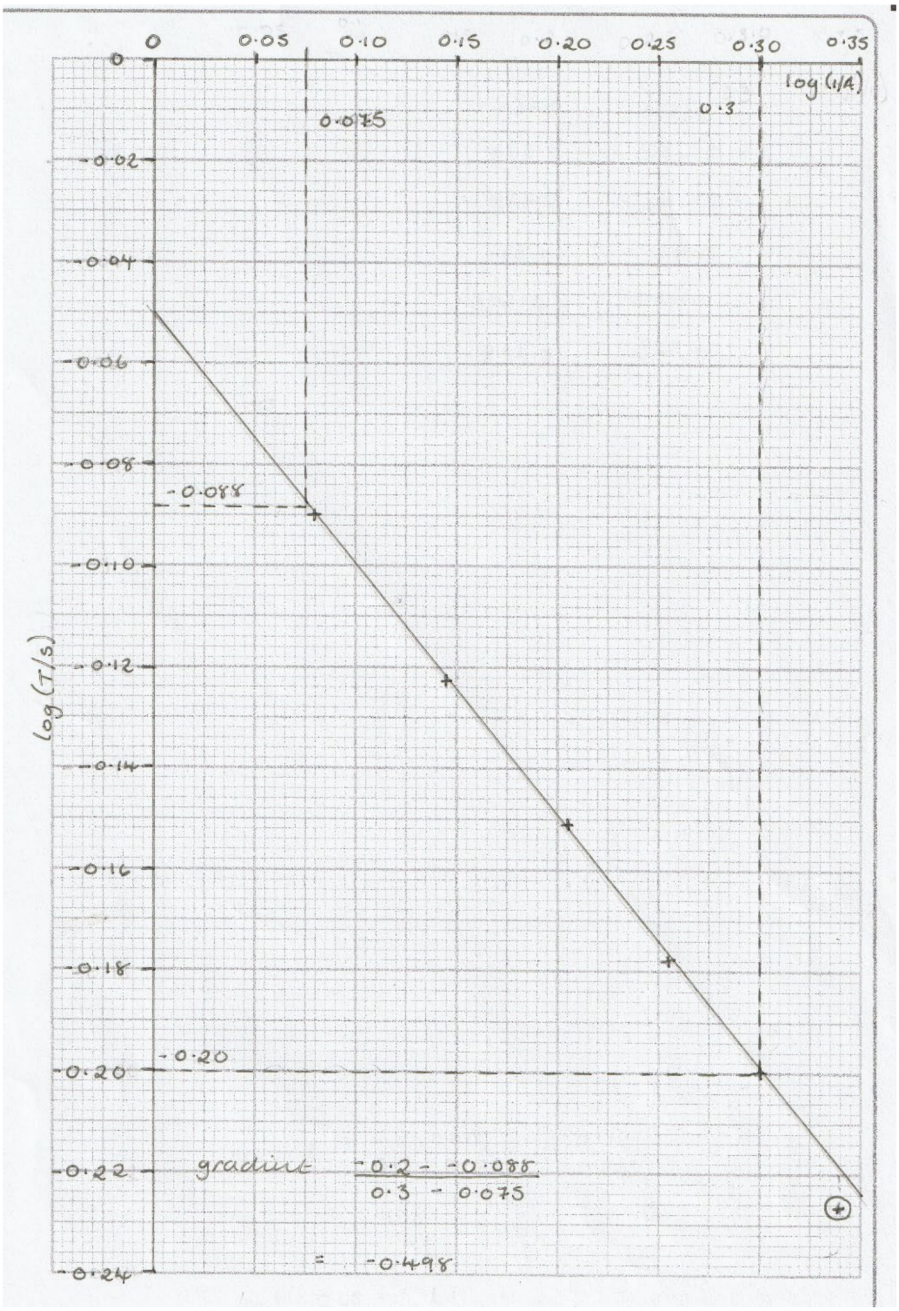
Question number	Answer		Mark
3(a)	Any **THREE** from Measure multiple oscillations and divide by the number of oscillations Repeat **and** calculate a mean Use a timing marker (at the centre of the oscillations) Start timing after several oscillations have completed	(1) (1) (1) (1)	**3**
3(b)(i)	Variable resistor	(1)	**1**
3(b)(ii)	log $T = n$ log I is in the form of $y = mx$ (+ c) (hence if the relationship is valid) it will be a straight line (through the origin) with a gradient of n	(1) (1)	**2**
3(c)(i)	log$I$ values correct with minimum 2 decimal places log$T$ values correct and minimum 2 decimal places Axes labelled: y as log(T / s) and x as log (I / A) Most appropriate scales for both axes Plots accurate to ± 1mm Best fit line with even spread of plots	(1) (1) (1) (1) (1) (1)	**6**
3(c)(ii)	Correct calculation of gradient using large triangle shown Value of n in range 0.49 to 0.53 Value of n given to 2 or 3 s.f., negative, no unit Example of calculation $n = \frac{-0.2--0.088}{0.3-0.075} = \frac{-0.112}{0.225} = -0.498$	(1) (1) (1)	**3**
3(c)(iii)	log $T = n$log$I$ + log$k$ is in the form of $y = mx + c$ The graph shows a (non-zero) y intercept Hence the value of k is not equal to 1 (so the prediction is correct) **Or** the value of c is not zero (so the prediction is correct)	(1) (1) (1) (1)	**4**
			Total mark for Question 3 = 19

I/A	*T*/s	log(*I*/A)	log(*T*/s)
1.20	0.813	0.079	-0.090
1.40	0.754	0.146	-0.123
1.60	0.706	0.204	-0.151
1.80	0.663	0.255	-0.178
2.00	0.631	0.301	-0.200
2.20	0.593	0.342	-0.227



I/A	T/s	ln(I/A)	ln(T/s)
1.20	0.813	0.182	-0.207
1.40	0.754	0.336	-0.282
1.60	0.706	0.470	-0.348
1.80	0.663	0.588	-0.411
2.00	0.631	0.693	-0.460
2.20	0.593	0.788	-0.523