Version A

Name: Date: Period: Score: /41

Honors 2D Kinematics Test

$\Delta x = v_i t + \frac{1}{2}at^2 \qquad v_f^2 = v_i^2 + 2a\Delta x \qquad v_f = v_i + at$

Circle the best or most correct answer to the questions below and enter it into the clicker system. Each question is worth 2 points.

1. A soccer ball is kicked with a velocity of 25 m/s at an angle of 37° above the horizontal. What is the vertical component of the acceleration as it rises along its trajectory?
   A. 9.8 m/s² downward
   B. (9.8 sin 37°) m/s² upward
   C. (9.8 cos 37°) m/s² downward
   D. (9.8 sin 37°) m/s² downward
   E. 9.8 m/s² upward

2. At what angle should a water gun be aimed in order to have the greatest horizontal range?
   A. 0°
   B. 30°
   C. 45°
   D. 60°
   E. 90°

3. A bullet is fired horizontally, and at the same instant a second bullet is dropped from the same height. Ignore air resistance. Compare the times of fall of the two bullets.
   A. the fired bullet hits first
   B. the dropped bullet hits first
   C. they hit at the same time
   D. cannot tell without knowing the masses

4. Ignoring air resistance, the *horizontal* component of a projectile's velocity
   A. is zero
   B. remains constant
   C. continuously increases
   D. continuously decreases

5. Ignoring air resistance, the *vertical* component of a projectile's velocity
   A. is zero
   B. remains constant
   C. continuously increases
   D. continuously decreases

6. A pilot drops a care package from a plane flying horizontally. When the package hits the ground, the horizontal location of the plane will
   A. be behind the package
   B. be over the package
   C. be in front of the package
   D. depend on the speed of the plane when the bomb was released

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Fill in your answers in the space provided. Show all your work neatly and box in your final answer where appropriate. As always, pay attention to sig figs and units. Good luck!

7. A 25.8 g ball is rolled off a 90. cm tall table. Students observe the ball take an average of 0.60 seconds to travel 1.5 m on the flat portion of the table before rolling off. Use a straight edge for the graphs.
   a. How long is the ball airborne? *2 pts*

$0.9m = \frac{1}{2}(-9.8 m/s^2)(\Delta t)^2$

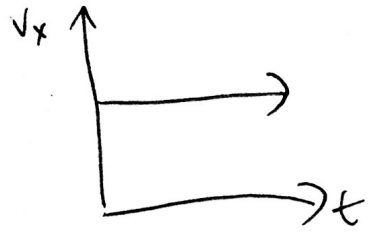
$\Delta t = 0.43 sec$

b. What is the range of the ball? *2 pts* $V_x = 2.5$ m/s

$v_x = \frac{\Delta x}{\Delta t}$ $\Delta x = 1.08$ m

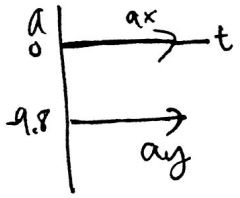
1.1m

c. Graph the horizontal velocity vs. time. *3 pts*



d. Graph the vertical velocity vs. time. *3 pts*

e. Graph acceleration vs. time (a_x and a_y on the same graph) *3 pts*



f. Graph y-position vs. x-position with at least four points. Use the table to organize data for the four different x- and y-positions at four different times. *4 pts*

time (s)	x-position (m)	y-position (m)

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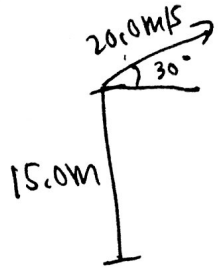
8. A cannonball is launched from a height of 15.0 m at a speed of 20.0 m/s at 35.0°.

a. Neatly draw a picture with all the given information labelled. *3 pts*



$V_x = 16.4 m/s$

$V_y = 11.5 m/s$

b. What is the maximum height reached? *2 pts*

$V_{fy}^2 - V_{iy}^2 = 2a\Delta y$

6.7m

c. How long is the cannonball airborne before reaching the ground? *2 pts*

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

$-15m = (11.5m/s)(\Delta t) + \frac{1}{2}(-9.81 m/s^2)(\Delta t)^2$

$t = 3.28 sec$

d. How far has it traveled horizontally? *2 pts*

$V_x = \frac{\Delta x}{\Delta t}$

$\Delta x = 53.8 m$

e. Determine the final total velocity as the cannonball reaches the ground. *3 pts*

$V_{fy} = V_{iy} + a\Delta t$

$= 11.5 m/s + (-9.8 m/s^2)(3.28 sec)$

$= -20.6 sec$

$V_{tot} = \sqrt{(-20.6 m/s)^2 + (16.4 m/s)^2}$

$V_{tot} = 26.4 m/s$

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