## Projectile Physics – H Physics 1 10/2/18 NAME:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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**Some ‘science facts’ to keep in mind:**

 An object in ‘free fall’ is accelerating only because of gravity, plus what ever velocity
 it initially had to set it flying. An object traveling upward is still in ‘free fall’.

 Vectors that point up are positive; vectors that point down are negative.
 - The y-axis is associated with up/down vectors
 - Displacement, velocity, force, and acceleration are the important vectors.

 Usually we’ll let vectors that point to the right be positive, and left negative.

 Objects in free fall will accelerate at a rate of 9.8 m/sec2 regardles of their mass or size.
 Since the acceleration is always down (towards the Earth), we’ll use -9.8 m/sec2 for *a*.
 The number -9.8 m/sec2 is so important that it gets its own symbol, g: *g=-9.8 m/sec2*

**Use the PhET simulation ‘Projectile Motion’, and your knowledge of vector components to answer these questions:**

If an object is dropped from some height, what is it’s initial velocity in the y-direction? In the x-direction?

If you knew the height, could you find an equation for the time until it hits the ground (fall time)?
Could you find an equation for the final velocity? (Vf is the moment before it hits the ground)

 Use the kinematic equations to find expressions for fall time and final velocity.

If you fire a cannonball horizontally, what are the important variables that determine how far it will fly before hitting the ground (the range)?



**Simplifying Assumption**: If we assume there is no ‘drag’ or air resistance, then horizontal velocity is constant, but vertical velocity is always changing.

Turn on the ‘show vectors’ and watch how the vx and vy change during the object’s flight. When is Vy the largest smallest? When is V (the total velocity) largest?

Does changing vi for a horizontal cannonball affect the flight time? (Use the measurement tools to be sure; your intuition is probably wrong.)

Since vx is constant, could you develop an equation for the range (∆x for the landing spot?). What would be the important input variables for the range? Could you develop a formula or equation for the range of a horizontally fired projectile, given Vi and the height ∆y?