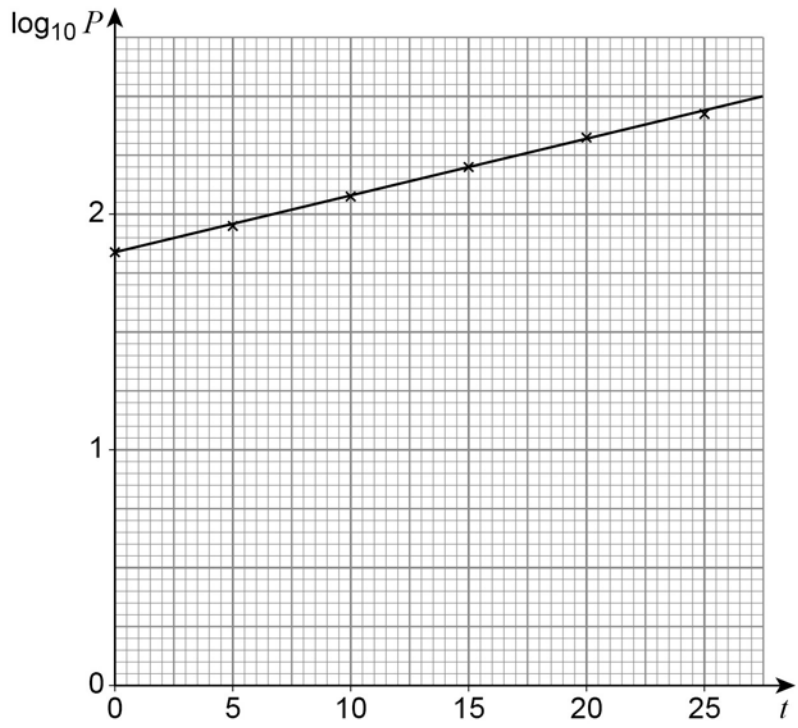
Q	Marking instructions	AO	Marks	Typical solution
9(a)	Takes $\log_{10}$ of both sides to obtain $\log_{10} P = \log_{10}\left(A \times 10^{kt}\right)$ Or States that $A = 10^{c}$	1.1a	M1	$\log_{10} P = \log_{10}\left(A \times 10^{kt}\right)$ $\log_{10} P = \log_{10} A + \log_{10} 10^{kt}$ $\log_{10} P = \log_{10} A + kt$
	Obtains $\log_{10} P = \log_{10} A + \log_{10} 10^{kt}$ Or $P = 10^{kt+c}$	1.1b	A1	
	Completes rigorous argument to show $\log_{10} P = \log_{10} A + kt$ Or $\log_{10} P = kt + c$	2.1	R1	
	Subtotal		**3**	

Q	Marking instructions	AO	Marks	Typical solution
9(b)(i)	Completes table.	1.1b	B1	
	Subtotal		**1**	

t	0	5	10	15	20	25
$\log_{10} P$	1.88	1.97	2.08	2.19	2.31	2.41

Q	Marking instructions	AO	Marks	Typical solution
9(b)(ii)	Plots at least four points correctly. Allow +/- one small square	1.1a	M1	
	Draws a ruled line of best fit from t=0 to t=25 or better CSO	1.1b	A1	
	Subtotal		**2**	

Q	Marking instructions	AO	Marks	Typical solution
9(c)(i)	Calculates the gradient of the graph either using the line of best fit or two points from the table of values	1.1a	M1	$k=\frac{2.41-1.88}{25}$ $=0.0212$ ≈ 0.02
	Obtains a value of k which rounds to 0.02	1.1b	R1	
	Subtotal		**2**	

Q	Marking instructions	AO	Marks	Typical solution
9(c)(ii)	Infers the value of A Uses 75 from data or uses $10^{their\ intercept}$	2.2b	B1F	A=75
	Subtotal		**1**	

Q	Marking instructions	AO	Marks	Typical solution
9(d)	Substitutes $t=50$ into their model of the form $P=A\times10^{0.02t}$ PI by 750	3.4	M1	$P=75\times10^{0.02\times50}$
	Obtains the value for the number of tonnes of annual global production of plastics. Follow through their 70 < A <90	3.2a	A1F	750 million tonnes
	Subtotal		**2**	

Q	Marking instructions	AO	Marks	Typical solution
9(e)	Forms an equation or inequality using their model of the form $P=A\times10^{0.02t}$ and $P=8000$	3.4	M1	$8000=75\times10^{0.02\times t}$ $t=101.401$
	Obtains t=101.4 AWFW [97.44,102.90]	1.1b	A1F	2082
	Interprets their answer as a year by calculating their (integer part of t)+1980+1, provided their t>50	3.2a	A1F	
	Subtotal		**3**	

Q	Marking instructions	AO	Marks	Typical solution
9(f)	Gives a **reason in context** why the model for the **production** of plastics will be inappropriate. Eg It is not appropriate to extrapolate the future global production of plastics from the date provided. The global production of plastics may decrease in the future.	3.5b	E1	The world will produce less plastics to be more environmentally friendly.
	Subtotal		**1**	

	Question Total		**15**	