Answer on Question #77746, Physics / Mechanics | Relativity

A mass m = 1 kg is falling downward under the effect of gravity and of a vertical upward force P = 3 N. Assuming for simplicity that g≅10 m/s2. What is the acceleration of the mass?
A: 7 m/s2 upward
B: 3.5 m/s2 downward
C: 10 m/s2 downward
D: 7 m/s2 downward
E: 3 m/s2 upward

Solution

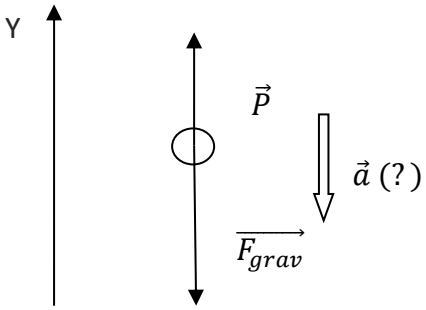
m=1 kg

P=3 N

g=10m/s^2

a-?

Free body diagram



Newton's Second Law of motion: $\overrightarrow{F_{net}} = m\vec{a}$

$$\overrightarrow{F_{grav}} + \vec{P} = m\vec{a}$$

$$m\overrightarrow{g} + \vec{P} = m\vec{a}$$

y: $-mg_y + P_y = ma_y$

$$-1 \times 10 + 3 = 1 \times a_y$$

$$a_y = -7\ (m/s^2)$$

As a_y is negative it's direction is opposite to y axis, consequently the body A moves downward with the acceleration of mass 7m/s^2

Answer: D: 7 m/s2 downward