Question Number	Scheme	Marks
9(a)	$(V)=\pi\int_0^4\left(\cos x+\frac{1}{5}e^x\right)^2 dx$	B1
	$\left(\cos x+\frac{1}{5}e^x\right)^2=\cos^2 x+\frac{2}{5}e^x\cos x+\frac{1}{25}e^{2x}$	M1
	$=\frac{\cos 2x+1}{2}+\frac{2}{5}e^x\cos x+\frac{1}{25}e^{2x}$	dM1
	$=\pi\int_0^4\left(\frac{1}{2}+\frac{\cos 2x}{2}+\frac{2}{5}e^x\cos x+\frac{1}{25}e^{2x}\right)dx$	A1
		(4)
(b)	**Way I** $\int e^x\cos x\,dx=\pm e^x\sin x\pm\int e^x\sin x\,dx$ $=e^x\sin x-\int e^x\sin x\,dx$ **Way Two** $\int e^x\cos x\,dx=e^x\cos x\pm\int e^x\sin x\,dx$ $=e^x\cos x+\int e^x\sin x\,dx$	M1 A1
	$\int e^x\cos x\,dx=e^x\cos x\pm e^x\sin x-\int e^x\cos x\,dx$ $2\int e^x\cos x\,dx=e^x\cos x\pm e^x\sin x$	dM1
	$\int e^x\cos x\,dx=\frac{1}{2}e^x(\cos x+\sin x)+(c)$	A1
		(4)
(c)	$\pi\int_0^4\left(\frac{1}{2}+\frac{\cos 2x}{2}+\frac{2}{5}e^x\cos x+\frac{1}{25}e^{2x}\right)dx$	
	$=(\pi)\left[\frac{1}{2}x+\frac{\sin 2x}{4}+\frac{2}{5}\left(\frac{1}{2}e^x(\sin x+\cos x)\right)+\frac{1}{50}e^{2x}\right]_0^4$	M1A1ft
	$2\pi\left(2+\frac{\sin 8}{4}+\frac{2}{5}\left(\frac{1}{2}e^4(\sin(4)+\cos(4))\right)+\frac{1}{50}e^8-\frac{11}{50}\right)$	dM1
	$=\text{awrt }290\ (\text{cm}^3)$	A1
		(4)
		(12 marks)

(a)

Question Number	Scheme	Marks
4(a)	e.g. $5+17x-10x^2 = A(2x+1)(1-x)+Bx(2x+1)+Cx(1-x)$ $\Rightarrow A=...,\ B=....,\ C=....$	M1
	$A=5,\ B=4,\ C=8 \Rightarrow \mathrm{f}(x)=\dfrac{5}{x}+\dfrac{4}{(1-x)}+\dfrac{8}{(2x+1)}$	A1A1
		(3)
(b)	$\displaystyle\int \frac{5}{x}+\frac{4}{(1-x)}+\frac{8}{(2x+1)}\,\mathrm{d}x = 5\ln\lvert x\rvert-4\ln\lvert 1-x\rvert+4\ln\lvert 2x+1\rvert\ (+c)$	M1A1ftA1
	$\left[5\ln\lvert x\rvert-4\ln\lvert 1-x\rvert+4\ln\lvert 2x+1\rvert\right]_2^4$ $=(5\ln 4-4\ln 3+4\ln 9)-(5\ln 2-4\ln 1+4\ln 5)=5\ln 2+4\ln\left(\dfrac{3}{5}\right)$	dM1A1
		(5)
		(8 marks)

Question	**Scheme**	**Marks**
1	$\displaystyle\int x\cos 3x\,\mathrm{d}x=\frac{1}{3}x\sin 3x-\frac{1}{3}\int \sin 3x\,\mathrm{d}x$	**M1**
	$=\dfrac{1}{3}x\sin 3x+\dfrac{1}{9}\cos 3x$	**dM1** **A1**
	$\displaystyle\int_0^{\frac{\pi}{6}} x\cos 3x\,\mathrm{d}x=\left[\frac{1}{3}x\sin 3x+\frac{1}{9}\cos 3x\right]_0^{\frac{\pi}{6}}=\frac{1}{3}\frac{\pi}{6}\sin\frac{\pi}{2}+\frac{1}{9}\cos\frac{\pi}{2}-\left(0+\frac{1}{9}\right)$	**M1**
	$=\dfrac{\pi}{18}-\dfrac{1}{9}$	**A1**
		(5)
		(5 marks)