Answer on Question #51378, Physics, Mechanics | Kinematics | Dynamics

A rocket-driven sled running on a straight, level track is used to investigate the effects of large accelerations on humans. One such sled can attain a speed of 1640 km/h in 2.00 s, starting from rest. Find (a) the acceleration (assumed constant) in terms of g and (b) the distance traveled.

Solution:

The time dependence of velocity is given by Eq.(1).

$$v(t) = v_0 + at \tag{1}$$

where a is acceleration and $v_0 = 0$ is initial velocity.

From Eq.(1)

$$a = \frac{v}{t} = \frac{1640 km/h}{2.00 s} = \frac{455.6 m/s}{2.00 s} = 227.8 m/s^2 \tag{2}$$

where $1640 km/h = 1640 \cdot 1000 / 3600 = 455.6 m/s$

The acceleration of free fall is $g = 9.8 m/s^2$. Than

$$a = 227.8 m/s^2 = 23.2 g \tag{3}$$

The distance of traveling is given by Eq.(4)

$$s = v_0 t + \frac{at^2}{2} = 0 \cdot 2s + \frac{227.8 m/s^2 \cdot (2s)^2}{2} = 455.6 m \tag{4}$$

Answer: The acceleration in terms of g is $a = 227.8 m/s^2 = 23.2 g$ the distance of traveling is 455.6m.