Friday, December 7/2
Physics 122/121

Due: Dec. 14/12 { Grad Write-Ups
Grad Surveys

Lab - SHM - Pendulum - Due Friday → Monday.

1. Projectile Motion

2. Text: Page 536, PP #1-8

3. Experiment 7.2 - Range of a Projectile (Lab Manual - Page 45)

* Sample calculations.

* Graph: T^2 vs L

$T^2 \rightarrow y$, $L \rightarrow x$

$$T = 2\pi\sqrt{\frac{l}{g}}$$

$$\left.\frac{T^2}{l}\right\} \Rightarrow \text{slope: } \frac{s^2}{m}$$

Circular Motion

Handout: Problems - Circular Motion

LEVEL 1 -> Packet (Banked and Unbanked Curves, Vertical Circular Motion)

Universal Gravitation

Experiment 8.1 - Kepler's Laws - Page 49

Chapter 12 - Page 580, PP#1-7

Investigation 12-A, Page 581

Handouts (3) - Kepler's Laws, Value of "g", Speed and Period of a Satellite

Simple Harmonic Motion

Text: Page 608, #1-4
Page 623, #23-27, 30 } Mass on Spring

Text: Page 614, #5-8
Page 623, #28, 29 } Pendulum

Answer to #5 is listed as #7's. Scan answers for others.

SHM - Pendulum Lab

Handout: SHM Problems

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Projectile Motion

projectile -> object launched into the air
-> moves in two dimensions

trajectory -> path taken by a projectile

horizontal motion -> constant (ignoring air resistance)

vertical motion -> constantly changing due to gravity

Simulation

http://www.mansfieldct.org/Schools/MMS/staff/hand/Lawsindependenceofhorizontalandverticalmotion.htm

Chapter 11 Projectiles and Circular Motion • MHR 533

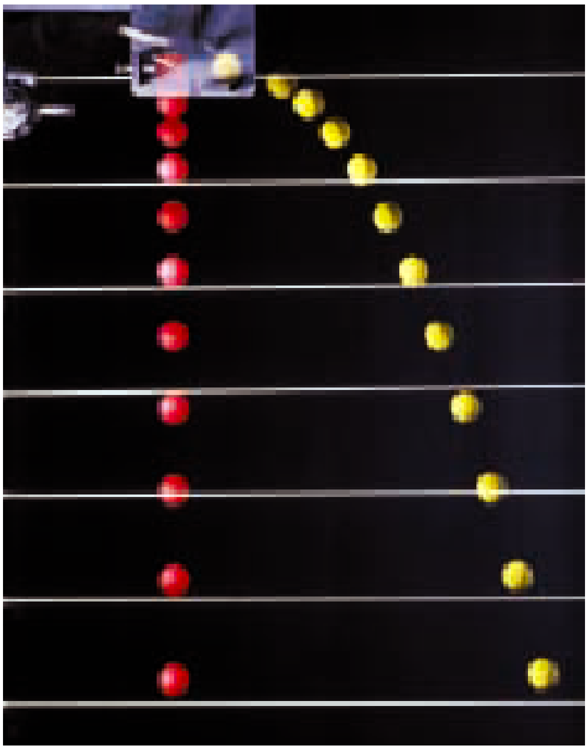
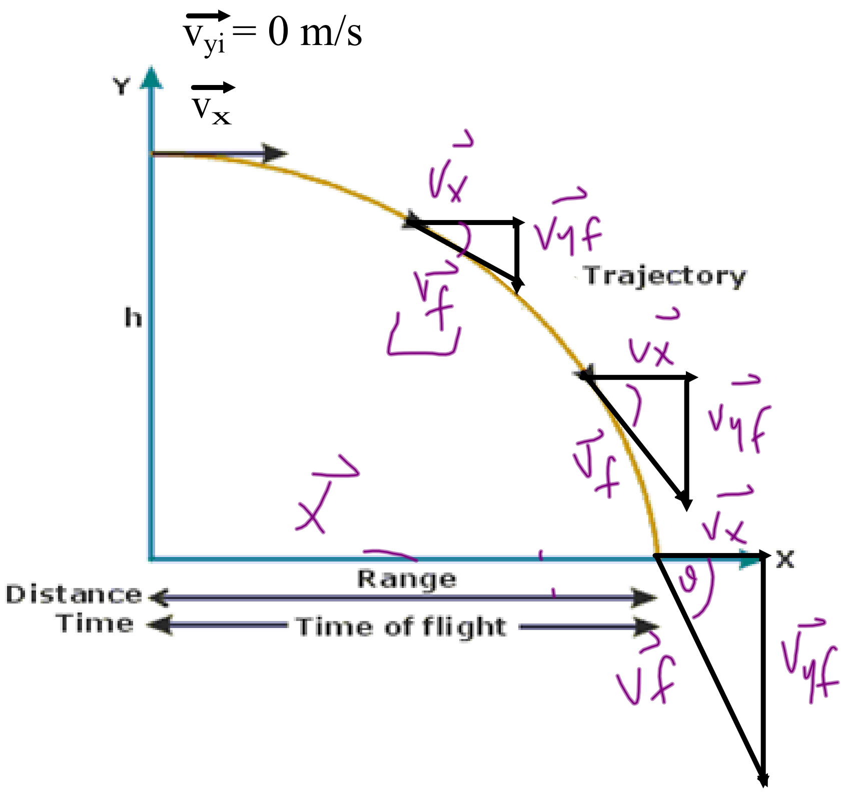


Figure 11.2 You can see that the balls are accelerating downward, because the distances they have travelled between flashes of the strobe light are increasing. If you inspected the horizontal motion of the ball on the right, you would find that it travelled the same horizontal distance between each flash of the strobe light.

Projectile Fired Horizontally



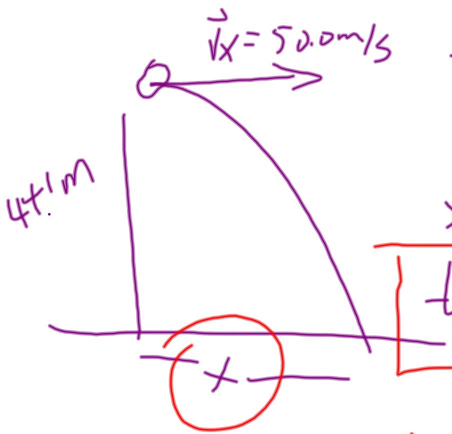
Projectile Launched Horizontally

Formulas

Horizontal Motion **CONSTANT**	Vertical Motion **CHANGES**
$\vec{v}_x = \dfrac{\vec{x}}{t}$	$\vec{y} = \vec{v}_{yi}t + \dfrac{1}{2}\vec{a}t^2$ $\vec{v}_{yf} = \vec{v}_{yi} + \vec{a}t$ $\vec{v}_{yf}^{\,2} = \vec{v}_{yi}^{\,2} + 2\vec{a}\vec{y}$
	$\vec{v}_{yi} = 0$ m/s $\vec{a} = -9.80$ m/s^2

Example: A projectile is fired horizontally from a height of 44.1 m at a speed of 50.0 m/s.

a) How long after it was fired, did the projectile hit the ground? (3.00 s)
b) How far forward did the projectile travel? (150 m)



horizontal	vertical
$\vec{v}_x = 50.0$ m/s	$\vec{v}_{yi} = 0$ m/s
$\vec{x} = ?$	$\vec{a} = -9.80$ m/s^2
$t = ?$ 3.00 s	$t = ?$
	$\vec{y} = -44.1$ m

a) $\vec{y} = \vec{v}_{yi} t + \frac{1}{2}\vec{a}t^2$

$t = \sqrt{\frac{2\vec{y}}{\vec{a}}}$

$t = \sqrt{\frac{2(-44.1)}{-9.80}}$

$t = 3.00$ s

WS.

b) $\vec{v}_x = \frac{\vec{x}}{t}$

$\vec{x} = \vec{v}_x t$

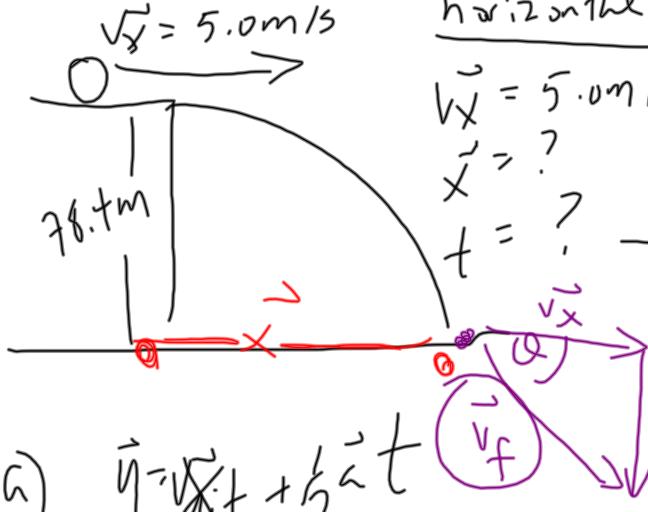
$\vec{x} = (50.0 \frac{m}{s})(3.00\ s)$

$\vec{x} = 150$ m.

WS

Example: A stone is thrown horizontally at a speed of 5.0 m/s from the top of a cliff that is 78.4 m high.

a) How long does it take the stone to reach the bottom of the cliff? (4.0 s)
b) How far from the bottom of the cliff does the stone land? (20 m)
c) What is the velocity of the stone as it hits the ground? (40 m/s, 83° S of E)



horizontal	vertical
$\vec{v}_x = 5.0$ m/s	$\vec{y} = -78.4$ m
$\vec{x} = ?$	$\vec{v}_{yi} = 0$ m/s
$t = ?$ —	$\vec{a} = -9.80$ m/s^2
	$t = ?$ —
	$\vec{v}_{yf} = ?$

a) $\vec{y} = \vec{v}_{yi}t + \frac{1}{2}\vec{a}t^2$

$t = \sqrt{\frac{2\vec{y}}{\vec{a}}}$

$t = \sqrt{\frac{2(-78.4)}{-9.80}}$

$t = 4.0$ s

b) $\vec{x} = \vec{v}_x t$

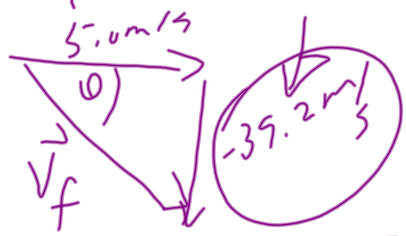
$\vec{x} = (5.0)(4.0)$

$\vec{x} = 20$ m

c) $\vec{v}_{yf} = \vec{v}_{yi} + \vec{a}t$

$\vec{v}_{yf} = (-9.80)(4.0)$

$\vec{v}_{yf} = -39.2 \frac{m}{s}$



$v_f = \sqrt{(5.0)^2 + (39.2)^2}$

$v_f = 40$ m/s

$\tan\theta = \frac{v_{yf}}{v_x}$

$\theta = 83°$

$\vec{v}_f$ 40 m/s, 83° S of E.

Text: Page 536, PP #1-8 HW

Exp. 7.2 p.45

Range of a Projectile.

wed - p6.