

Conclusions

1. Describe the relationship between the distance of the fall (height) and the diameter of the parent drop.
2. What is the relationship between the distance of the fall (height) and the formation of splines and satellite drops?
3. Is there height above which the diameter of the parent drop remains the same? If so, what is that height?
4. If you answered yes to #3, why do you think the drop diameter remains the same?

Part 2: Effect of Surface Type - In this lab we will investigate how the type of surface affects the shape and diameter of the blood spatter.

Procedure:

1. Place a piece of newspaper on the floor.
2. Drop a single drop of blood straight down onto the scrap paper from a height of 60 cm.
3. Repeat step 2, 4 more times using the same surface.
4. When the parent drop is dry, use a metric ruler to measure its diameter and record it in Data Table 3.
5. Observe if splines and satellite drops were formed and record your observations in Data Table 4.
6. Repeat steps 2 through 5, using a whiteboard as the surface.
7. Clean up your area and put the materials away.
8. Calculate the average diameter for each height and record the values in the data table. Transfer your 60 cm data from Table 1 and Table 2 to Tables 3 and 4.

Data Table 3 – Effect of Surface on Parent Drop Diameter

Surface	Parent Drop Diameter (cm)					Average
	Trial 1	Trial 2	Trial 3	Trial 4	Trial 5	
Copy Paper						
Newspaper						
Whiteboard						

Data Table 4 – Effect of Surface on Formation of Splines and Satellite Drops

Surface	Formation of Splines and Satellite Drops (yes/no)									
	Trial 1		Trial 2		Trial 3		Trial 4		Trial 5	
	Splines	Satellite	Splines	Satellite	Splines	Satellite	Splines	Satellite	Splines	Satellite
Copy Paper										
News-paper										
White-board										

Conclusions

5. Which surface produced the largest diameter drop?
6. Which surface produced the smallest diameter drop?
7. Which surface produced the most splines and satellite drops?
8. Which surface produced the fewest splines and satellite drops?
9. Why did the type of surface affect the drop size and splatter pattern?

Part 3: Motion of Victim – You will investigate how motion affects the size and shape of the droplets and splines.

Procedure:

1. Tape a long piece of paper (4-5 meters in length) to the floor.
2. Hold the dropper upside down so that your hand is out and away from your body (waist level), but is still over the paper.
3. Start off walking at a **SLOW WALKING RATE** along the paper strip from one end to the other and GENTLY squeeze the dropper as you walk so that blood is released one drop at a time. Be sure that all the drops land on your paper strip. *Missed the paper? Use a paper towel to wipe it off the floor!*
4. Repeat steps 2 and 3 using a **NORMAL WALKING RATE** and a **FAST WALKING RATE**.
5. Draw a sketch of the drops showing their shape for each walking speed in Data Table 5 below.
6. Measure the size of the drops and the distance between them at each speed and record in Data Table 6.
7. Clean up your area and put away your materials.

Data Table 5 – Effect of Victim’s Motion on Blood Spatter Patterns

Walking Rate	Sketch of Blood Spatter Pattern
Slow	
Normal	
Fast	

Data Table 6 – Effect of Victim’s Motion on the Size and Distance between Drops

Walking Rate	Drop Width (cm)	Drop Length (cm)	Distance Between Drops (cm)
Slow			
Normal			
Fast			

Conclusions

10. What did you notice about the shape of the drops as you increased your walking speed?

11. What did you notice about the spines as you increased your walking speed?

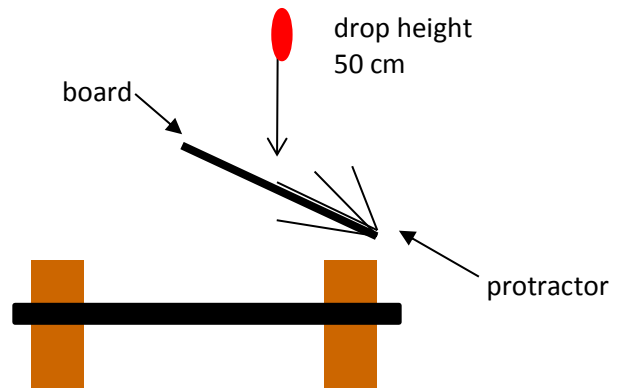
12. What did you notice about the size of the drops as you increased your walking speed?

13. What did you notice about the distance between the drops as you increased your walking speed?

Part 4: Angle of Impact – You will be investigate the drop patterns created by blood landing at different angles from the same height.

Procedure:

1. Label five pieces of copy paper with your names and then indicate the angle for each drop - 15°, 30°, 45°, 60°, or 75°.
2. Tape the first piece of paper on the board and align the clipboard with the 15° mark on the protractor. Hold the bottle of blood at a height of 50 cm from the top of the table.
3. GENTLY squeeze the dropper so that ONE drop of blood is released and lands on the paper. Repeat two more times at this angle.
4. Continue testing by dropping blood from a height of 50 cm at each of the other angles.
5. When drops are dry measure the width and length of the parent drops and record the information in Data Table 7. Do not include the tail of the drop in your length measurements.
6. Clean up your area and put away your materials.



Data Table 7 – Effect of Angle of Impact on Dimensions of Blood Spatter

Angle of Impact		15°	30°	45°	60°	75°
Trial 1	Length, cm					
	Width, cm					
	$\sin^{-1} \frac{w}{l}$					
Trial 2	Length, cm					
	Width, cm					
	$\sin^{-1} \frac{w}{l}$					
Trial 3	Length, cm					
	Width, cm					
	$\sin^{-1} \frac{w}{l}$					
Average	Length, cm					
	Width, cm					
	$\sin^{-1} \frac{w}{l}$					

Conclusions

14. What happened to the size and shape of the parent drop as the angle of impact decreased?
15. How can investigators estimate the angle of impact from the size and shape of the parent drop?

Part 5: Medium-Velocity Blood Spatter – You will simulate blunt force trauma and calculate the effect on blood spatter patterns.

Procedure:

1. Place sponge on smashing surface within the white-wall confines.
2. Measure and record the height from the ground to the original placement of the sponge. This is the z-coordinate value.
3. Smash the sponge causing it to spatter.
4. Locate three individual spatter drops and label them A, B and C.
5. String from Spatter A to the original placement of the sponge.
6. Measure and record the angle between the smashing surface and the string. This is the Measured Angle of Impact (AOI).
7. Repeat steps 6 & 7 for Drop B and Drop C.
8. Measure and record both the length and the width (for Drops A-C). This is the Length and Width.
9. Use the following steps to calculate the Angle of Impact for each of Drops A-C.
 - a. Divide the width of the drop by the length of the drop.
 - b. On your calculator, press “Shift” or “Second”, then press “Sin”, then type in your answer to part (a). Press “enter”.
 - c. Record this value in the table.

Data Table 8 – Effect of Velocity on Blood Spatter

	Drop A	Drop B	Drop C
Measured AOI, degrees			
Length of drop, cm			
Width of drop, cm			
Calculated AOI, degrees			
z-coordinate, cm			

Conclusions:

16. Why did we cover the blood in sponge?

17. If the diameter of a spatter drop is large, what does that tell you about the velocity of the blood at impact?

18. If the distance from the source origin and the spatter is large, what does that tell you about the velocity of the blood at impact?

19. Theoretically, the Measured AOI and the Calculate AOI should be the same. If they don't match explain some possible errors: