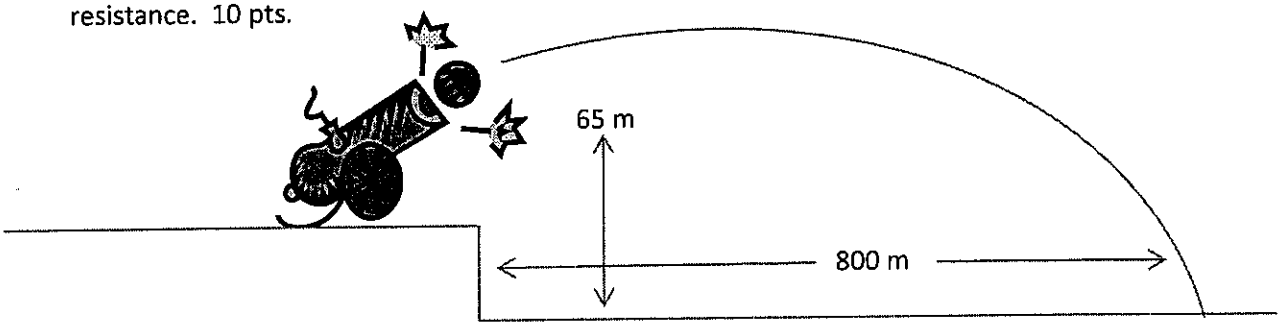
Chapter 4 practice Quiz A,B,C,D /25 Name: _____
UCONN Physics Date: _____ Period ____

Directions: Answer each problem, showing all your work and labeling all of your units!!!

1. In the diagram below, a shell is fired from a cannon on the edge of a cliff. The mouth of the cannon is 65 m above the level of a lake. The shell is observed to fall into the water at a distance of 800 m from the bottom of the cliff 6 seconds after the cannon is fired. Neglect air resistance. 10 pts.



a. Find the initial horizontal velocity of the shell. Ans = 133.33 m/s

$\vec{V}_H = \frac{S_H}{t} = \frac{800m}{6\,sec} = 133.33 m/s$

b. Find the initial vertical component of the velocity of the shell. Ans = 18.6 m/s

Up = +
Dn = −

$S = -65m$
$a = -9.8 m/s^2$
$t = 6.0\,sec$

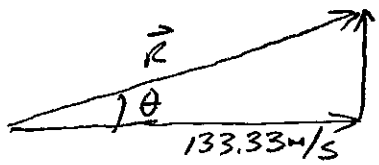
$S = V_0 t + \frac{1}{2} a t^2$

$-65m = V_0 (6sec) + \frac{1}{2}(-9.8 m/s^2)(6sec)^2$

$V_0 = 18.6 m/s$

c. Find the initial velocity of the shell when fired. Ans = 134.6 m/s @ 7.9°

$a^2 + b^2 = c^2$



$\tan\theta = \frac{18.6 m/s}{133.33 m/s}$

$\theta = 7.9°$

$\vec{R} = 134.6 m/s$ @ 7.9° Above Horizontal Ground

d. How high above the cliff does the shell rise? Ans = 17.65 m

Up = +
Dn = −

$V_0 = 18.6 m/s$
$V_f = 0 m/s$
$a = -9.8 m/s^2$
$S = ?$

$V_f^2 = V_0^2 + 2aS$

$S = 17.65 m$

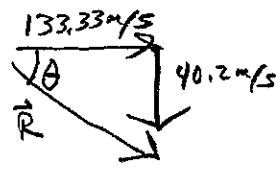
e. Find the velocity with which the shell strikes the water. Ans = 139.3 m/s @ 16.8°

$V_0 = 18.6 m/s$
$V_f = ?$
$a = -9.8 m/s^2$
$S = -65m$

$V_f^2 = V_0^2 + 2aS$

$V_f = 40.2 m/s$

∴



$\tan\theta = \frac{40.2 m/s}{133.33 m/s}$

$\theta = 16.8°$

$\vec{R} = 139.3 m/s$ @ 16.8° with respect to water

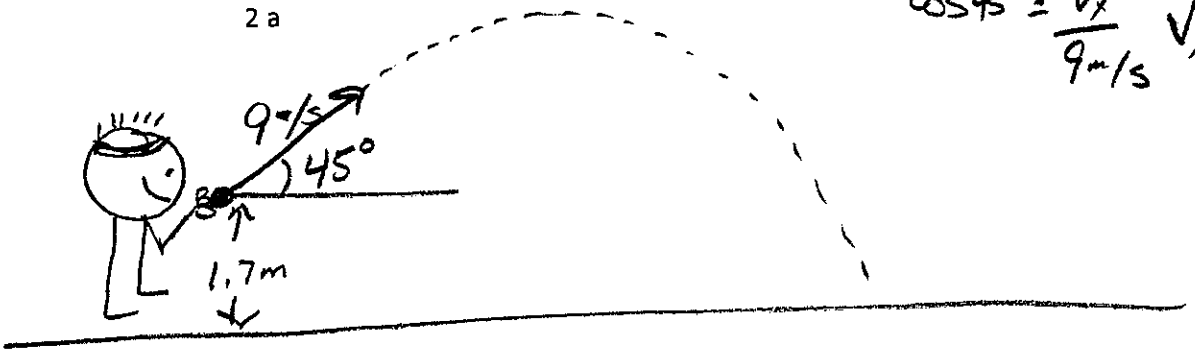
2. An athlete throws a shotput (mass 7.3 kg) with an initial velocity of 9 m/s at a 45 degree angle to the horizontal. Calculate the horizontal distance traveled. The shot leaves the shotputter's hand at a height of 1.7 m above the ground. 10 pts. Ans = 9.6 m

$$x = \frac{-b +/- \sqrt{b^2 - 4ac}}{2a} \qquad ax^2 + bx + c = 0$$

a) solve V_x & V_y

$\sin 45° = \frac{V_y}{9\,m/s}$ $V_y = 6.4\,m/s$

$\cos 45° = \frac{V_x}{9\,m/s}$ $V_x = 6.4\,m/s$



b) Solve time IN the AIR USING quadratic formula.

$V_y = V_0 = 6.4\,m/s$ $s = -1.7m$

$a = -9.8\,m/s^2$ $t = ?$

USE Quadratic TO solve for Time

$t = 1.5\,sec$

c) $\bar{V}_H = \frac{S_H}{t}$ $S_H = \bar{V}_H \cdot t$ $S_H = 6.4\frac{m}{s} \times 1.5sec$

$S_H = 9.6\,m$

3. Draw the Free-Body diagram for the Box allowed to slide down the below incline. Label F_x, F_N, F_w, F_{fr}. Draw the right triangle with dotted lines to show F_N', and F_x added together vectorally. 5 pts.