Motion at Constant Acceleration

Student's Name

Instructor's Name

Course

Institution

Due Date

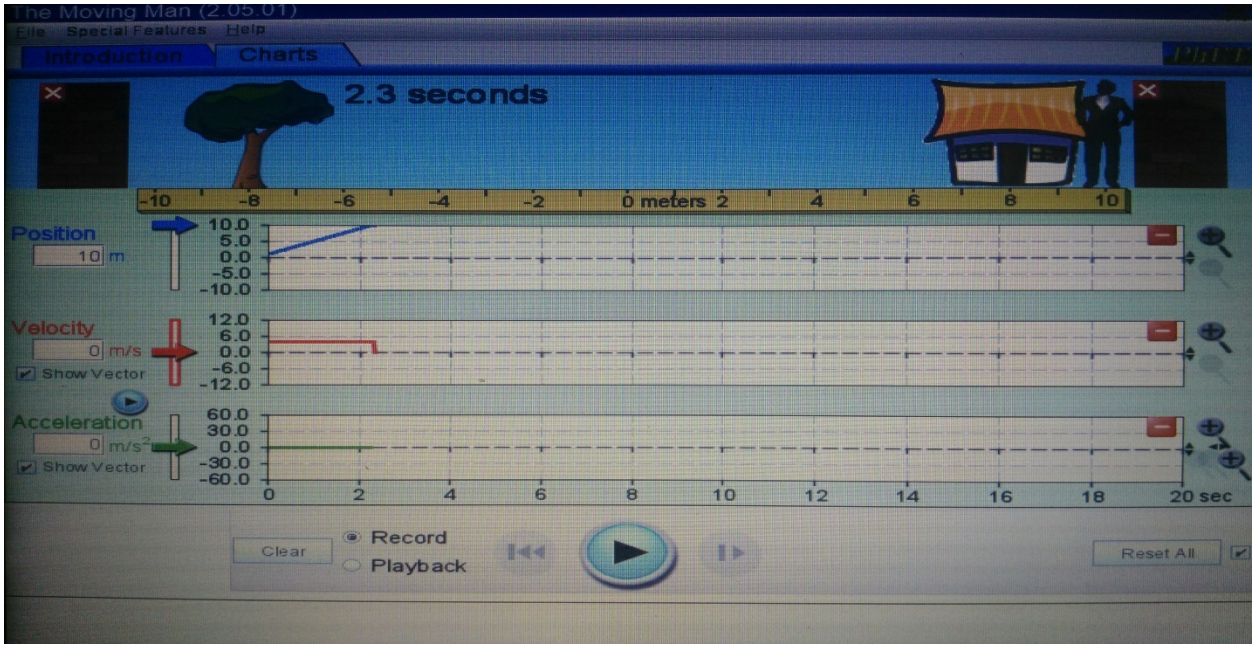
Part I: Motion at Constant Acceleration along a Straight Line

Part I: Motion at Constant Velocity

Exercise 1:

1. Initial position =1m

   Initial velocity = 4m/s



3. The equation for the motion is x (t) = 1+4*t

5. **Determination of time using equation**

   Initial position x (0) = 1m

   Final position [x (t)] = 10m

   Equation for motion x (t) = 1+4*t

   Substituting for the values of x (t) in the equation

   10 =1 +4*t

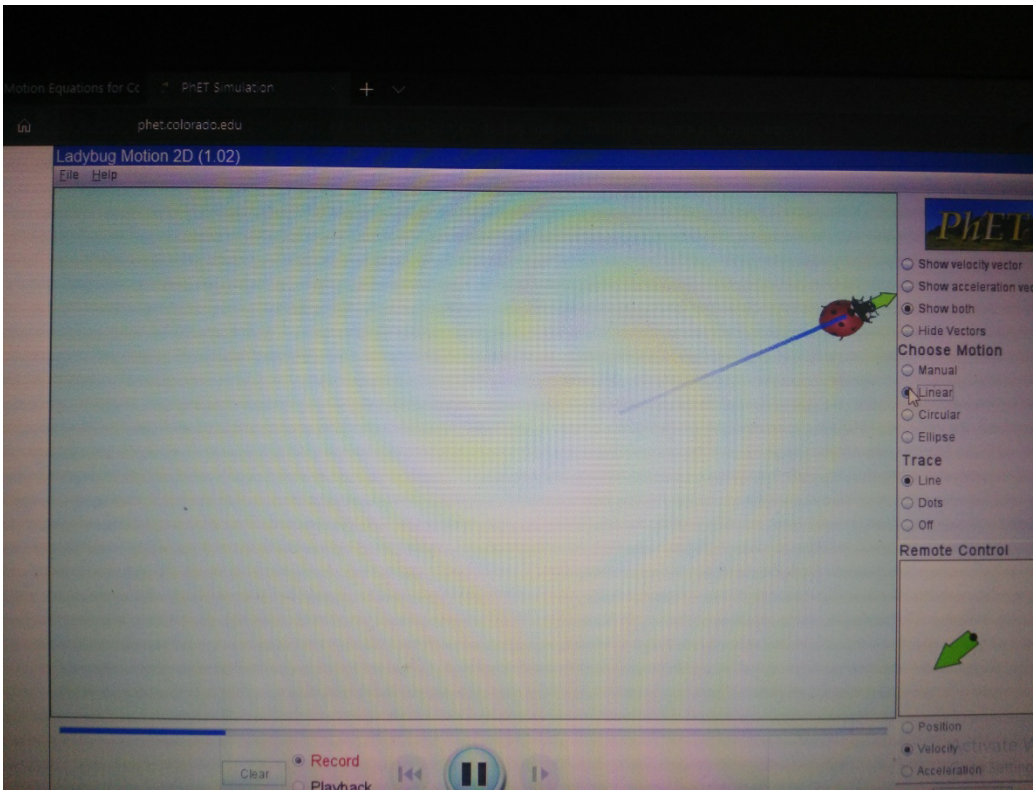
   10-1= 4*t

   4*t =9

   T= 2.25seconds

6. Qualitatively, the velocity is constant and the acceleration is zero. Both the acceleration and velocity occur in the same direction since the movement is along a horizontal plane.

Exercise 2

1. 

2. In the motion of ladybug, there is only a single segment of constant velocity in the screenshot since the ladybug is moving in a straight line at constant acceleration. On bouncing from the wall, the direction of acceleration differs from that of the velocity both of which appear at an angle to one another. Velocity after bouncing from the wall is negative due to a decrease in the acceleration.

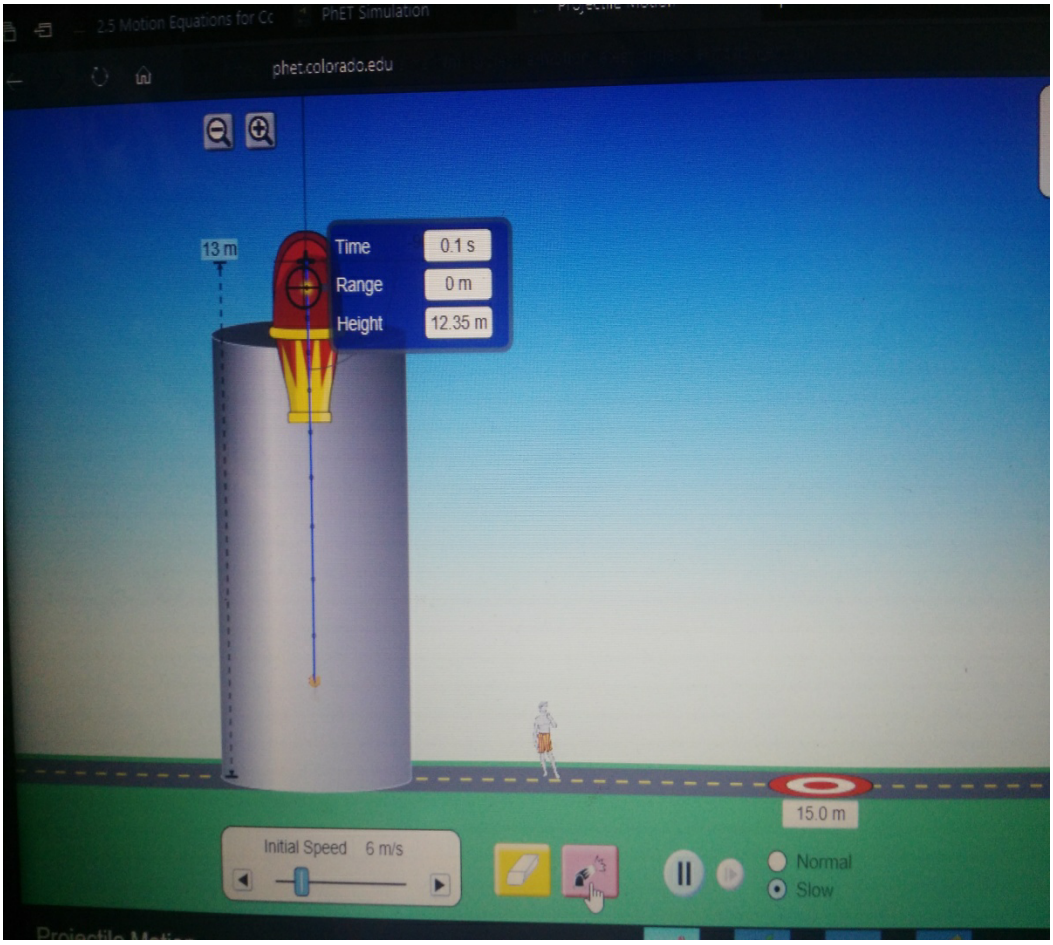
Part II: Motion at Constant Acceleration

Exercise 3

1. Initial height =13m

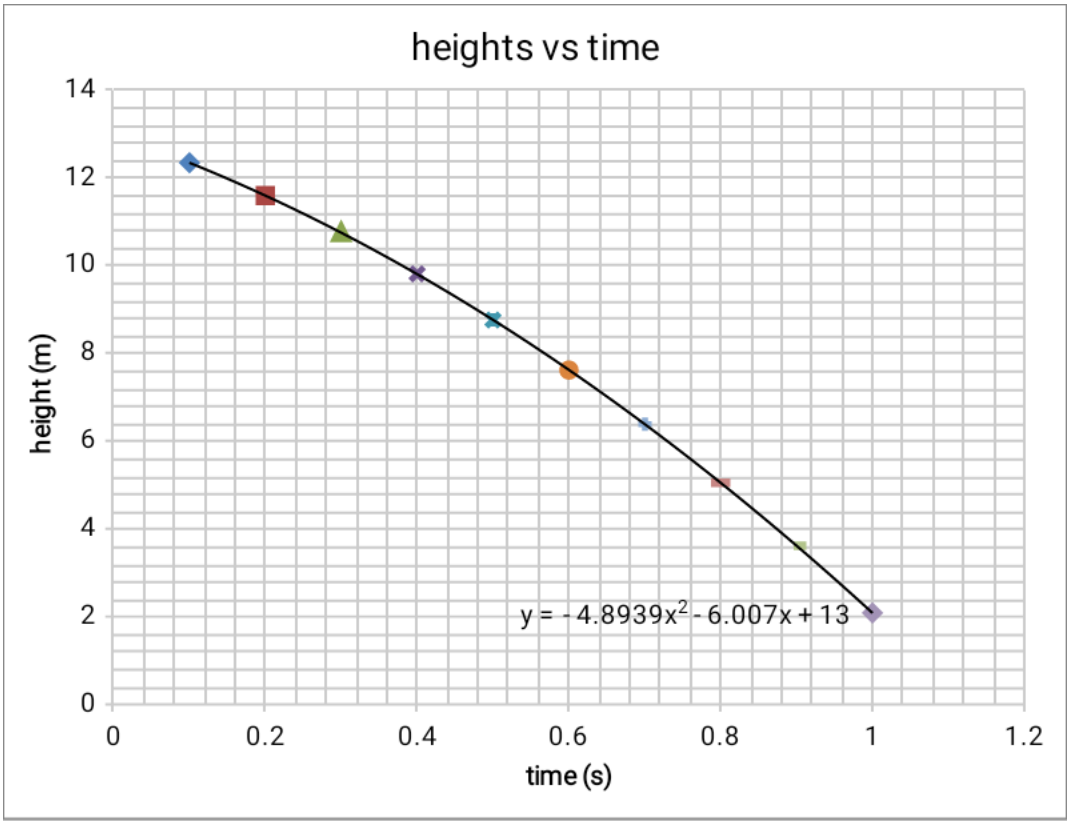
   Initial seed = 6m/s

2. The velocity and the direction are pointing in the same direction downwards.

3. 

Times	Heights
0.1	12.35
0.2	11.6
0.3	10.76
0.4	9.82
0.5	8.77
0.6	7.63
0.7	6.4
0.8	5.06

0.9	3.63
1.0	2.1



7. $y(t) = 13 - 6*t -4.9t^2$

8. Excel graph

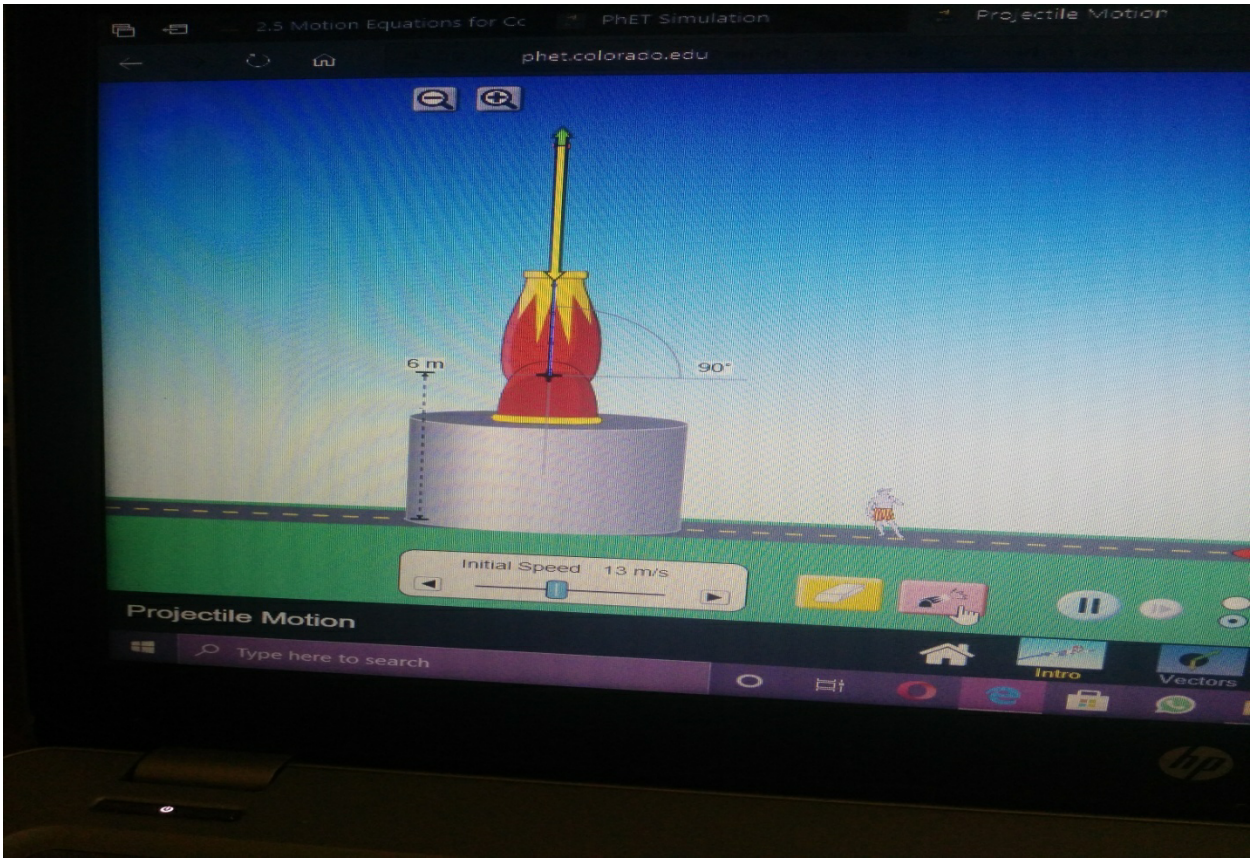
9. The values from the simulation match those which are generated from the equation with the only difference being in the number of decimal places. When these values are plotted on a different graph, the curve produced show a similarity with that of the values obtained from the simulation.

10. Graph

11. There would be no change simulation results if a small object was used. This is because the object will still be under influence by the same gravitational acceleration which is constant.

Exercise 4

1. The direction of velocity changes during the motion. In the first phase velocity is upwards and after attaining maximum height the velocity is directed downwards. The acceleration however is has a single direction throughout the motion which is downwards. When compared throughout the motion, the velocity and acceleration are different.

2. 

3. **Highest point**

   Height =14.61m

   Time= 1.33seconds

4. **Lowest point**

   Height =0m

Time =3.05seconds

5. **Equation**

   $y(t) = 6 + 13*t - 4.9t^2$ for upward movement.

   $y(t) = 6 - 13*t - 4.9t^2$ for free fall movement

6. Graph

7. Graph

8. Graph.

9. The time and height for highest point correspond to those from the simulation.

10. Values of time and height for lowest point are also correspondent to those of simulation.

11. Excel

12. The values from the formula and simulation match correctly except for the difference in decimal points in the values.

13. Graph

14. $V_2^2 - V_1^2 = 2a(y_2 - y_1)$

    $(13^2 - 0) = 2*9.8(14.61-6)$

    $169 = 168.756$

    The values make sense because we can also relate position with the velocity without considering time and the motion is at constant acceleration.