**Blood Stain Shape and Impact Angle**

**Background:**

The overall shape of an individual blood spot is relative to the angle in which it struck a particular surface. The theory behind bloodstain pattern analysis is simple: blood is a fluid and will respond accordingly to the laws of physics. Bloodstain pattern analysis is not typically powerful enough evidence to convict a criminal, but it can be very useful in reconstruction of the events leading up to and immediately following the commission of a crime. In this exercise you will be dropping individual blood drops onto horizontal surfaces at set angles. The angles of the horizontal surfaces in this experiment vary from 90˚ to 10˚ increments. You will deposit drops of blood onto cardboard targets at these set angles and observe the elliptical shape that results from each angle. The elliptical shape of the stains elongates as the angle of impact deceases from 90˚ to 10˚. At a 90˚ of impact the stain will be circular. The surface texture that the blood drop impacts will also have an effect on the stains outer edge characteristics, which in turn, may affect our ability to accurately calculate its impact angle. In order to observe the distortion that varied surface textures may have on the shape you would want to run a known set of drops for the surface your blood was found on. You will be testing blood on paper in the lab today positioned on inclined planes to represent the angles. After the stains have dried you will be able to calculate the stains width to length ratios and associate them with their respective angles.

**Knowledge Probe:**

1. What are cohesion and adhesion?
2. Why does most blood stay in one drop when it hits a surface?
3. Why does some blood keep moving in the direction it was traveling?
4. How can you use the “tail” of the blood drop to determine the direction in which the drop was traveling?

**Question:** What is the relationship between the shape of a blood stain and its impact angle?

**Investigation Plan:**

1. Tape one end of the clipboard to the table making a hinge.
2. Hold the protractor to the edge of the clipboard so it is perpendicular to the table and the center (0 point) is at the edge of the clipboard. See Figure 1.
3. Start with the 90˚ angle (the board is lying flat). Place a card/paper onto the clipboard and label it 90˚.
4. Using the simulated blood hold the dropper upside down about 30cm and allow a drop to fall to the paper.
5. Move your hand and make another drop on the same card at the same angle. Move hand again to make one more drop. Let it dry for 30 seconds at least.
6. Remove the card from the clipboard and allow it to dry.
7. Repeat the above for each of the angles on your data table. To change the angle, lift the clipboard. Lifting it 10˚ will represent a drop of 80˚ since the blood is coming from above.
8. Fill in the data table for blood drops made at all angles. Measure all three drops and calculate the average.

Dropper **Figure 1**

Bottle

clipboard angle of drop

angle of lift protractor

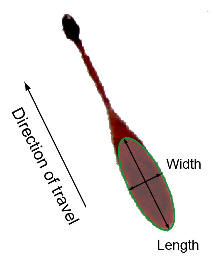
Table

**Observations:**

1. Paste/Tape in your notebook the data table provided to you.
2. Record in your data table:
   1. A sketch of one of the blood stains at each angle
   2. The average width of the bloodstains at each angle
   3. The average length of the bloodstains at each angle

**Data Analysis:**

1. Calculate the impact angle for the average bloodstain at each angle by following the steps below:
   1. Start with the 90 degree angle.
   2. Divide the average width of the bloodstains by the average length of the bloodstains.
   3. Fill this value in the data table.
   4. Take the sin-1 of the value you just calculated. Record this value in the data table.
   5. Repeat a-d for each impact angle.



Impact Angle Calculation:

**Explanation:**

Claim: Answer the initial question .

Evidence: Give data that supports your claim.

Reasoning: WHY does the blood behave according to your claim? What is the scientific reasoning?

**Evaluation:**

What are some sources of error in your experiment? Is there anything you would do differently? How confident are you in your results? Explain.

**Application:**

How can this data be used at a crime scene? Give an example.