QUES 08

A spring with one end attached to a mass and the other to a rigid support is stretched and released.

(a) Magnitude **of acceleration, when just released is maximum.**

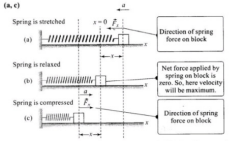
(b) Magnitude **of acceleration, when at** equilibrium **position, is maximum.**

(c) Speed is maximum when mass is at equilibrium **position.**

(d) Magnitude of displacement is always maximum whenever speed is minimum

Sol:(a, c)

Sol. (a, c)



As shown in the figure above when spring is stretched by length x, restoring force will be $F = -kx$ (–ve sign shows that the force is always in the direction opposite to displacement x). Then the potential energy of the stretched spring

$= PE = \frac{1}{2}kx^2$

The restoring force is central, hence when particle is released it will execute Simple Harmonic Motion about equilibrium position.

Acceleration will be $a = \frac{F}{m} = \frac{-kx}{m}$

At equilibrium position, $x = 0 \Rightarrow a = 0$

Hence, when just released $x = x_{max}$

Hence, acceleration is maximum. Thus option (a) is correct.

At equilibrium whole PE will be converted to KE, so KE will be maximum and hence, speed will be maximum. Thus option (c) is correct.