Answer on Question #70674, Physics / Mechanics | Relativity |

Question

A balloon is rising with a constant velocity of 10m/s. An object is released freely from that balloon and hits to the ground after 20 seconds. Ignoring the air resistance, find the position of the balloon:

a) at the time of object released;

b) at the time of object hits to the ground.

Solution

$$t = 20s$$
$$v = 10 \, m/s$$
$$H_1 -? \, H_2 -?$$

The object (as free-falling object) accelerates downwards at a rate of $9.8ms^{-2} \simeq 10ms^{-2}$ with initial velocity $v_0 = -10 \, m/s$, where minus means that the direction of the velocity is upwards.

a) The displacement of the object is

$$H_1 = v_0 t + \frac{gt^2}{2} = -10 \cdot 20 + \frac{10 \cdot 400}{2} = 1800m.$$

b) While the object is falling the balloon is rising with a constant velocity of 10m/s. The position of balloon changes from H_1 to H_2:

$$H_2 = H_1 + vt = 1800 + 10 \cdot 20 = 2000m.$$

Answer: $H_1 = 1800m; H_2 = 2000m.$