Planetary Science

Que what is the typical period of revolution of polar orbiting Earth satellite, orbiting at a height of around 700 km from the Earth's surface?

Ans → Mean radius of Earth = 6371 km

So, Radius of satellite orbit, r

= 6371 km + 700 km

= 7071 km

The distance covered by satellite in one revolution of its orbit

= 2π × radius of orbit (r)

The orbital velocity of satellite

for M = mass of Earth = 6×10^{24} kg

$$V_{orbit} = \sqrt{\frac{GM}{r}} = 7500 \text{ m/s}$$

Time period of revolution of satellite

$$= \frac{2\pi \times \text{radius of orbit}(r)}{7500 \text{ m/s}} = 98.7 \text{ minutes}$$

Que- Two planets A & B orbit around Sun, B Being four times Farther away then A from their Sun. Then length of year on B compared to that of A, would be

(a) Same

(b) twice

(c) Four time

(d) Eight time

Solution

The length of the year on a planet is time taken by planet to complete on revolution in its orbit around it Sun. So length of the year of a planet is given by its orbital period.

Let the distance of planet A from the sun be a

a = semi-major axis of the elliptical orbit of planet A

∴ Distance of planet B from Sun $= 4a$

Let T_A, T_B = orbital periods of planets A & B respectively

from kepler's 3rd law of planetary motion

$$\frac{T_A^2}{a^3} = \frac{T_B^2}{(4a)^3} \Rightarrow \frac{T_A}{T_B} = \frac{1}{8}$$

$$T_B = 8T_A$$

So 4th option is correct