Question Number	Scheme	Marks
2(a)	$\frac{dV}{dx} = 3x^2$	M1 (B1 on EPEN)
	$\frac{dx}{dt} = \frac{dx}{dV} \times \frac{dV}{dt} = \frac{5}{3x^2}$	**d**M1A1
		(3)
	Alternative 1	
	$V = x^3 \Rightarrow x = V^{\frac{1}{3}} \Rightarrow \frac{dx}{dV} = \frac{1}{3}V^{-\frac{2}{3}}$	M1 (B1 on EPEN)
	$\frac{dx}{dt} = \frac{dx}{dV} \times \frac{dV}{dt} = \frac{5}{3V^{\frac{2}{3}}} = \frac{5}{3x^2}$	**d**M1A1
	Alternative 2	
	$\frac{dV}{dt} = 5 \Rightarrow V = 5t + c$	M1 (B1 on EPEN)
	$V = x^3 \Rightarrow x^3 = 5t + c \Rightarrow 3x^2 \frac{dx}{dt} = 5$ or $V = x^3 \Rightarrow x^3 = 5t + c \Rightarrow 3x^2 = 5\frac{dt}{dx}$	**d**M1
	$\frac{dx}{dt} = \frac{5}{3x^2}$	A1
(b)	$\frac{dx}{dt} = \frac{5}{3\times 4^2} = \frac{5}{48}$	M1A1
		(2)
		(5 marks)
Note this is now being marked as M1dM1A1 not B1M1A1		

Question	Scheme	Marks
7(a)	$\frac{dx}{dt} = k - 3x \Rightarrow \int \frac{1}{k-3x}\,dx = \int dt$ oe	M1
	$\Rightarrow -\frac{1}{3}\ln(k-3x) = t(+c)$	M1 A1
	$t = 0, x = 0 \Rightarrow -\frac{1}{3}\ln k = c$	M1
	$-\ln(k-3x) = 3t - \ln k \Rightarrow \ln\frac{k-3x}{k} = -3t \Rightarrow 1 - \frac{3}{k}x = e^{-3t} \Rightarrow x = \ldots$	M1
	$x = \frac{k}{3}(1 - e^{-3t})$	A1
		(6)
(b)	$t \to \infty \Rightarrow e^{-3t} \Rightarrow 0 \Rightarrow x \to \frac{k}{3} \Rightarrow \frac{k}{3} = 7 \Rightarrow k = \ldots$	M1
	$k = 21$	A1
		(2)
(c)	$x = 5 \Rightarrow 7(1 - e^{-3t}) = 5 \Rightarrow e^{-3t} = \ldots$	M1
	$\Rightarrow t = -\frac{1}{3}\ln\frac{2}{7}$	dM1
	Awrt 0.42 seconds	A1
		(3)
		(11 marks)

Question Number	Scheme	Marks
7	$x = 4\sin\theta \Rightarrow \frac{dx}{d\theta} = 4\cos\theta$	B1
	$\int \frac{1}{(16-x^2)^{\frac{3}{2}}}\,dx = \int \frac{4\cos\theta}{(16-16\sin^2\theta)^{\frac{3}{2}}}\,d\theta = \int \frac{4\cos\theta}{64\cos^3\theta}\,d\theta$	M1 A1
	$= \frac{1}{16}\tan\theta$	dM1
	Uses limits of $\frac{\pi}{6}$ and $\frac{\pi}{3}$ or 30° and 60° within their attempted integration and subtracts the right way round e.g. $f\left(\frac{\pi}{3}\right) - f\left(\frac{\pi}{6}\right)$ or $f(60°) - f(30°)$	M1
	$= \frac{1}{16}\tan\frac{\pi}{3} - \frac{1}{16}\tan\frac{\pi}{6} = \frac{\sqrt{3}}{24}$	A1
		(6 marks)