

QUES 03

In one dimensional motion, instantaneous speed v satisfies $0 < v < v_0$

(i) The displacement in time T must always take non-negative values.

(ii) The displacement in time T satisfies $v_0 T < x < v_0$

(iii) The acceleration is always a non-negative number.

(iv) The motion has no turning points.

Ques 03

Key concept: Instantaneous speed: It is the speed of a particle at a particular instant of time. When we say

"speed", it usually means instantaneous speed. The instantaneous speed is average speed for infinitesimally small time intervals (i.e., $\Delta t \rightarrow 0$).

Thus, instantaneous speed $v = \lim_{\Delta t \rightarrow 0} \frac{\Delta x}{\Delta t}$

As instantaneous speed is less than maximum speed. Then either the velocity is increasing or it is decreasing. For maximum and minimum displacement we have to keep in mind the magnitude and direction of maximum velocity.

As maximum velocity in positive direction is v_0 , magnitude of maximum velocity in opposite direction is also v_0 .

Maximum displacement in one direction = $v_0 T$. Maximum displacement in opposite direction = $-v_0 T$. Hence $-v_0 T < x < v_0 T$.

Important point: It should not confuse with direction of velocities, i.e., in one direction it is taken as positive and in another direction it is taken as negative.