**Using PhET Interactive Simulations Name(s): Date:**

1. **Type “PHET” in the search engine. Select University of Colorado web page.**
2. **Type “projectile” into the search engine on the web site. Select “projectile motion”.**
3. **Select “Run Now”.**
4. **Copy the default settings for angle, initial speed and mass.**
5. **Look at the top of the screen. Which variables are calculated by the program?**
6. **What variables can be changed by the user?**
7. **List the different objects that can be fired from the cannon.**
8. **Launch the cannon ball at a speed of 10 m/s at an angle of 35o. Launch the cannon ball after changing the mass from the default setting of 2 kg to 6 kg and then 8 kg. Record the range each time. What effect does the change in mass have on the range of the projectile?**
9. **Find the angle of launch that gives the greatest range. Record that angle here.**
10. **Launch an object at 15 m/s, 65o. Record the height upon landing. If the height is negative, give an explanation for this.**
11. **Use the tape measure to measure the height of the projectile in #10 at its highest (maximum) point. Record the maximum height here.**
12. **Look at your “Solving projectile problems” page of notes. What equation can be used to calculate the horizontal displacement of a non-horizontally launched projectile?**
13. **On the PHET program, what is the horizontal displacement called?**
14. **Look at your “Solving projectile problems” page of notes. What equation can be used to calculate the vertical displacement of a non-horizontally launched projectile?**
15. **On the PHET program, what is the horizontal displacement called?**
16. **Drag the cannon up to a height of around 10m. Use the tape measure to set the height. Set the angle to 0o. Choose a launch speed and an object. Sketch your set up and include the speed in your sketch. Launch the object and record the range in your sketch.**
17. **Since you cannot use the parallelogram method to determine the components of the initial velocity vector, what 2 equations do you use to determine the x and y velocity components of a projectile?**
18. **Drag the cannon back down to the ground level and select an angle for a launch. Choose an angle between 15 and 75o.**
    1. **Sketch your setup in the space below. Label your launch angle.**
    2. **Launch the projectile you choose at an initial speed of 22 m/s.**
    3. **Determine the vertical and horizontal components of the projectile.**
    4. **Record the range of the projectile for the program.**
    5. **Write down the equation used to solve for the range. Fill in the variables with numbers from the program.**
19. **Drag the cannon up to a height of around 13m. (Use the tape measure to set the cannon height!) Choose an initial speed between 10 and 40 m/s. Make sure the angle is 0o.** 
    1. **Determine the horizontal and vertical components. Show your equations.**
    2. **Calculate the range, height (distance) and time in the air. You must show your work**
    3. **Check your work with the program.**
20. **Drag the cannon back down and choose and initial speed between 5 m/s and 25 m/s. Choose a launch angle between 5 and 75 degrees.** 
    1. **Determine the horizontal and vertical components. Show your equations.**
    2. **Calculate the range, height (distance) and time in the air. You must show your work**
    3. **Check your work with the program.**