| Name | Period | Date |
|---------|--------|----------------|
| Physics | | Mr. Bartolotta |

Lab # - Free Falling Bodies (Projectiles Part I) - 90 minutes



Introduction and Purpose: Under the influence of gravity, free falling bodies are excellent real life examples of one (or two) dimensional motion with *constant* acceleration. In this investigation, we will use what we know about one dimensional kinematics with constant acceleration to analyze the motion of air powered rockets and determine their initial velocities, final velocities (velocity as a function of time), maximum heights and time of flights. Since we are starting with one dimensional motion (straight line motion) The rockets will only be launched vertically upward (as vertical as possible). We will later use these same results to analyze the projectile (two dimensional) motion of these rockets when they are launched at different angles.

Materials: stopwatch, air rocket, air pump

Safety Precautions: (1) Beware of Falling objects! Do not try to catch the rockets (2) Try to separate from other groups as much as possible (3) Do no stand or lean over rockets while pumping for obvious reasons (duh!) (4) Try to launch rockets straight up only. (5) Eye protection MUST be worn at all times in this lab.

| Background information: | ∧ maximum height |
|-------------------------|------------------|
| time up | time down |
| ground | |
| | |

Procedures: To determine the maximum height and velocities of the air rockets (technically not rockets) only the time of flight is needed. That is, the time from the moment of takeoff to landing back on the ground. For the launching of the rockets which will be done on the football field, follow the procedures shown to you by your teacher very carefully. Four different valves are available for the rockets pertaining to the rocket's altitude: low, medium, high, and super. We will use each of them for comparison. Measure the time the rocket remains in the air for each valve. More than one trial per valve is a must (3 is good, more is better). Eye protection MUST be worn at all times in this lab.

<u>**Observations</u>**: Create a data table for recording all your data and be sure to include a sample calculation for any calculated quantities. Being good scientists you obviously know more than one trial should be performed for each valve.</u>

Analysis and Questions :

1. Use the kinematic equations to determine the initial and final velocities , and the maximum altitude attained by the rocket for each trial. Put these values into your tables.

2. Generate data and create graphs that show the rockets velocity, altitude (displacement) and acceleration as a function of time for the Medium trial only (3 separate graphs!).

3. What type of data or information did we omit or assume had no effect on our results. Did these factors actually effect your answers? Explain.

<u>Conclusion</u>: Remember to discuss specific results and trials from your data! Also: sources of error, possible improvements in data collection, graph analysis and possible applications.