Blood Spatter Pattern Analysis

One technique used by crime scene investigators is the analysis of stains left by blood shed at crime scenes. If a scientist understands the dynamics of how blood behaves when it exits the body and how it reacts when it contacts a surface, then an attempt can be made to understand the circumstances behind the presence of the blood spatter and to determine whether a crime has occurred. As a trained scientist, you will look at patterns of shed blood, measurement of blood droplets and drawings or photographs of potential crime scenes to determine what may have occurred. Blood stains cannot always be moved back to the lab so it is important that you keep good records of all of the evidence that you find at the scene.

The shape of a blood drop can indicate the distance from which the blood fell and the angle of its impact. Very few studies have been done to determine the patterns that blood makes as it impacts a surface. Therefore, a thorough scientist will conduct investigations to collect their own data regarding shape of blood droplets. When a droplet is falling, it is primarily spherical in shape, and the smaller the drops, the more spherical their shape will be during the fall.

If you examine a blood droplet that has struck a surface at a 90 degree angle from the surface, the droplet is generally round. Straight-on impacts on hard, smooth surfaces produce round droplets with smooth edges. ● Higher velocity impacts or impacts on rougher surface produce drops with more ragged edges.

Drops with ragged edges have fallen at high velocities.

Drops that fall at angles greater than 90 degrees are elongated in shape.

Blood droplets can be produced in several ways. A droplet that forms slowly, as from a dripping wound, has a volume of 0.05 ml. Smaller droplets are produced during active situations, such as fights or beatings. Blood drops that appear to have come from an aerosol spray have come from a powerful force such as a gunshot or an explosion.

Now it's time to generate your own set of blood spatter patterns that you can compare to the evidence found at your crime scene.

Supplies:
You will need a dropper bottle containing simulated blood, metric measuring tools, paper, protractor, string, and a clip board.

Part 1: Simulating Blood Droplet Patterns from Various Heights:

1. Label 6 sheets of paper as follows 15 cm, 30 cm, 45 cm, 60 cm, 75 cm, and 100cm. The paper will serve as the target for your vertical blood drop measurements.

2. For the first paper, hold the dropper bottle upside down in a vertical position so that the dropper end is 15 cm from the target (paper).

3. Gently squeeze the dropper so that only one drop is released, make sure the height is correct and that the drop lands on the paper.

4. Place the paper on the table to dry.

5. Repeat the blood dropping process with each of the other measurements. Make sure that you are the correct distance from the target **before** you simulate your drop pattern.

6. When the drops are dry measure the circular portion of the drop. If the drops are ragged, DO NOT measure the edges. Record your data in the following table. Save all data sheets for later reference.

Simulating Blood Droplet Patterns from Various Heights:

Height of Blood Drop Data Table:

Height of Blood Drop	Diameter of Drop in mm	Sketch of Blood Drop Or insert picture
15 cm		
30 cm		
45 cm		
60 cm		
75 cm		
100cm		

Simulating Blood Droplet Patterns from Various Heights:
Analysis Questions:

1. How are blood drops falling from different heights alike? How are they different?

2. How do large volume and the single/multiple volume of blood patterns compare to each other?

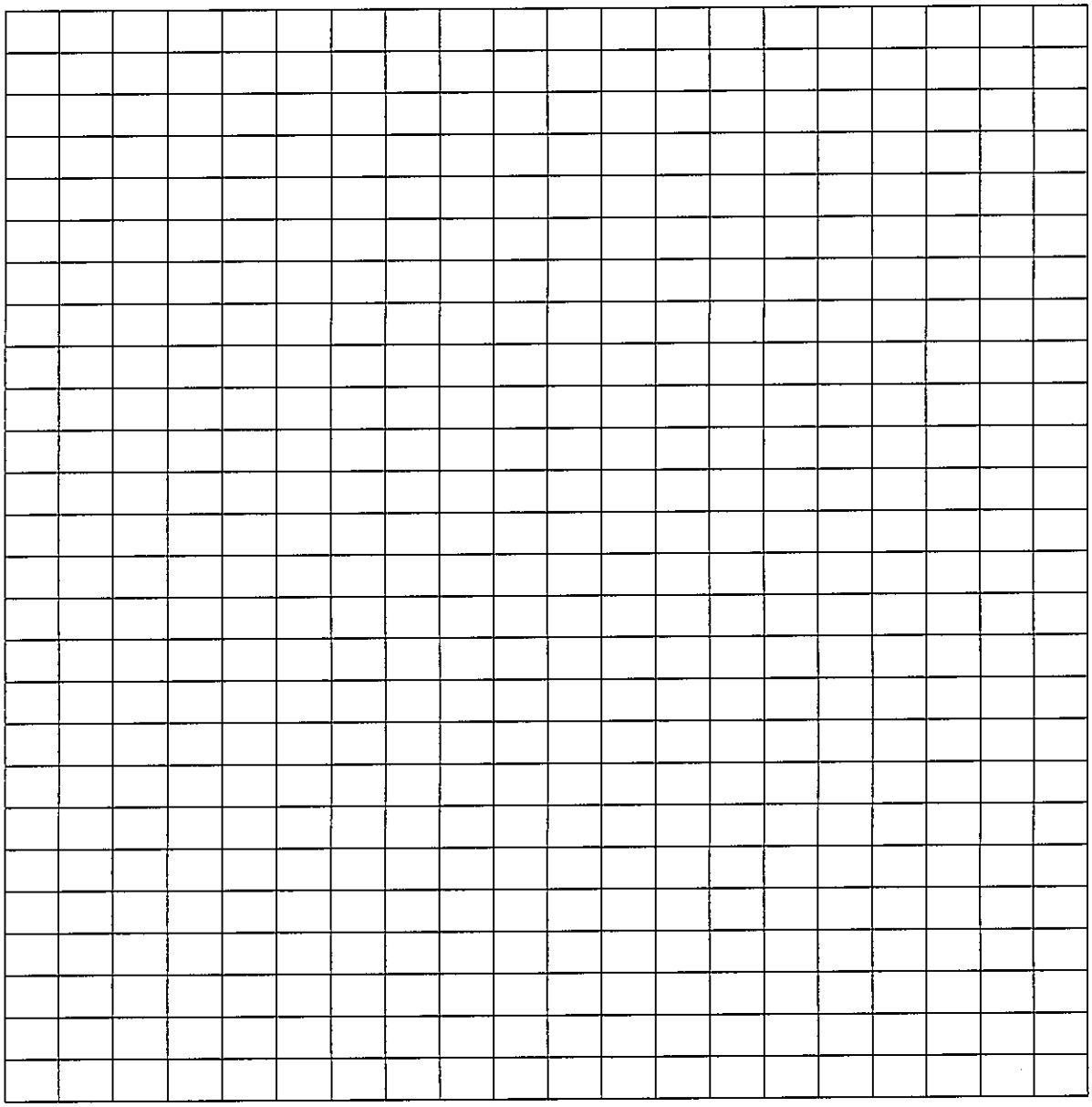
3. On the next page, draw a line graph using the data that you have gathered to generate a predictive line graph that illustrates the drop height vs. blood drop diameter.

4. From your graph, predict the distances of fall of the following drops: a drop of diameter 8 mm; 14 mm; and 18 mm.

5. Describe your observations of the blood cast-off patterns from different distances. How else might cast-off patterns be generated if they do not come from a weapon?

Simulating Blood Droplet Patterns from Various Heights:

X Axis = Height of blood drop
Y Axis = Diameter of blood spatter



Part 2: Impact angles

1) Attach a string to the eyehole of the clipboard clip, and loop the other end through the ring on the ring stand.

2) Using the protractor raise the clipboard exactly to 15° and hold the string so the angle remains constant.

3) Drop one drop of blood on to the target paper from a height of 30cm.

4) Allow the droplet to dry for a few minutes and then measure its length and width.

5) Repeat this procedure for 30°, 45°, 60°, and 75°.

6) Use the formula Angle of impact = Arc Sin (Width/Length) to see how close your calculate angle is to the actual angle of impact.

Angle (Actual angle of impact)	Width	Length	Arc sin (W/L) (Calculate angle of impact)
15°			
30°			
45°			
60°			
75°			

Questions:

1) How accurate were you in determining the angles of impact for each trial?

2) How would you account for any differences between your actual angle of impact (Protractor) and your calculated angle as determined by your clipboard setup?

3) Provide and explain an example of how knowing the actual angle of impact could help investigator solve crimes.

Part 3: Directionality - Horizontal Movement - Walking

1) Set up approximately 6-8 feet of newsprint (lengthwise) in the hallway. Tape the pieces of newsprint together.

2) Have a blood filled dropper in your hand with your arm extended over the newsprint. The dropper should be facing down at a 90° angle.

3) Slowly depress the dropper as you walk at a normal speed from start to end of the newsprint path.

4) Analyze the droplet size, shape, and spacing between droplets.

*** Practice first doing some "Dry Runs" without blood.

Questions:
1) List and describe 2 factors that affected the size, shape, pattern, and spacing distance between each of the droplets