Name:

Date:

School:

Facilitator:

6.01 Shooting Scene Evidence (35 Points)

# Projectile Motion Simulation

Use the simulation linked in the Task section to complete the following questions.

When the simulation opens, choose “Lab”

1. Starting with the default settings and only changing the velocity, hit the target. At what velocity were you able to hit the target? (include units) (2 points)
2. Check the air resistance box and fire the cannon at the same velocity used above.

a. What is the effect of air resistance on the motion of the projectile? (2 points)

b. What velocity is necessary to successfully hit the target under these conditions? (2 points)

3. Uncheck the air resistance button and slide the gravity button to 7.0 m/s2.

a. Describe what happens when you fire the cannon. (1 points)

b. Why do you think this is? (2 points)

c. What velocity is necessary to successfully hit the target under these conditions? (2 points)

4. Create 2 unique scenarios that successfully hit the target by significantly changing two or more of the conditions from the default. (2 points per scenario)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Scenario | Height | Angle | Initial Speed | Mass | Other factors |
| 1 |  |  |  |  |  |
| 2 |  |  |  |  |  |

5. Based on this simulation and what you learned in the lesson, name three factors that affect the motion of bullets and describe the effect that each has. (2 points each)

a.

b.

c.

# Analyzing Evidence

****Investigators are test firing a gun to see the maximum distance at which the gunpowder residue pattern in question could have been produced. They fire the weapon three times each from three different distances.****

They perform both the Griess and sodium rhodizonate tests on the impacted fabrics with the following results.

|  |  |  |  |
| --- | --- | --- | --- |
| Distance (Feet) | Trial 1 | Trial 2 | Trial 3 |
| 5 | present | present | present |
| 6 | present | not present | present |
| 7 | not present | not present | not present |

6. The Griess Test reveals the presence of       and the sodium rhodizonate test detects      ; both are present in gunpowder. (1 point each)

7. What is the maximum distance from which this gun could have been fired? Explain. (2 points)

An assassination attempt was made on a government official while he was giving a speech at an outdoor ceremony. The official dodged the bullet, which passed through the podium he was standing behind. They believe the shot was fired from a nearby hotel window. Use the following information to determine from which floor the shot was fired.

The distance to the hotel is 120 feet. The angle of impact was 27 degrees. The bullet hole on the podium was 4 feet off the ground.

8. Draw lines and label the diagram below with the information given. (3 points)

|  |
| --- |
| *Draw lines and add labels to the diagram below:* |
| Lecturer with solid fill |

9. Calculate the distance above the ground where the shot was fired. Be sure to show how you arrived at your answer. (5 points)

|  |
| --- |
| *Show your calculations below:* |
|  |

10. Which floor do you think the shooter was most likely standing on when firing the shot? The average height of each floor is approximately 9.5 feet. (2 points)

|  |
| --- |
| *Show your calculations below:* |
|  |