Question			Answer	Marks	AO	Guidance	
11	**(a)**		$\int e^{3y}dy = \int 3x^2 \ln x \, dx$	**M1**	**3.1a**	Separate variables and attempt integration of at least one side	Allow ke^{3y}, with $k \neq 1$, as 'attempt' at integration of LHS 'Attempt' at RHS may not be use of integration by parts Allow BOD on missing integral sign / missing dy / missing dx as long as intention clear
			$\int e^{3y}dy = \frac{1}{3}e^{3y}$	**B1**	**1.1**	Correct LHS	B0 if still part of an expression also involving x
			$\int 3x^2 \ln x \, dx = x^3 \ln x - \int x^2 dx$	**M1**	**3.1a**	Attempt integration by parts on RHS – must have correct parts	As far as attempt at $x^3 \ln x - \int x^2 dx$, possibly with $\int \frac{1}{x}x^3 dx$ not yet simplified
			$= x^3 \ln x - \frac{1}{3}x^3 + c$	**A1**	**1.1**	Correct RHS (condone no + c)	Condone no modulus sign on ln$x$
			$\frac{1}{3}e^3 = e^3 \ln e - \frac{1}{3}e^3 + c$ so $c = -\frac{1}{3}e^3$	**M1**	**1.1a**	Attempt use of (e, 1) to find c	Used in an equation involving x, y and c, following some integration attempt of both sides As far as finding c, either exact or as a decimal M1 can be implied by sight of $-\frac{1}{3}e^3$ or –6.695… following a correct equation
			$\frac{1}{3}e^{3y} = x^3 \ln x - \frac{1}{3}x^3 - \frac{1}{3}e^3$ $e^{3y} = 3x^3 \ln x - x^3 - e^3$	**A1**	**1.1**	Obtain correct equation, in required form	Any equivalent form on the RHS, but must be $e^{3y} = ...$ A0 if decimal approximation for e^3

Question			Answer	Marks	AO	Guidance	
				[6]			
11	**(b)**		$e^{3y} = 3e^6 \ln e^2 - e^6 - e^3$ $= 6e^6 - e^6 - e^3$ $= 5e^6 - e^3$	**M1***	2.1	Substitute $x = e^2$, into their integral involving $\ln x$, and attempt to simplify	$\ln x$ may be $\ln x^p$ if any coefficient has been taken into the ln term As far as correctly simplifying the ln term to remove ln Must be working exactly, so M0 if decimals seen before ln dealt with
			$3y = \ln(e^3(5e^3 - 1))$ $= 3 + \ln(5e^3 - 1)$	**M1 dep***	2.1	Introduce logs correctly, and attempt to rearrange to given form	Their equation must have two terms, or possibly more, with the terms having a common factor of e^k Attempt must go as far as splitting into the sum of two terms, with $\ln e^k$ simplified to k
			$y = 1 + \frac{1}{3}\ln(5e^3 - 1)$	**A1** **[3]**	2.1	Obtain $y = 1 + \frac{1}{3}\ln(5e^3 - 1)$	No need to state a, b and c explicitly