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Class: PHYS 2211L - G02

Lab: 2 "Projectile Motion"

Grade: _____

1) Objective: To run a successful simulation using known and unknown information regarding two objects

2) Theory: Using formulas learned in lecture, students should be able to use given information and complete the problems.

3) Procedure:

- Using formulas listed below, derive unknown information to complete the simulation.
- Using the same formulas and intuition, create a successful freefall simulation.

4) Data: Formulas used in this lab

- $A * T_f - T_i = V_f - V_i$
- $X_f - X_i = V_{ix} * T_f - T_i + .5 * a_g * (T_f - T_i)^2$
- $Y_f - Y_i = V_{iy} * T_f - T_i + .5 * a_g * (T_f - T_i)^2$

5) Calculations: (attached)

6) Results: Success! (see attached pdf pictures)

7) Comments: none

Lab 2 Part 1

$$1. a \Delta t = \Delta v$$

$$2. \Delta x = v_{ix} \Delta t + \frac{1}{2} a t^2$$

$$3. \Delta y = v_{iy} \Delta t + \frac{1}{2} a t^2$$

Black circle

$$x_i = 1.5 \quad y_i = 7$$

$$x_f = 1.5 \quad y_f = 0$$

$$v_{ix} = 0 \quad v_{iy} = 5.0$$

$$a = -9.8$$

$$\Delta y = -7$$

Red Circle

$$x_i = 4.5 \quad y_i = 12 \quad \Delta y = -12$$

$$x_f = 4.5 \quad y_f = 0$$

$$t = 1.810$$

$$-12 = v_{iy} \times 1.810 + \frac{1}{2} \times -9.8 \times 1.810^2$$

$$\underline{12.239 = v_{iy}}$$

$$3 \quad -7 = 5t + \left(\frac{1}{2} \times -9.8 \times t^2 \right)$$

$$= -4.9t^2 + 5t + 7$$

$$\frac{-5 \pm \sqrt{25 + 137.2}}{-9.8} = \underline{1.810 \text{ s} = t}$$

Part 2

Black circle

$$x_i = 8 \quad x_f = 8$$

$$y_i = 8 \quad y_f = 2$$

$$a = -9.8 \quad \Delta y = -6$$

$$v_{ix} = 0 \quad v_{iy} = -9.8$$

Red Circle

$$x_i = 0 \quad x_f = 8 \quad \Delta x = 8$$

$$y_i = 0 \quad y_f = 2 \quad \Delta y = 2$$

$$a = -9.8 \quad t = .49$$

Black circle is in freefall
so no x movement and
 v_{iy} = gravitational constant.

$$2. 2 = v_{iy} \times .49 + \frac{1}{2} \times -9.8 \times .49^2$$

$$\underline{6.48 = v_{iy}}$$

$$3 \quad \Delta y = v_{iy} t + \frac{1}{2} a t^2$$

$$-6 = -9.8t + \frac{1}{2} \times -9.8 \times t^2$$

$$\frac{-4.9 \pm \sqrt{96.04 + 117.6}}{-9.8} = \underline{1.49 \text{ s} = t}$$

$$3. 8 = v_{ix} \times .49 + \frac{1}{2} \times -9.8 \times .49^2$$

$$\underline{18.73 = v_{ix}}$$