

Mathematics Questions by Topic

Motion and Force

Answer 18

Source: K14SM2Q18

Question 18

A car is moving with constant acceleration has its speed reduced from $3V \text{ ms}^{-1}$ to $V \text{ ms}^{-1}$, over a distance of $D \text{ m}$ when the driver applies the brakes. The car travels a further distance of $S \text{ m}$ until it comes to rest. The time T seconds represents the time when the driver applies the brakes until the car comes to rest. Then

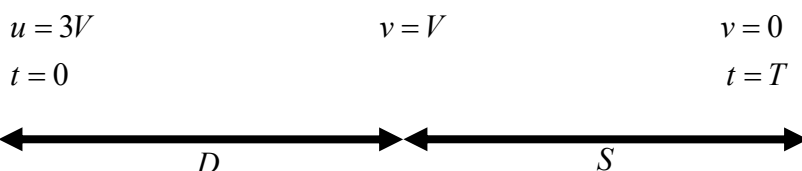
A. $D = 8S$ and $T = \frac{2(D+S)}{3V}$

B. $D = 4S$ and $T = \frac{2(D+S)}{3V}$

C. $D = 8S$ and $T = \frac{S}{V}$

D. $D = 4S$ and $T = \frac{S}{V}$

E. $D = 2S$ and $T = \frac{D}{2V}$

ANSWER A

use $v^2 = u^2 + 2as$

with $v = V$, $u = 3V$ $s = D$

$$V^2 = 9V^2 + 2aD$$

$$a = -\frac{4V^2}{D}$$

use $s = \left(\frac{u+v}{2}\right)t$

with $v = 0$, $u = 3V$ $s = D+S$ and $t = T$

$$D+S = \frac{3V}{2} \times T \Rightarrow T = \frac{2(D+S)}{3V}$$

use $v^2 = u^2 + 2as$

with $v = 0$, $u = V$ $s = S$ and $a = -\frac{4V^2}{D}$

$$0 = V^2 - 2 \times \frac{4V^2}{D} \times S \Rightarrow D = 8S$$