23/8/21

## HOME ASSIGNMENT

1. How much is the gravitational force that keeps an artificial satellite of mass 3500kg in orbit around the earth an altitude of 4200 km.

(2) 12500N

Given: Mass of artificial satellite = 3500kg

Altitude = 4200km

First, find the acceleration due to gravity

$$g = (9.8\ m/s^2)\left(\frac{6400km}{6400km+4200km}\right)^2 = 3.57\ m/s^2$$

Then, $w = mg = (3500kg)(3.57\ m/s^2) = 12500N$

2. The value of g is maximum -

(1) At poles of earth

3. A stone is thrown vertically upwards and caught at the point of projection after 10 seconds. The time taken by the stone to reach the highest point is -

(1) 5 sec

Time taken to go upwards is equal to time taken to travel downwards from the same height.

According to second equation of motion,

$$S_1 = ut - \frac{1}{2}gt^2 \rightarrow (1)$$

$$S_2 = \frac{gt^2}{2} \rightarrow (2)$$

Equation (1) and (2)

$$ut = gt^2$$

$$u = gt$$

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Now according to the laws of freefall time of accent = time of descent

for, $2t = 10$ secs

$t = 5$ secs

4. The period of a satellite in a circular orbit of radius R is T, the period of another satellite in a circular orbit of radius 4R is —

(3) 8T

$$\frac{T_1}{T_2} = \left(\frac{R_1}{R_2}\right)^{3/2} = \left(\frac{R}{4R}\right)^{3/2} \Rightarrow T_2 = 8T_1.$$