TRAINING LAB – BLOOD AS EVIDENCE – BLOOD DROPS DRIPPING FROM A WOUND

NAME_____

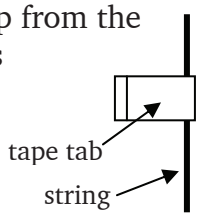
Background: Blood drops at a crime scene, called BLOOD SPATTER, can be important clues to help you recreate how the crime occurred. The shape of the blood drops can help you determine the location of the victim when they were injured, how an injured person moved about a crime scene, and even the method used to injure a victim. In this Training Lab you will be investigating blood that is dripping from a stationary (non-moving) victim. Blood drops dripping in this way are called PASSIVE BLOOD DROPS because they drop straight down with no outside forces pushing on them (and making them fall at an angle).

1. You will be trained to analyze passive blood drops to determine the height from which the blood drops fell.

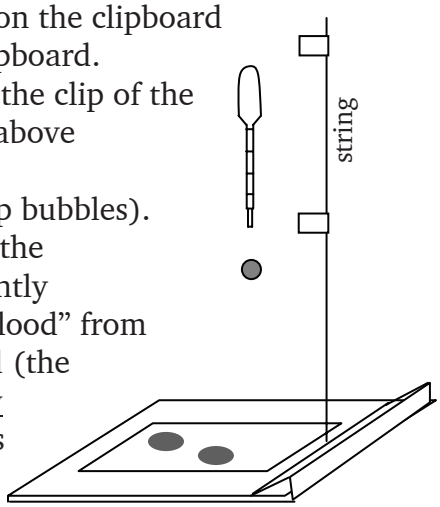
Procedures:

Part 1 – Collecting Blood Drops That Have Fallen From Different Heights

1. You will need a clipboard, SEVEN large note cards, a covered beaker of simulated blood, a dropper, an eight foot piece of string or cord, a meter stick, a roll of masking tape, and old newspaper to spread on the floor.
2. Tie a knot very close to one end of the string. Accurately measure 1 foot up from the knot at the end of the string and place a small piece of masking tape at this location (fold the tape over so it wraps around the string and sticks to itself – forming a flag-like tab). Label this piece of tape "1foot".



3. Accurately measure 2 feet up from the knot at the end of the string and add another tab of tape. Label this piece of tape "2 feet".
4. Repeat measuring, placing, and labeling tape tabs at 3 feet, 4 feet, 5 feet, 6 feet, and 7 feet up from the knot you placed at the end of the string. These tape tabs will represent the different heights from which you will release and observe blood drops.
5. Place your clipboard on the floor on top of newspaper (to protect the floor from any mess). Write your name and "1 foot" in a corner of one of the large note cards (use a blank side of the note card). Place the labeled card on the clipboard (blank side up). You do not need to clip the card to the clipboard.
6. Clip the knot you placed at the end of the string just under the clip of the clipboard so it will be held in place. Stretch out the string above the clipboard and note card (see sketch at right).

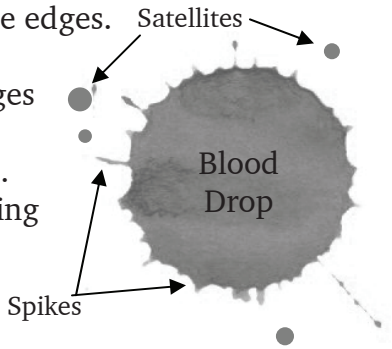


7. Suck up simulated blood into the dropper (avoid sucking up bubbles).
8. Hold the OPEN END of the dropper EXACTLY 1 foot above the note card (even with the 1 foot tape tab on the string). Gently squeeze the dropper to release THREE separate drops of "blood" from 1 foot – each drop falling on a different location of the card (the drops should not touch or overlap). You should NOT allow bubbles to form as you release drops. Add additional drops if any bubbles are present, or any drops overlap.

9. Carefully remove the note card with "blood" drops (be careful and don't tilt the card or your "blood" drops will run and change shape). Place the card with wet "blood" drops on a flat surface where they can dry without being disturbed.
10. Repeat Steps #5 - #8 and collect <u>THREE separate drops</u> of "blood" from each of the remaining heights of 2 feet, 3 feet, 4 feet, 5 feet, 6 feet, and 7 feet. The "blood" dropped from each height should be collected on separate, labeled note cards. For the higher heights you may need to stand on a chair – be careful!
14. After the "blood" drops are dry you can make observations and measurements.

Part 2 – Analyzing Blood Drops That Have Fallen From Different Heights

1. Observe the shapes of the "blood" drops on your cards. Because the drops fell straight down to the ground they should be a <u>round shape</u> –  as if dripping from a victim that was standing still. Blood drops that strike a surface at an angle (blood drops that are flung from a victim or drip from a moving victim) are more  <u>oval-shaped</u>.
2. Look around the edges of your "blood" drops. You may notice that the blood drop edges are smooth, or there may be some jagged, pointy areas along the edges. These jagged, pointy areas are called **<u>SPIKES</u>**. Blood drops that fall on smooth, hard surfaces, like glass or tile, have smooth edges with few spikes. Blood drops that fall on a rough, fiber surface, like wood or paper, usually have jagged edges with more spikes.



3. You may also notice smaller, separate specks of blood surrounding some of your drops. These small specks are called **<u>SATELLITES</u>** and are sometimes thrown out of the large blood drop during impact with a hard surface.
4. Accurately measure the DIAMETER (<u>in millimeters to the nearest 0.5mm</u>) of each of the three "blood" drops you dropped from 1 foot. DO NOT include spikes or satellites in your diameter measurements. Record these measurements in Table 1 –" Blood Drop Diameters From Different Heights".
5. Repeat Step #4 by measuring and recording (in Table 1) the diameters (<u>in millimeters – to the nearest 0.5mm</u>) of the blood drops you released from each height.
6. Calculate and record (in Table 1) the Average Blood Drop Diameter for each height.
7. Pick up Figure 1 – "Standard Curve For Diameter Of Passive Blood Drop vs. Height Blood Drop Fell" from your supervisor. This graph already has points and a line on it, however, you should <u>plot your AVERAGE Blood Drop Diameter for each height on this same graph</u>. <u>However, DO NOT draw a line through your points</u>.

Part 3 – How To Use The Blood Drop Diameter vs. Height Graph

1. The graph in Figure 1(Diameter of Blood Drop vs. Height of Blood Drop) is an important tool. The graph contains a line called a **<u>STANDARD CURVE</u>** for Blood Drop Diameter vs. Blood Drop Height, and it can help you analyze blood spatter at a crime scene.
   <u>Example</u> - Pretend you are working a crime scene and the only evidence you find is a single, round blood drop on the floor.
   1st - Measure the diameter of the blood drop (<u>to the nearest 0.5 millimeter</u>).
   2nd - Find this diameter along the "Y" axis of the Blood Drop Diameter vs. Blood Drop Height graph and place your finger on this point.

3rd - Next, move your finger straight and level across the graph (toward the right) to the Standard Curve and stop when you touch the line.

4th - Next, move your finger straight down from the Standard Curve to the "X" axis and stop when you reach the axis.

5th - What Height Value along the "X" axis is your finger touching? You will need to accurately estimate the Height Value if your finger is between two values.

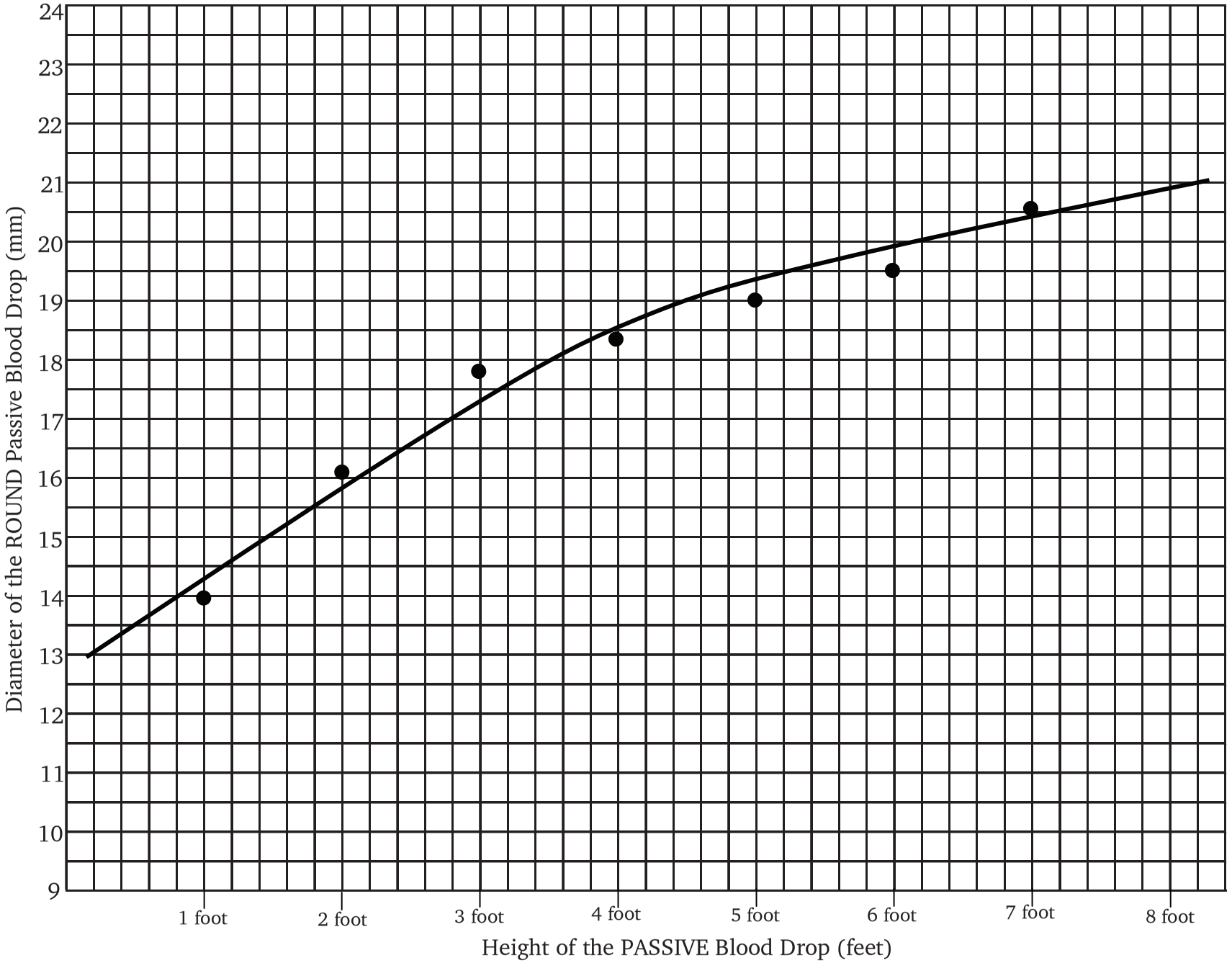
6th - The Height Value you determine from the "X" axis is the approximate height the blood drop fell before hitting the floor. This can tell you the approximate location of a bleeding person's injury – even if the injured person is no longer present!

2. Look closely at your average blood drop diameters you plotted on the graph. Imagine what a best fit curve through your points would look like (imagine it – don't actually draw one). This line would be a Standard Curve for Blood Drop Diameter vs. Blood Drop Height based on your measurements. It should look like the Standard Curve already drawn in – but don't be disappointed if it doesn't. Your data was based on only three blood drops for each height. The Standard Curve on the graph was made by averaging the diameters of many blood drops – therefore, it should be a little more accurate.

Table 1 – Blood drop diameters from different heights

Height of Blood Drop	Trial #	Diameter of Blood Drop (mm)	Average Diameter of Blood Drop (mm)
1 foot	1		
	2		
	3		
2 feet	1		
	2		
	3		
3 feet	1		
	2		
	3		
4 feet	1		
	2		
	3		
5 feet	1		
	2		
	3		
6 feet	1		
	2		
	3		
7 feet	1		
	2		
	3		

Figure 1 - STANDARD CURVE FOR DIAMETER OF PASSIVE BLOOD DROP vs. HEIGHT BLOOD DROP FELL



QUESTIONS – BLOOD AS EVIDENCE – BLOOD DROPS DRIPPING FROM A WOUND

NAME_____

1. Observe the blood drop points you plotted on the Blood Drop Diameter vs. Blood Drop Height graph and finish the following statement. My blood drop points would produce a Standard Curve that is (choose one):
   - ☐ almost exactly like the Standard Curve that is already on the graph.
   - ☐ somewhat similar to the Standard Curve that is already on the graph.
   - ☐ not much like the Standard Curve that is already on the graph.

2. How can you look at a blood drop and determine if it dripped straight down from a wound or hit the floor at an angle (from a bleeding person that was running)?

3. How does a blood drop that falls on glass appear different from a blood drop that falls on a piece of paper?

4. You are looking at a blood drop from a crime scene that has a diameter of 16.5 mm. From approximately what height did this blood drop fall?

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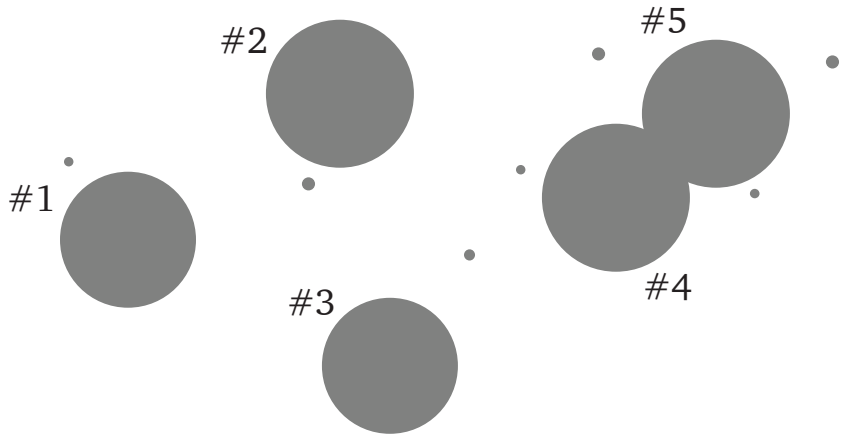
THE CASE OF THE PARKING LOT MURDER

You are investigating a murder that occurred approximately four hours earlier in the day. A witness saw two men arguing in a parking lot. She did not recognize either of the men, but described them both as being about 6 feet tall. The witness saw one man pull out a knife and swing it several times at the other man. The attacked man took a few steps back and stood for several seconds as he looked at his wounds – which appeared to be bleeding. He then pulled out a gun, shot the man that was holding the knife, and ran from the scene. The man that was shot died of his wounds, and you are now on a search for the missing suspect. You find blood drops on the parking lot where the shooter stood and bled from his knife wounds. These exact same blood drops are visible on the next page, ready for your analysis (carefully measure blood drop diameter to the nearest 0.5mm).

You decide to call area hospitals and see if anyone recently checked themselves in for treatment of lacerations (cuts). You discover that FIVE people recently checked in for laceration injuries:

Patient A – cut on the right calf (below the knee)
Patient B – cut left calf (below the knee) and left cheek
Patient C – cut along right hip region (just below waist)
Patient D – cut along left hip region (just below waist) and right cheek
Patient E – cut on left shoulder and forehead



Complete the Blood Drop Evidence Form below and then answer the questions that follow about the crime.

BLOOD DROP EVIDENCE FORM

Evidence #					
Location of Blood Drop	Parking Lot	Parking Lot	Parking Lot	Parking Lot	Parking Lot
Diameter of Blood Drop (mm)					
Approximate Height Blood Drop Fell					

5. In your opinion, did all the evidence blood drops fall from the same height? _____

   If you answered "YES" for Question #5 – from approximately what height did all the blood drops fall? _____

   If you answered "NO" for Question #5 – from how many different heights do you think the blood drops fell? _____

6. Based on the height(s) the evidence blood drops fell - list the body area (or body areas) where you think the suspect was injured by the knife.

7. Based on the blood drop evidence you analyzed, which patient is most likely your suspect?

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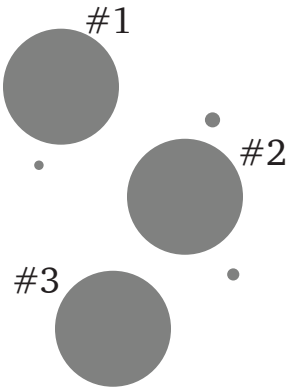
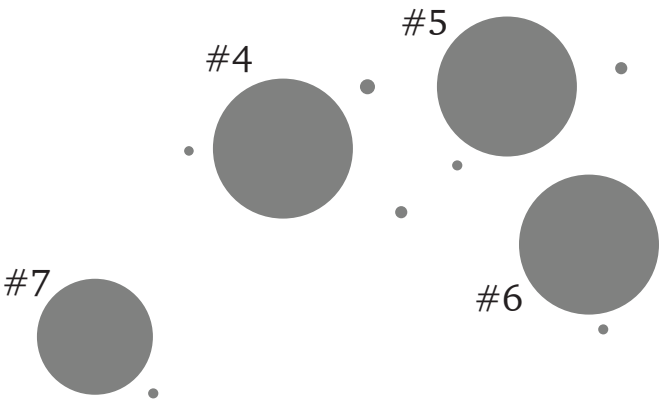
THE CASE OF THE BLOODY KNEE

You have been called to investigate a robbery at a local business. A single employee was working at the time. The employee stated that two men entered the business. One of the men quickly pulled a 2-foot tall stepladder (used to reach items on the store's top shelf) to the corner of the store near the door. The man stood on top of the stepladder, and pulled a plug on a security camera located there – presumably so they could not be filmed. The man jumped down, picked up the ladder, then threw it across the store at the employee and demanded money. The employee was scared and gave the men all the cash that was in the register - $2,500. The men quickly left with the money and the employee immediately called the police.

You notice several fresh drops of blood on the floor - three blood drops next to the cash register and four drops in the corner of the store beneath the disabled security camera near the door. <u>These exact same blood drops are visible below, ready for your analysis</u> (carefully measure blood drop diameter to the nearest 0.5mm). The employee states that all the blood drops came from a cut on her knee. She shows you the fresh cut on her knee and explains that the stepladder has a sharp edge and as the thrown ladder bounced across the floor it hit her knee and cut it. She says the drops by the cash register must have fallen while she removed the money, and the drops by the camera must have fallen as she stood near the door waiting for the police to arrive. You ask the employee how tall she is – she looks a little confused, but answers 5 foot 6 inches tall.



Blood Drops By Cash Register



Blood Drops Beneath Security Camera and Near Door

Complete the Blood Drop Evidence Form below and then answer the questions that follow about the crime.

BLOOD DROP EVIDENCE FORM

Evidence #							
Location of Blood Drop							
Diameter of Blood Drop (mm)							
Approximate Height Blood Drop Fell							

8. Do all the evidence blood drops by the cash register appear to have fallen from the same height?

_____

9. Which evidence blood drops by the cash register could have fallen from the employee's knee as stated?

_____

10. Do all the evidence blood drops by the security camera and door appear to have fallen from the same height?

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11. Which evidence blood drops by the security camera and door could have fallen from the employee's knee as stated?

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12. A blood test completed back at the lab confirms that all the evidence blood drops belong to the employee. Soon after you complete your analysis of the blood drops you file a report to have the employee arrested for faking a robbery and stealing the $2,500 from the cash register. The employee later admitted her guilt, stating that she had worked alone to steal the money and made the robbery story up. Everyone in the crime lab is amazed that you solved this crime based on only a few drops of blood. Recreate (describe) the events you think happened as the employee stole the money – including your conclusions about each of the evidence blood drops.