

Physics

Kinematics & Free Fall Quiz Review

Name: _____

KEY

Block: _____

1. What do the following variables stand for?

Δx : change in position (displacement)

x_i : initial position

x_f : final position

v_i : initial velocity

v_f : final velocity

a : acceleration

t : Time

Δx_y : vertical displacement

Δx_x : horizontal displacement

v_{iy} : initial vertical velocity

v_{fy} : final vertical velocity

2. If Mr. Muschong is looking over a bridge 20 m above a river and his sunglasses accidentally fall off his face. How long will it take the sunglasses to hit the water?

$$\Delta x_y = 20\text{m}$$

$$a = g = -9.8\text{m/s}^2$$

$$v_{iy} = 0\text{m/s}$$

$$t = ?$$

$$\Delta x_y = \frac{1}{2}at^2 + v_{iy}t$$

$$20 = \frac{1}{2}(-9.8)(t^2) + 0t$$

$$\frac{20}{-4.9} = \frac{-4.9t^2}{-4.9}$$

$$\sqrt{t^2} = \sqrt{4.08}$$

$$t = 2.02$$

How fast are the sunglasses moving when they hit the water?

$$\Delta x_y = 20\text{m}$$

$$a = g = 9.8\text{m/s}^2$$

$$v_{iy} = 0$$

$$v_{fy} = ?$$

$$\sqrt{v_{fy}^2} = \sqrt{v_{iy}^2 + 2a\Delta x_y}$$

$$v_{fy} = \sqrt{v_{iy}^2 + 2a\Delta x_y}$$

$$v_{fy} = \sqrt{0 + 2(9.8)(20)}$$

$$= \sqrt{392}$$

$$v_{fy} = -19.8\text{m/s}$$

3. Mr. Woods is playing soccer with his kids in his backyard and kicks the ball with a velocity of 10 m/s. His son is standing 40 meters away. If the ball accelerates at a constant rate and comes to a stop after 7 seconds, will it reach his son?

$$v_i = 10\text{m/s}$$

$$\Delta x = 40\text{m}?$$

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

$$t = 7\text{s}$$

$$\Delta x = ?$$

$$\Delta x = \frac{1}{2}t(v_i + v_f)$$

$$= \frac{1}{2}(7)(10 + 0)$$

$$= (3.5)(10)$$

$$\Delta x = 35\text{m}$$

No, the ball does not make it there.