Question

A satellite S is moving in an elliptical orbit around the earth. the mass of the satellite is very small compared to the mass of the earth

A. The acceleration of S is always directed towards the centre of the earth.

B. The angular momentum of S about the centre of the earth changes in direction, but magnitude remains constant

C. The total mechanical energy of S varies periodically with time

D. The linear momentum of S remains constant in magnitude

Solution

Correct option is
A)

As gravitational force on satellite due to earth acts always towards the centre of earth, thus acceleration of S is always directed towards the centre of the earth.
Also, as there is no external force so according to conservation of energy , total mechanical energy of S is constant always.
Also, as in the absence of external torque L is constant in magnitude and direction.
Thus, mrv = constant $\Rightarrow$ v varies as r changes
Hence, $p = mv$ is not constant.