Projectile Motion Activity: Introduction to Projectile Motion *(Using the Phet simulation)*

Success Criteria: Students will be able to

- Predict how varying initial conditions effects a projectile path
- Use reasoning to explain the predictions.
- Describe all the vectors acting on a projectile during its flight
- Try making predictions based on calculations, to test the accuracy of the simulation (do SUVAT equations apply?)

Open the link to the projectile motion simulation:
http://www.physicstutoronline.co.uk/projectile-motion-simulation/

1. One day after school, you are enjoying a drink in the park with friends. When the can is empty, you decide to throw it in the waste bin. What factors effect whether or not it lands in the bin?

2. Use *Projectile Motion* simulation to test your ideas about the things that affect the landing location of a projectile.

- Make a complete list of things that affect the landing site of a projectile including your ideas from question #1 above and any discoveries you made using the simulation.
- Next to each item, briefly explain why you think the landing location changes.
- Compare your list with another group, discuss your explanations and make modifications

3. Draw the flight path of your drink can and describe the shape. Use the simulation to investigate how the items you listed in #2 affect the shape of the flight path. Summarize your discoveries including explanations for the different flight paths.

4. Label all the vectors acting on a projectile at different stages of flight. Remember the length of arrow indicate the relative size of the vector. The simulation allows you to add the velocity and acceleration vectors, so use this to help with the diagram. You should also add force vectors (ignore air resistance).

5. Use SUVAT equations to make predictions for the horizontal range of projectiles launched at different angles and speeds. Does the simulation work as predicted? Show your working clearly

- Calculate the horizontal range when the initial velocity is 25m/s and the launch angle is 20 deg to the horizontal. Test your predicted value using the simulation. Does the simulation agree?
- Try for at least 2 other combinations of launch velocity and angle.

6. Describe why using the simulation is a good method for studying projectiles. Clearly identify the error sources the simulation eliminates or minimizes. What are the limitations of simulations?