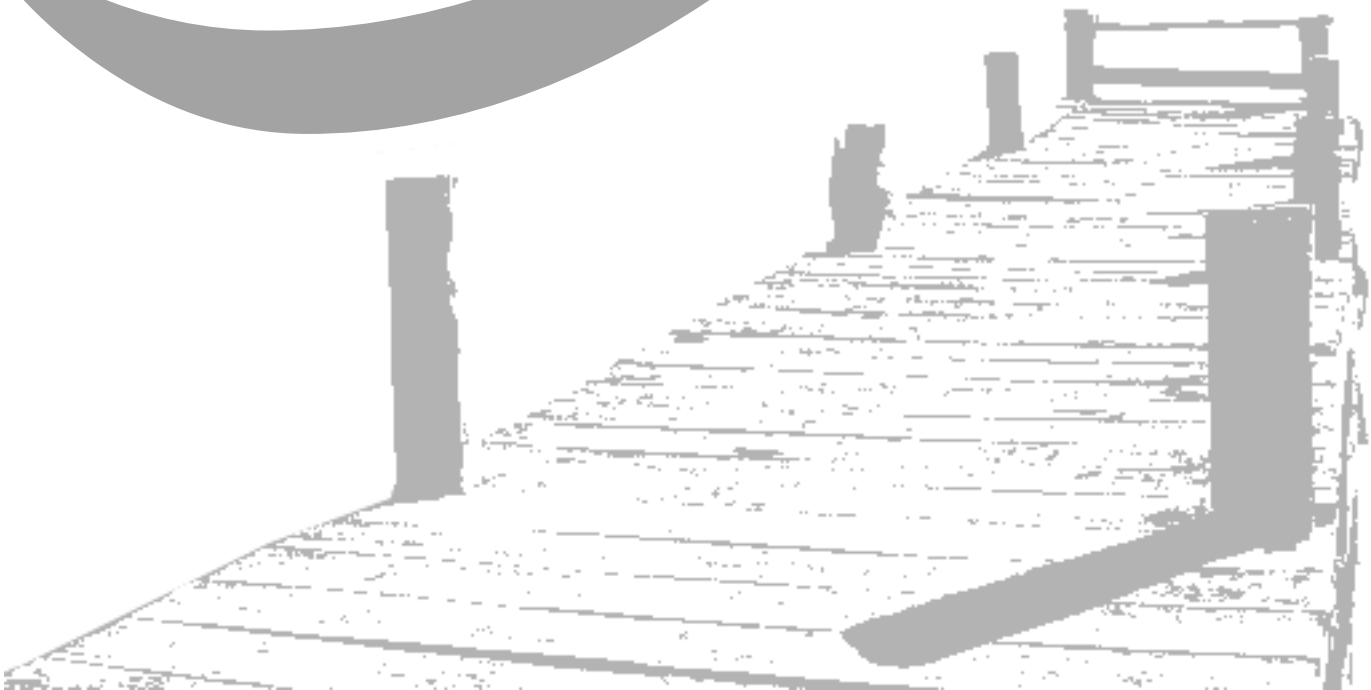
GCE
AS and A Level

Physics A

AS exams 2009 onwards
A2 exams 2010 onwards

Unit 6T: Approved specimen mark scheme

Version 1.0



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ASSESSMENT and QUALIFICATIONS ALLIANCE

General Certificate of Education

Physics 2451

Specification A

PHA6T Practical and Investigative Skills in A2 Physics

Mark Scheme

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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Dr Michael Cresswell Director General

PHA6T: Practical and Investigative Skills in A2 Physics

Stage 1		
	if **no help** was given in setting up the circuit and obtaining results ✓ for clear evidence of **repeat readings** being taken for at least one of the curves ✓ well presented table of results with at least 10 voltage readings for each curve ✓ *all* readings presented in the table (including repeats if taken), every column headed with correct quantity and unit, appropriate significant figures and decimal places throughout ✓ well presented graph showing both curves accurately plotted ✓ good attempt at drawing a best fit **curve** through each set of points ✓ sensible scales chosen making good use of the graph paper and both axes correctly labelled with quantity and unit ✓	**7**
	Total	**7**

Section A		
(1)	recognition that the independent variable is *time* ✓ statement to the effect that the range chosen went well past both peaks ✓	**2**
(2) (a)	both values read correctly and quoted in volts ✓	
(b)	plausible reasoning such as *the second discharge was faster so C2 gained charge more quickly* ✓	**2**
(3)	both times accurately found and quoted in seconds ✓	**1**
(4)	statement to the effect that the range was estimated from the spread of the peak ✓ correct calculation of a reasonable percentage uncertainty ✓ answer expressed in the form $\pm$ n% and 2 s.f. maximum ✓	**3**
(5)	difficulty reading the stopclock and the voltmeter at the same time ✓	**1**
(6)	a value quoted within the range 6..14 s ✓ statement to the effect that since T_m was less for 47 kΩ than for 100 kΩ T_m for 33 kΩ would be less again ✓	**2**
	Total	**11**

Section B			
(1)	(a)	$T_1 = 470 \times 103 \times 220 \times 10^{-6}$ **or** $T_2 = 100 \times 10^3 \times 100 \times 10^{-6}$ *seen* ✓ $T_1 = 103(.4)$ **and** $T_2 = 10$ *seen* ✓ $T_m = 25.9$ s ✓ ***only 2 or 3 s.f. given and correct unit quoted*** appropriate statement to the effect that *the calculated value is within/is not within the estimated uncertainty* ✓	**5**
	(b)	this product is called the **time constant** ✓	
(2)		repeat the experiment with **at least five** combinations of C2 and R2 ✓ covering a **wide range** C2R2 time constants ✓ **compare** the calculated values with the measured values to see if they agree **within experimental uncertainty** ✓	**3**
(3)	(a)	a **data logger** was probably used ✓ since the **time intervals are so short** ✓	**6**
	(b)	neat table produced as directed with logs correctly found ✓ graph well presented with both axes labelled with quantity and units ✓ axes correct way round and scales well chosen ✓ all points accurately plotted and good straight line drawn ✓	
(4)	(a)	triangle for gradient at least half the length of the drawn line ✓ coordinates accurately read from the line ✓ gradient quoted as -21 ± 2 (s^{-1}) ✓ $\tau = 0.48 \pm 0.02$ ✓ τ given to 2 or 3 significant figures only and unit (s) quoted ✓	**7**
	(b)	*y*-axis intercept read correctly ✓ $V_o = 6.0 \pm 0.2$ ✓ ***no s.f. or unit penalty here***	
(5)		both half-lives must be measured in years ✓ the rate of decay must be the same for both isotopes ✓	**2**
		Total	**23**