5 (i) $\log_{[0]} n = \log_{[0]} a + kt \log_{[0]} 2$ This is of form $y = mx + c$ [with $\log_{[0]} n$ as y and t as x] 5 (ii) Reasonable line of best fit drawn (by eye) Suitable method leading to a value eg use of intercept leading to $0.9 < log a < 1.2$ So $7.4 < a < 15.85$ Suitable method leading to k value eg $k \log_{[0]} 2 = \text{gradient} \approx 0.33$ k in range $0 < k < 1.25$ and a in range $7.4 < a < 15.85$ A1 2.2a Finding gradient of line or sub'n of t and $\log n$ If gradient of exactly $1/3$ used $k = 1.10730936$ 5 (iii) $500000 = 10 \times 2^{1.1t}$ $1.1t \log 2 = \log 50000$ $t = 14.2$ $t = 14 \text{ is } 1/3/18$ M1 3.4 Correct substitution For $k = 1.10730936$ For $k = 1.10730936$ A1 1.1 Value of t (FT their a and k) For $k = 1.10730936$ For $k = 1.10730936$			g g				2
Solution	5	(i)	$\log_{[10]} n = \log_{[10]} a + kt \log_{[10]} 2$	M1	1.1a	\mathbf{AG} Allow $t \log 2^k$	
5(ii)Reasonable line of best fit drawn (by eye)B11.1aWith $0.9 < c < 1.2$ Suitable method leading to $0.9 < loga < 1.2$ So $7.4 < a < 15.85$ M12.2aMay use 2 points from line or condone use of 2 given pointsSuitable method leading to k value eg $k \log_{10} 2 = \text{gradient} \approx 0.33$ M11.1Finding gradient of line or sub'n of t and $\log n$ If gradient of exactly $1/3$ used $t = 1.10730936$ 5(iii) $500000 = 10 \times 2^{1.1t}$ $1.1t \log 2 = \log 50000$ $t = 14.2$ $t = 14 \text{ is } 1/3/18$ M13.4Correct substitutionA1 A2 A2 A3 A4 A4 A4 A4 A4 A4 A4 A				E 1	1.1		
Suitable method leading to a value eg use of intercept leading to $0.9 < log a < 1.2$ So $7.4 < a < 15.85$ Suitable method leading to k value eg $k \log_{10} 2 = \text{gradient} \approx 0.33$ k in range $0 < k < 1.25$ and a in range $7.4 < a < 15.85$ M1 1.1 Finding gradient of line or sub'n of t and $\log n$ If gradient of exactly $1/3$ used $k = 1.10730936$ 5 (iii) $500000 = 10 \times 2^{1.1t}$ $1.1t \log 2 = \log 50000$ $t = 14.2$ A1 1.1 Value of t (FT their a and k) For $k = 1.10730936$ A1 3.4 Translation into date				[2]			
Solution intended teaching to a value eg use of intercept leading to $0.9 < log a < 1.2$ So $7.4 < a < 15.85$ Suitable method leading to k value eg $k \log_{10} 2 = \text{gradient} \approx 0.33$ M1 1.1 Finding gradient of line or sub'n of t and $\log n$ If gradient of exactly 1/3 used t in range t in rang	5	(ii)	Reasonable line of best fit drawn (by eye)	B1	1.1a	With $0.9 < c < 1.2$	
State that related relating to k value of $k \log_{10} 2 = \text{gradient} \approx 0.33$ If gradient of exactly 1/3 used			leading to $0.9 < loga < 1.2$	M1	2.2a		from line or condone use of 2
K in range $0 < k < 1.25$ and a in range $7.4 < a < 15.85$ A1 2.2a exactly 1/3 used k = 1.10730936 5 (iii) 500000 = $10 \times 2^{1.1t}$ M1 3.4 Correct substitution $t = 14.2$ A1 1.1 Value of t (FT their a and k) For $k = 1.10730936$ $t = 14$ is $1/3/18$ M1 3.4 Translation into date Translation into date Same answer				M1	1.1		
5 (iii) $500000 = 10 \times 2^{1.1t}$ M1 3.4 Correct substitution $t = 14.2$ A1 1.1 Value of t (FT their a and k) For $k = 1.10730936$ $t = 14$ is $1/3/18$ M1 3.4 Translation into date $t = 14.1$ Same answer			k in range 0 < k < 1.25 and a in range 7.4 < a < 15.85	A1	2.2a		
1.1 $t \log 2 = \log 50000$ t = 14.2 t = 14 is 1/3/18 A1 1.1 Value of t (FT their a and k) For $k = 1.10730936$ $t = 14.1$ Same answer				[4]			<i>k</i> =1.10730936
t = 14.2 t = 14 is 1/3/18 A1 1.1 Value of t (FT their a and k) For $k = 1.10730936$ Translation into date A1 1.1 Same answer	5	(iii)	$500000 = 10 \times 2^{1.1t}$	M1	3.4	Correct substitution	
$t = 14 \text{ is } 1/3/18$ $M1 \qquad 3.4 \qquad \text{Translation into date}$ $A1 \qquad \qquad$			$1.1t \log 2 = \log 50000$				
			t = 14.2	A1	1.1	Value of t (FT their a and k)	For k= 1.10730936
			t = 14 is 1/3/18	M1	3.4	Translation into date	M. 70.70.70
			So 1/4/18		3.2a	Rounding up	

Question		n	Answer	Marks	AOs	Guidance	
5	(iv)		Suitable reason	E1	3.5b		
			e.g. The data are only for a short time scale and cannot extrapolate e.g. There will not be enough people for the growth to continue				
				[1]			