

QUES 02

A lift is coming from 8th floor and is just about to reach 4th floor. Taking ground floor as origin and positive direction upwards for all quantities, which one of the following is correct?

- (A) $v < 0, a < 0, \frac{dv}{dt} < 0$
 (B) $v < 0, a < 0, \frac{dv}{dt} > 0$
 (C) $v < 0, a > 0, \frac{dv}{dt} < 0$
 (D) $v < 0, a > 0, \frac{dv}{dt} > 0$

Sol (C)

Key concept: The time rate of change of velocity of an object is called acceleration of the object. It is a vector quantity. Its direction is same as that of change in velocity (not of the velocity). In the table Possible ways of velocity change

When only direction of velocity changes	When only magnitude of velocity changes	When both magnitude and direction of velocity change
Acceleration perpendicular	Acceleration parallel or anti-parallel	Acceleration has two components—one is parallel to velocity and another is perpendicular to velocity

is velocity	parallel to velocity	perpendicular to velocity and another parallel or anti-parallel to velocity
e.g. Uniform circular motion	E.g. Motion under gravity	E.g. Projectile motion

Here we will take upward direction positive. As the lift is coming in downward direction, the displacement will be negative. We have to see whether the motion is accelerating or retarding. We know that due to downward motion displacement will be negative. When the lift reaches 4th floor and is about to stop velocity is decreasing with time, hence motion is retarding in nature. Thus, $v < 0, a > 0$. As displacement is negative, velocity will also be negative, i.e. $v < 0$. The motion of lift will be shown like this.

