

## Answer on Question #62531, Physics / Mechanics | Relativity

How fast would rain drops hit the ground after falling from a cloud 1 kilometer above the Earth's surface

### Solution:

Without air resistance, everything falls at the same acceleration, 9.81 m/s/s. That is, every second, it goes 9.81 meters per second faster.

The speed is

$$v = \sqrt{2gh}$$

Free fall is independent of the mass of the body. It only depends on height and time period for which body is thrown.

$$v = \sqrt{2 \cdot (9.81 \text{ m/s}^2) \cdot (1000 \text{ m})} = 140 \text{ m/s}$$

Free Fall Formula is

$$y = y_0 - \frac{1}{2}gt^2$$

where  $y = 0$ ,  $y_0 = 1000 \text{ m}$  and  $g = -9.81 \text{ m/s}^2$  is acceleration.

Thus, time of fall of the drop is

$$t = \sqrt{\frac{2(y_0 - y)}{g}} = \sqrt{\frac{2h}{g}} = \sqrt{\frac{2 \cdot 1000}{9.81}} \approx 14.3 \text{ s}$$

**Answer:** 140 m/s; 14.3 s