

## 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,  $mr v = \text{constant} \Rightarrow v$  varies as  $r$  changes

Hence,  $p = mv$  is not constant.