Answer on Question 80386, Physics, Other

Question:

If the breaks of a car can decelerate it at $10\ m/s^2$

1) what time is required to reduce the velocity of the car from $157\ km/h$?

2) how many meters does the car travel while decelerating?

Solution:

1) We can find the time required to reduce the velocity of the car from $157\ km/h$ from the kinematic equation:

$$v = v_0 + at,$$

here, $v = 0$ is the final velocity of the car when it stops, $v_0 = 157\ km/h$ is the initial velocity of the car, $a = -10\ m/s^2$ is the deceleration of the car and t is the time required to reduce the velocity of the car from $157\ km/h$.

Then, we get:

$$0 = v_0 - at$$

$$t = \frac{v_0}{a} = \frac{157\ \frac{km}{h} \cdot \frac{1000\ m}{1\ km} \cdot \frac{1\ h}{3600\ s}}{10\ \frac{m}{s^2}} = 4.36\ s.$$

2) We can find distance that the car travels wile decelerating from another kinematic equation:

$$d = v_0 t + \frac{1}{2}at^2 =$$

$$= 157\ \frac{km}{h} \cdot \frac{1000\ m}{1\ km} \cdot \frac{1\ h}{3600\ s} \cdot 4.36\ s + \frac{1}{2} \cdot \left(-10\ \frac{m}{s^2}\right) \cdot (4.36\ s)^2$$

$$= 95.1\ m.$$

Answer:

1) $t = 4.36\ s.$

2) $d = 95.1\ m.$