Question Number	Answer	Mark
3 (a)	$\log Z = \log k + n \log f$ (1) Is in the form $y = c + mx$ with a constant gradient ($= n$) (1) **Or** $\log Z = n \log f + \log k$ (1) Is in the form $y = mx + c$ with a constant gradient ($= n$) (1) MP2 dependent on MP1	**2**
3 (b)(i)	Values of $\log Z$ correct to 2 d.p. [Accept ln values, 3 d.p.] (1) Values of $\log f$ correct to 2 d.p. [Accept ln values, 3 d.p.] (1) Axes labelled: y as $\log Z$ and x as $\log (f / 10^{15}\text{Hz})$ [Accept ln for ln values] (1) Appropriate scales chosen (1) log values plotted accurately (1) Best fit line drawn (1)	**6**
3 (b)(ii)	Gradient calculation using correct data and large triangle shown (1) Value of n in range 0.45 to 0.49, (1) to 2 or 3 s.f, no unit (1) <u>Example of calculation</u> $n = (1.92 - 0.5) / (2.25 - -0.75) = 1.42 / 3 = 0.47$	**3**
3 (b)(iii)	Correct value of y intercept shown (1) Value of k in range 6.9 to 7.3 [e.c.f. for value of n in (b)(ii)] (1) Value given to 2 or 3 s.f., (1) <u>Example of calculation</u> Log $k = 0.86$ $k = 10^{0.86} = 7.24$	**3**
3 (c)	**Either** States mathematical relationship using calculated values of n (and k) (1) Conclusion based on comparison with $Z \propto f^{0.5}$ (1) **Or** A graph of $\log Z$ against $\log f$ would be a straight line with a gradient of 0.5 (1) Conclusion based on comparison with calculated n (1)	**2**
	Total for question 3	**16**