

Name : Solution

Id :

Sec. # : 27

An airplane has a speed of 290 km/h and is diving at an angle of 30.0° below the horizontal when the pilot releases a bomb. The horizontal distance between the release point and the point where the bomb strikes the ground is 700 m.

a) How long does it take the bomb to hit the ground?

$$v_0 = 290 \frac{\text{km}}{\text{h}} \times \frac{1000}{1\text{km}} \times \frac{1\text{h}}{3600\text{s}} = 80.6 \text{ m/s}$$

$$v_{0x} = v_0 \cos(-30) = 80.6 \times \cos(-30) \\ = 69.8 \text{ m/s}$$

Since velocity along the horizontal is constant

$$\Delta x = v_{0x} t \Rightarrow t = \frac{700}{69.8} = 10.0 \text{ s}$$

b) How high was the released point?

Take the origin at the release point

$$\Delta y = (v_0 \sin \theta_0) t - \frac{1}{2} g t^2$$

$$\Delta y = \frac{80.6}{1000} \sin(-30) \times 10 - \frac{1}{2} \times 9.8 \times 10^2$$

$$= -403 - 490 = -893 \text{ m}$$

$$\Rightarrow \text{height} = 893 \text{ m}$$

