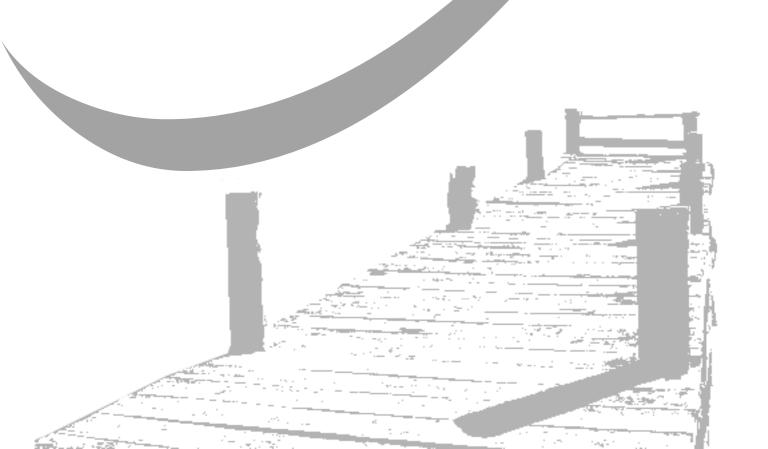# GCE
AS and A Level

Physics A

AS exams 2009 onwards
A2 exams 2010 onwards

Unit 3T: Approved specimen mark scheme

Version 1.2

AQA

ASSESSMENT and
QUALIFICATIONS
ALLIANCE

General Certificate of Education

Physics 1451
Specification A

PHA3T   Practical and Investigative Skills
in AS 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.

PHA3T: Practical and Investigative Skills in AS Physics

Stage 1		
	table, with column headings showing all recorded results ✓	10
	including negative voltage values in table ✓	
	all units correct in column headings ✓	
	significant figures correct in all readings (compatible with ammeter and voltmeter used) ✓	
	correct computation of resistance values for all readings ✓	
	suitable significant figures for resistance (compatible with I, V figs) ✓	
	suitably large graph scale (do not award if scale on axis could have been doubled) ✓	
	graph heading and correctly labelled axes with units ✓	
	all points accurately plotted ✓	
	approximately straight line or curve drawn ✓	
	Total	**10**

Section A		
(a)	voltage (assuming candidates set the voltages values and measured corresponding current) ✓	1
(b)	factors to consider: as wide a range voltages as available supply allows ✓ current values not too high to avoid overheating ✓	2
(c)	correctly stated sensitivity for **both** instruments ✓	1
(d)	% error = $\dfrac{\text{instrument precision}}{\text{largest voltage}} \times 100$ ✓	1
(e)	Positive voltage; very high resistance up first ✓ then lower resistance ✓ Negative/reverse; even higher voltages ✓	3
(f)	diode or resistor ✓ diode in **series** with a resistor ✓	2
	Total	**10**

Section B			
(1)	(a)	length of wire used ✓	
	(b)	all 3 correct average current values: 0.258, 0.279, 0.290 A ✓	
		all 3 correct resistance values: 23.3, 25.1, 27.6 ohms ✓	
	(c)	3 plotted points correct to nearest mm ✓	
		straight line drawn through first six points ✓	
		changing into smooth curve from approx 6 volts upwards ✓	
	(d)	triangle drawn (horizontal side covering at least 4 volts) ✓	**11**
		correct values read from graph ✓	
		correct answer gradient = 0.045 AV^{-1} ✓	
		(allow 0.044 or 0.046 or calc based on ecf from incorrectly read scale values(s), no unit penalty)	
	(e)	resistance = 1/0.045 ✓	
		$\qquad\qquad$ = 22.2 ohms (no mark if unit wrong) ✓	
(2)	(a)	spread of repeat readings suggests much greater error ✓	
	(b)	more realistic error is 0.005 A or 0.006 A ✓	
		(based on spread of repeat readings about mean value)	
	(c)	random errors ✓	**5**
	(d)	graph - all points on or close to line of best fit indicating reliability ✓	
		table - a comment on the spread of repeat readings indicating reliability ✓	
(3)	(a)	current and voltage are **directly proportional** ✓	**2**
	(b)	resistance **increases** at higher voltages ✓	
(4)		any sensible points from:	
		vary temperature ✓	
		measure corresponding resistance ✓	**max 3**
		repeat over wide range V, I values ✓	
		suggested method to vary temperature ✓	
		Total	**21**