Question

A particle of mass m is moving in a straight line with momentum p. Starting at time t = 0, a force F=kt acts in the same direction on the moving particle during time interval T so that its momentum changes from p to 3p. Here k is a constant. The value of T is?

A $2\sqrt{\dfrac{p}{k}}$

B $\sqrt{\dfrac{2p}{k}}$

C $\sqrt{\dfrac{2k}{p}}$

D $2\sqrt{\dfrac{k}{p}}$

Solution

Correct option is A)

$$\frac{dp}{dt} = F = kt$$

$$\int_{P}^{3P} dP = \int_{O}^{T} kt\,dt$$

$$2p = \frac{KT^2}{2}$$

$$T = 2\sqrt{\frac{P}{K}}.$$