Forensics

Lesson: Tuesday April 7th

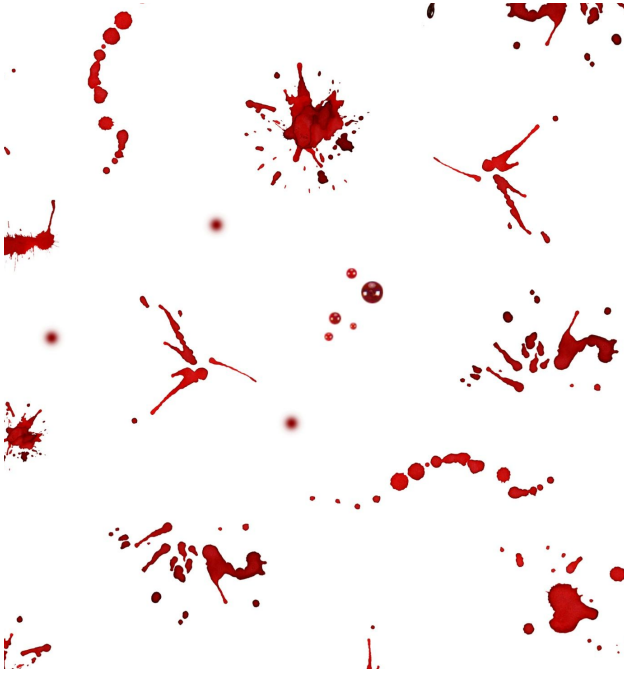
Learning Target:

Students will be able to identify height and angle of impact for various shapes and sizes of blood drops.

Let's Get Started:

1. What would be the difference between a blood drop that fell from a really high height compared to a blood drop that fell from a much lower height?

2. What would be the difference between a blood drop that strikes at a steep angle, compared to a relatively flat (lower) angle?



Let's Get Started: ANSWERS

1. What would be the difference between a blood drop that fell from a really high height compared to a blood drop that fell from a much lower height? The higher the blood drop falls from, the larger the diameter of the blood drop will be on the surface it strikes.

2. What would be the difference between a blood drop that strikes at a steep angle, compared to a relatively flat (lower) angle? The steeper the angle, the longer and thinner the blood drop will be. From very steep angles, we will see very long and thin ovals. At larger angles of impact, we will see more circular shapes.

Lesson Part 1: Passive Drops

Directions: Read through the following informational slides and answer the following questions.

Passive Blood Drops

- PASSIVE BLOOD DROPS: fall straight down with no outside forces pushing on them

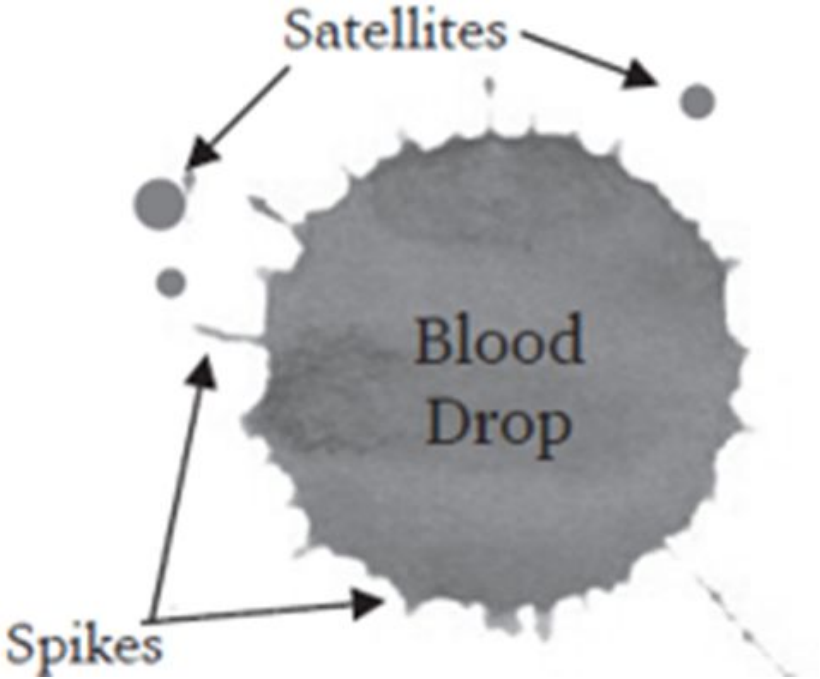
- Shape is very circular

- Higher up fall, larger diameter
- Lower fall, smaller diameter

Characteristics of Passive Drops

Satellites: small, separate specks of blood surrounding blood drops

Spikes: jagged, pointy areas along the edges



Practice Part 1

You will use the information from the previous 2 slides to answer a few questions.

Practice Questions: Part 1

1. Which height would create a larger blood drop?
    a. A drop that fell from 5 feet
    b. A drop that fell from 2 feet
    c. A drop that fell from 6 inches
2. What shape would you expect to see for a blood drop that fell from straight above?
3. Predict: Which height would you predict produces more spikes and satellites surrounding the blood drop?
    a. A drop that fell from 5 feet
    b. A drop that fell from 2 feet
    c. A drop that fell from 6 inches

Practice Questions: Part 1 (continued)

4. The data to the right was from an experiment testing blood drop size across a wide range of drop heights.

According to the data, what you predict the diameter of a blood drop to be that was dropped from 125cm?

Height(cm) blood was dropped from	Diameter of drop on card 1 (cm)	Diameter of drop on card 2 (cm)	Average Diameter
25	1.5 cm	1.5 cm	1.5 cm
50	1.7 cm	1.5 cm	1.60 cm
100	1.6 cm	1.7 cm	1.65 cm
150	2 cm	1.7 cm	1.85 cm
200	2 cm	2 cm	2 cm
250	2 cm	2.1 cm	2.05 cm

Answer Key: PART 1

Once you have completed the practice questions check your work below.

1. Which height would create a larger blood drop?
   a. A drop that fell from 5 feet
   b. A drop that fell from 2 feet
   c. A drop that fell from 6 inches
2. What shape would you expect to see for a blood drop that fell from straight above? CIRCLE
3. Predict: Which height would you predict produces more spikes and satellites surrounding the blood drop?
   a. A drop that fell from 5 feet (Due to higher impact velocities)
   b. A drop that fell from 2 feet
   c. A drop that fell from 6 inches
4. According to the data, what you predict the diameter of a blood drop to be that was dropped from 125cm? 1.75cm (or anything between 1.65cm and 1.85cm)

Lesson Part 2: Angled Drops

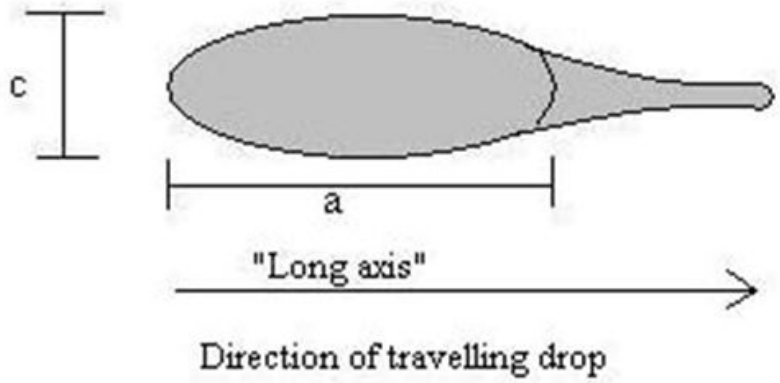
Directions: Read through the following informational slides and answer the following questions. You can also watch the youtube link below.

Link: Stain Measurement and Calculating Angle of Impact h

Blood Drops at an Angle (determining direction)

Follow blood drop along LONG AXIS

TAIL points opposite the direction the blood came from

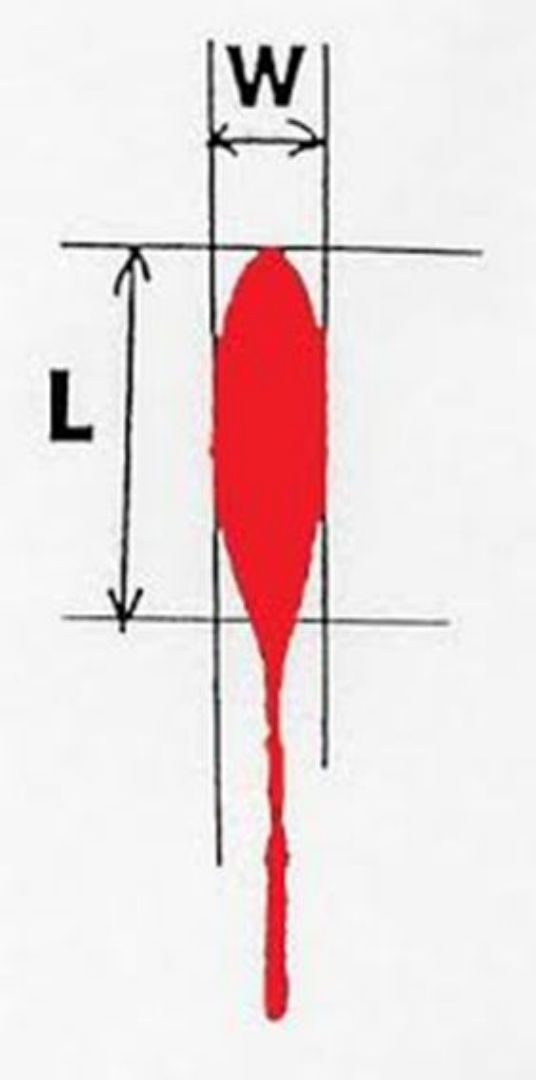


Measure first...

To calculate the angle of impact of a blood drop, you will need to measure both the WIDTH and LENGTH of the blood drop in millimeters.

DO NOT INCLUDE…!!!

a. Spikes
b. Satellites
c. Tails



Calculating Angle of Impact

Using your measurements from the previous slide and the formula below, you can calculate the angle of impact for each blood drop.

$$\textit{Impact Angle} = \text{Inverse Sine of } \frac{\textbf{Width of drop}}{\textbf{Length of drop}}$$

Practice: Part 2

You will use the information from the video and the previous 3 slides to answer the following questions.

You will also need a scientific calculator. Use one linked below or google “scientific calculator” and use Google’s

Online Calculator

Practice Questions: Part 2

1. How do you determine the directionality of an angled blood drop?
2. In order to calculate impact angle, what two measurements do you need to make?
3. What is the formula you will use to determine the impact angle of the blood?
4. If the length is 36mm and the width is 5mm, what is the angle of impact for this blood drop?
5. If the length is 20mm and the width is 10mm, what is the angle of impact for that blood drop?

Answer Key: Part 2

Once you have completed the practice questions check your work below.

1. How do you determine the directionality of an angled blood drop? The tail will point opposite the direction the blood drop came from
2. In order to calculate impact angle, what two measurements do you need to make? Length of the drop, width of the drop (no tails, spikes, satellites)
3. What is the formula you will use to determine the impact angle of the blood? Inverse sin of (width ÷ length)
4. If the length is 36mm and the width is 5mm, what is the angle of impact for this blood drop? Inverse sin of (5 ÷ 36) = $\sin^{-1}(5 \div 36) = 7.98^{o}$
5. If the length is 20mm and the width is 10mm, what is the angle of impact for that blood drop? Inverse sin of (10 ÷ 20) = $\sin^{-1}(10 \div 20) = 30^{o}$

Additional Practice and Information

Blood Spatter Activity

Bloodstain Pattern Analysis