Question Number	Scheme	Marks
4(a)	$a = v\dfrac{\mathrm{d}v}{\mathrm{d}x}$	M1
	$= \dfrac{3}{2}(2x+1)^{\frac{1}{2}} \times 2 \times (2x+1)^{\frac{3}{2}} = 3(2x+1)^2$	A1
	$3(2x+1)^2 = 243$	M1
	$x = 4$	A1
		(4)
4(b)	$(2x+1)^{\frac{3}{2}} = \dfrac{\mathrm{d}x}{\mathrm{d}t}$ **OR** $a = 3v^{\frac{4}{3}} = \dfrac{\mathrm{d}v}{\mathrm{d}t}$	M1 A1
	$\int \mathrm{d}t = \int (2x+1)^{-\frac{3}{2}}\mathrm{d}x$ $\int 3\mathrm{d}t = \int v^{-\frac{4}{3}}\mathrm{d}v$	M1
	$t = -(2x+1)^{-\frac{1}{2}}(+C)$ $3t + (C) = -3v^{-\frac{1}{3}}$	A1
	$t = 0,\ x = 0 \Rightarrow C = 1$ $t = 0,\ x = 0 \Rightarrow v = 1 \Rightarrow C = -3$ and obtain an equation in v and t only.	M1
	$v = \dfrac{1}{(1-t)^3}$	A1
		(6)
		(10)

Notes	
(a)	
M1	Use of $a = v\dfrac{\mathrm{d}v}{\mathrm{d}x}$ or $a = \dfrac{d}{dx}\left(\dfrac{1}{2}v^2\right)$. Evidence of differentiation, power decreasing by 1. Should see a product of terms to imply 'use of'.
A1	Correct differentiation
M1	Independent. Use their result from differentiation and put a = 243 then solve for x
A1	Cao If -5 is seen then it must be rejected or 4 must be clearly identified.
(b)	
M1	Use of $v = \dfrac{\mathrm{d}x}{\mathrm{d}t}$ to obtain DE in x and t **OR** Use of $a = \dfrac{\mathrm{d}v}{\mathrm{d}t}$ to obtain DE in v and t
A1	Correct equation
M1	Separate and integrate (evidence of integration, power increasing by 1)
A1	Correct integration, condone missing C
M1	Use t = 0, x = 0 to obtain a value of C and obtain an equation in v and t *only*.
A1	Cao Accept $v = (1-t)^{-3}$ or $v = \dfrac{-1}{(t-1)^3}$ or $v = -(t-1)^{-3}$
	Note: No marks in (b) for use of a = 243