

Q1. A ball is thrown upward with a velocity of 29.4m/s. After 3 seconds another ball is thrown upwards with a velocity of 19.6m/s . at what height and at what time will the two balls collide?

Q2. A stone after falling freely under gravity for 1 second strikes a pane of glass held horizontally. In breaking through the pane it loses half of its velocity. How far will it travel or fall in the next 2 seconds?

Solution

Q1

$$h_1 = v_1 t - \frac{gt^2}{2}, h_2 = v_2(t - 3) - \frac{g(t - 3)^2}{2}$$

$$h_1 = h_2 \gg v_1 t - \frac{gt^2}{2} = v_2(t - 3) - \frac{g(t - 3)^2}{2} \gg$$

$$t = \frac{3v_2 + 4.5g}{v_2 - v_1 + 3g} = 5.25 \text{ s}$$

or  $(t - 3) = 5.25 - 3 = 2.25 \text{ s}$  after throwing the second stone

$$h(2.25) = 29.4 * 5.25 - \frac{9.8 * 5.25^2}{2} = 19.3 \text{ m}$$

Q2

Velocity of the stone flew one second

$$v = gt = g * 1 = g$$

In breaking through the pane it loses half of its velocity, so

$$v_0 = v/2 = g/2$$

$$h = v_0 t + \frac{gt^2}{2} = \frac{g}{2}t + \frac{gt^2}{2} \gg h(2) = \frac{g}{2} * 2 + \frac{g * 2^2}{2} = 3g = 29.4 \text{ m}$$