

NAME: LONGJOHN DOMAEINTAMUNOPIRI ADANCIO

MATRIC NO: 191EN001020

DEPARTMENT: CHEMICAL

COURSE CODE: ENG 234

Assignment 2

F12-9

For $0 \leq t \leq 6$, $s = 0.5t^3$

$$v = \frac{ds}{dt} \quad v = \frac{d}{dt}(0.5t^3)$$

$$v = 1.5t^2$$

$$v(0s) = 1.5(0)^2 = 0 \text{ ms}^{-1}$$

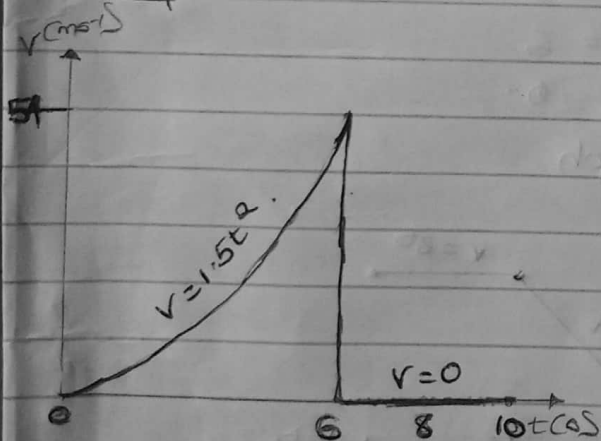
$$v(6s) = 1.5(6^2) = 54 \text{ ms}^{-1}$$

For $6 < t \leq 10$, $s = 108m$

$$v = \frac{ds}{dt} \quad v = \frac{d}{dt}(108)$$

$$v = 0 \text{ ms}^{-1}$$

v-t Graph.



F12-10

$$v = -4t + 80 \quad ; \quad s(0s) = 0$$

$$s = \int v dt = \int (-4t + 80) dt$$

$$= \frac{-4t^2}{2} + 80t + c$$

$$s = -2t^2 + 80t + c \quad ; \quad s(0s) = 0$$

$$0 = -2(0)^2 + 80(0) + c \quad ; \quad c = 0$$

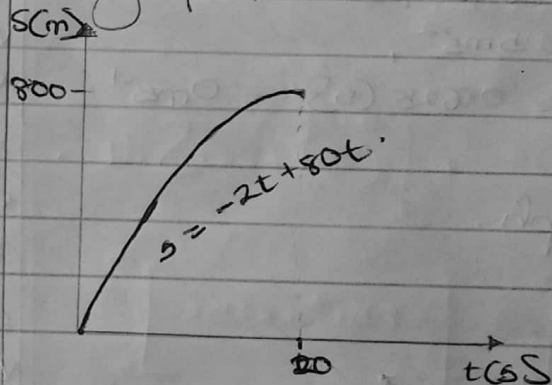
$$s = -2t^2 + 80t$$

$$s(20s) = -2(20)^2 + 80(20) \\ = 800 \text{ m}$$

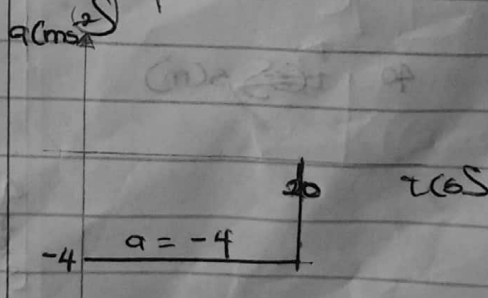
$$a = \frac{dv}{dt} = \frac{d}{dt}(-4t + 80)$$

$$= -4 \text{ ms}^{-2}$$

s-t graph.



a-t graph.



F12-11

$$v = 0.25s, \quad 0 \leq s \leq 40 \text{ m}$$

$$v(40\text{s}) = 10 \text{ m s}^{-1}$$

$$v(0\text{s}) = 0 \text{ m s}^{-1}$$

Recall

$$a ds = v dv$$

$$a = v \frac{dv}{ds}$$

$$\frac{dv}{ds} = \frac{d(0.25s)}{ds} = 0.25$$

~~$$a(40\text{s}) = 0.25(v)$$~~

$$a = 0.25v = 0.25 \times 10 = 2.5 \text{ m s}^{-2}$$

~~$$a = 0.25(0.25s)$$~~

$$a = 0.25(0.25s)$$

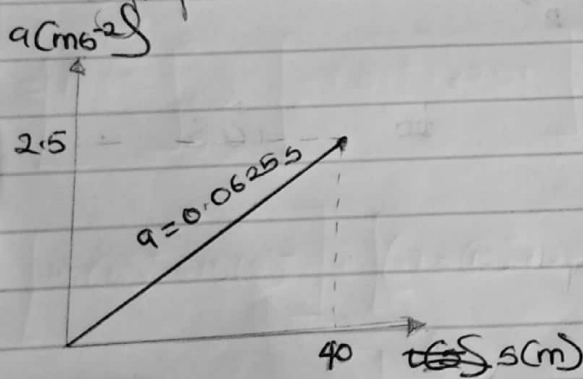
$$a = 0.0625s; \quad a(40\text{s})$$

$$= 0.0625(40\text{s})$$

$$= 2.5 \text{ m s}^{-2}$$

$$a(0\text{s}) = 0.0625(0\text{s}) = 0 \text{ m s}^{-2}$$

a-s graph.



F12-12

For $0 \leq t \leq 5$

$$s = 3t^2$$

$$v = \frac{ds}{dt} = \frac{d(3t^2)}{dt} = 6t$$

$$a = \frac{d^2s}{dt^2} = \frac{d^2(3t^2)}{dt^2} = 6$$

For $5 \leq t \leq 10$

$$s = 30t - 75$$

$$v = \frac{ds}{dt} = \frac{d(30t - 75)}{dt} = 30$$

$$a = \frac{d^2s}{dt^2} = \frac{d^2(30t - 75)}{dt^2} = 0$$

Hence

$$v(0\text{s}) = 6(0\text{s}) = 0$$

$$v(5\text{s}) = 6(5\text{s}) = 30$$

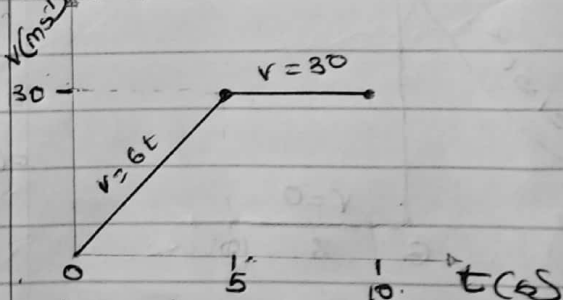
$$v(10\text{s}) = 30$$

$$a(0\text{s}) = 6$$

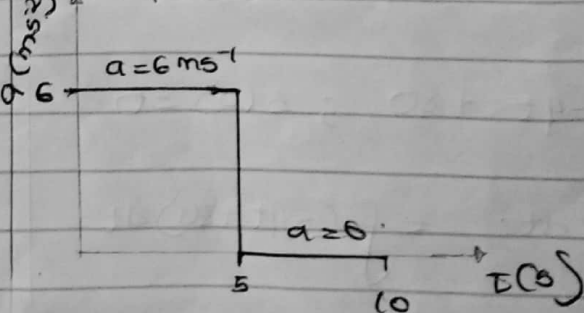
$$a(5\text{s}) = 6$$

$$a(10\text{s}) = 0$$

v-t graph



a-t graph



F12-13

• Starts from rest; hence $v(0) = 0$.

For

$$0 \leq t \leq 5$$

$$a = 20$$

$$v = \int a dt = \int 20 dt$$

$$v = 20t + c \quad \text{but } v(0) = 0$$

$$0 = 20(0) + c \quad \text{hence } c = 0$$

$$v(5) =$$

$$v = 20t; \quad v(5) = 20(5) = 100 \quad \text{F12-14}$$

For

$$5 \leq t \leq 15$$

$$a = -10 \quad v = \int a dt$$

$$v = \int -10 dt = -10t + c$$

$$v = -10t + c, \quad \text{but } v(5) = 100$$

$$100 = -10(5) + c$$

$$100 = -50 + c; \quad c = 150$$

$$v = -10t + 150$$

hence since t' is the time to come to rest; $v(t') = 0$.

$$0 = -10t' + 150$$

$$10t' = 150 \quad t' = \frac{150}{10} = 15 \text{ sec}$$

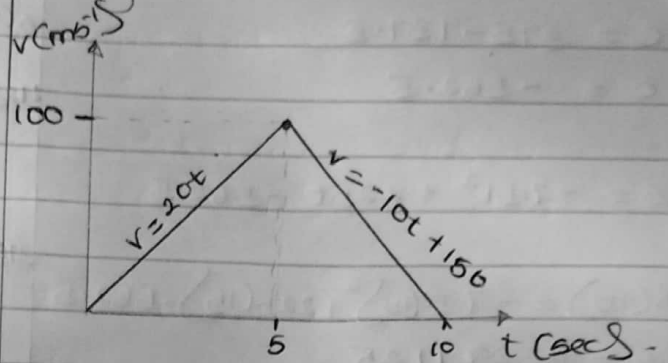
Hence

$$v(0) = 0$$

$$v(5) = 100$$

$$v(15) = 0$$

v-t graph



For $0 \leq t \leq 5$

$$v = 30t$$

NB: starts from rest; hence $v(0) = 0$ and $s(0) = 0$.

$$v = 30t$$

$$s = \int v dt = \int 30t dt$$

$$s = \frac{30t^2}{2} + c$$

$$s = 15t^2 + c \quad \text{but } s(0) = 0$$

$$0 = 15(0)^2 + c; \quad \text{hence } c = 0$$

$$s = 15t^2$$

$$s(5) = 15(5)^2 = 375 \text{ m}$$

For $5 < t \leq 15$

$$v = -15t + 225$$

$$s = \int v dt = \int (-15t + 225) dt$$

$$s = \frac{-15t^2}{2} + 225t + c$$

Recall that $s(5) = 375$

$$375 = -7.5(5)^2 + 225(5) + c$$

$$375 = 937.5 + C$$

$$C = 375 - 937.5$$

$$C = -562.5$$

$$s = -7.5t^2 + 225t - 562.5$$

$$s(15) = -7.5(15)^2 + 225(15) - 562.5$$

$$s = 4500 - 1125$$

$$s(0) = 0$$

$$s(5) = 375 \text{ m}$$

$$s(15) = 1125 \text{ m}$$

Total distance covered

$$= \int_0^{10} 15t \, dt$$

$$= \int_0^5 (30t) \, dt + \int_5^{15} (-7.5t + 225) \, dt$$

$$= \left[15t^2 \right]_0^5 + \left[-7.5t^2 + 225t \right]_5^{15}$$

$$= \left[15(5)^2 - 15(0)^2 \right] + \left[(-7.5(15)^2 + 225(15)) \right.$$

$$\left. - (-7.5(5)^2 + 225(5)) \right]$$

$$= 375 + 750 = 1125 \text{ m}$$

s-t graph

