

2002  
10(b)

(iii) Either  $\frac{dv}{dt} = 0 \Rightarrow 100 - v = 0$  (5)  
 $\Rightarrow v = 100 \text{ mL}$

OR

$x=0$	_____	$\rightarrow$	(5)
$t=0$			
$v=0$			
	$\frac{dv}{dt} = 100 - v$		
		$t \rightarrow \infty$	
		$v \rightarrow \infty$	

$$\Rightarrow - \int_0^V \frac{1 dv}{100-v} = \int_0^T t dt$$

$$\Rightarrow - \ln(100-v) \Big|_0^V = t \Big|_0^T$$

$$\Rightarrow \left[ \ln(100-v) - \ln(100) \right] = T - 0$$

$$\Rightarrow \ln\left(\frac{100-v}{100}\right) = -T$$

$$\Rightarrow \frac{100-v}{100} = e^{-T}$$

$$\Rightarrow 100 - v = 100 e^{-T}$$

$$\Rightarrow -v = 100 e^{-T} - 100$$

$$\Rightarrow v = 100 - 100 e^{-T}$$

$$\Rightarrow v = 100(1 - e^{-T})$$

As  $T \rightarrow \infty$

$$v \rightarrow \lim_{T \rightarrow \infty} [100(1 - e^{-T})]$$

$$v \rightarrow 100(1 - 0) = 100.$$