

Combining Dynamics + Kinematics

Recall: Newton's Second Law $\vec{F}_{\text{net}} = m\vec{a}$

MP165

$$m = 9.1 \times 10^{-31} \text{ kg}$$

$$v_1 = 0$$

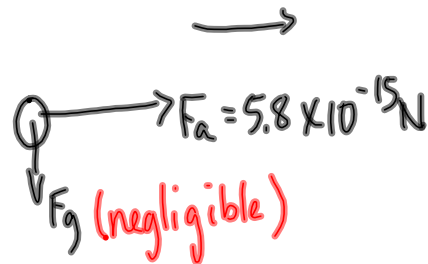
$$v_2 = ?$$

$$F_a = 5.8 \times 10^{-15} \text{ N}$$

$$\Delta d = 3.5 \text{ mm}$$

$$(3.5 \times 10^{-3} \text{ m})$$

Draw a FBD:



$$\vec{F}_{\text{net}} = m\vec{a}$$

$$F_a = ma$$

$$a = \frac{F_a}{m}$$

$$a = \frac{5.8 \times 10^{-15} \text{ N}}{9.1 \times 10^{-31} \text{ kg}}$$

$$a = 6.37 \times 10^{15} \text{ m/s}^2$$

$$v_2^2 = v_1^2 + 2a\Delta d$$

$$v_2^2 = 0^2 + 2(6.37 \times 10^{15} \text{ m/s}^2)(3.5 \times 10^{-3} \text{ m})$$

$$v_2 = 6.7 \times 10^6 \text{ m/s}$$

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$$\vec{F}_a = 9.50 \text{ N [S]}$$

$$m = 20.0 \text{ kg} \quad \Delta t = 1.86 \text{ s}$$

$$v_1 = 0 \text{ m/s}$$

$$a) \quad \vec{a}_{ave} = ?$$

$$b) \quad \vec{v}_2 = ??$$

$$b) \quad \vec{a} = \frac{\Delta \vec{v}}{\Delta t}$$

$$\vec{a} = \frac{\vec{v}_2 - \vec{v}_1}{\Delta t}$$

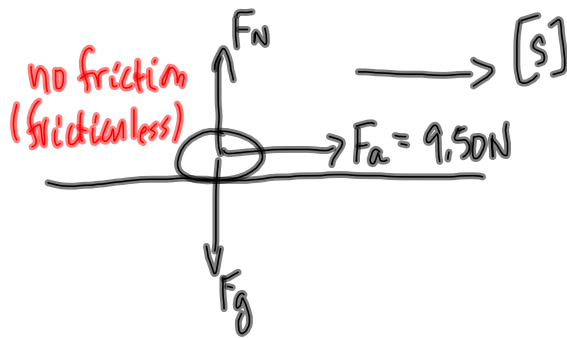
$$\vec{a} \Delta t = \vec{v}_2 - \vec{v}_1$$

$$\vec{v}_2 = \vec{v}_1 + \vec{a} \Delta t$$

$$\vec{v}_2 = 0 \text{ m/s} + (0.475 \text{ m/s}^2 \text{ [S]}) (1.86 \text{ s})$$

$$\vec{v}_2 = 0.884 \text{ m/s [S]}$$

Draw a FBD:



$$\vec{F}_{net} = m \vec{a}$$

$$\vec{F}_a = m \vec{a}$$

$$\vec{a} = \frac{\vec{F}_a}{m}$$

$$a) \quad \vec{a}_{ave} = \frac{9.50 \text{ N [S]}}{20.0 \text{ kg}}$$

$$\vec{a}_{ave} = 0.475 \text{ m/s}^2 \text{ [S]}$$

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