Find the value of ''g'' by free fall method when the distance between initial and final positions is 0.7m and average time for 15 vibrations is 24 seconds.

for one vibration:

$t_1 = t_{down} + t_{up}$

t_1 – time for 1 vibration

t_{down} , t_{up} - times for moving down and up

For moving down:

$h = \frac{gt_{down}^2}{2}$ => $t_{down} = \sqrt{\frac{2h}{g}}$

Obviously, $t_{down} = t_{up}$ from symmetry.

$t_1 = 2\sqrt{\frac{2h}{g}}$

$g = \frac{8h}{t_1^2}$

average time for 15 vibrations is 24 seconds, therefore for one vibration:

$t_1 = \frac{24s}{15}$

$g = \frac{8h}{t_1^2} = 8 * \frac{0.7}{\left(\frac{24}{15}\right)^2} = 2.19\frac{m}{s^2}$

Answer: $g = 2.19\frac{m}{s^2}$