Question			Answer	Marks	AO	Guidance	
8	(a)		$\frac{dx}{dt} = k\sqrt{x}$	**B1***	**3.3**	Set up a correct differential equation	Allow $-k$
			$-0.0032 = k\sqrt{0.64}$ so $k = -0.004$ hence $\frac{dx}{dt} = -0.004\sqrt{x}$ **A.G.**	**B1d***	**3.3**	Obtain correct differential equation www	Or $k = 0.004$ from $-k$ Must use -0.0032 when finding k B0 if $k = 0.004$, even if then comment about 'decreasing' and sign changed
				[2]			
	(b)		$\int -0.004\,dt = \int x^{-\frac{1}{2}}\,dx$	**M1***	**1.1a**	Separate variables and attempt integration	Condone dx, dt and/or integral sign not being explicit Could instead invert both sides of equation Increase by 1 in both of their powers
			$-0.004t = 2x^{\frac{1}{2}} + c$	**A1**	**1.1**	Correct integral – could still be in terms of k	Condone no $+ c$ Any correct equation eg $t = -500\sqrt{x} + c$
			$-0.004 \times 100 = 2\sqrt{0.64} + c$ $c = -2$	**M1d***	**3.4**	Use $t = 100$, $x = 0.64$ to find c	Substitute given values into their general solution and attempt c NB check method carefully for their equation and the position of their c
			$2\sqrt{x} = 2 - 0.004t$ $x = (1 - 0.002t)^2$	**A1**	**1.1**	Correct equation	Any equiv as long as x in terms of t ISW if correct equation subsequently spoilt
				[4]			
	(c)		when $x = 0$, $t = 500$	**M1**	**1.1**	Use $x = 0$ to attempt a value for t	Must be using $x = 0$ in their particular solution, with a non-zero value for c
			so tank will be empty after 500 seconds	**A1**	**3.4**	Units needed	Must come from using a correct equation Allow 8 mins 20 secs, $8.\dot{3}$ mins or 8.33 mins
				[2]			