The Case of Anna Garcia
An Introduction to Forensic Biology

This lab notebook belongs to:

Day 1: The Mysterious Death of Anna Garcia

Date:

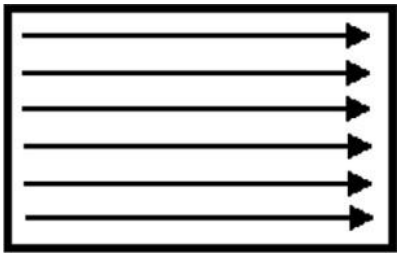
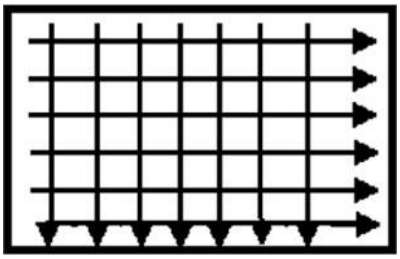
Instructions: *Watch the "Police Commissioner's Live Feed" video on Activity 1.1.1 of PLTW. Fill in the graphic organizer with information that we know and questions that still remain.*

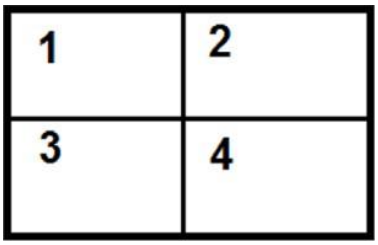
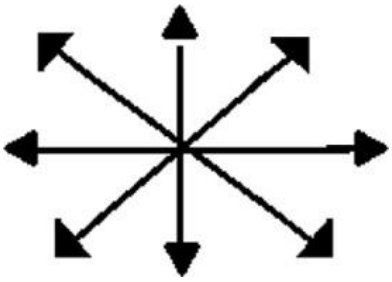
	What we already know	**Questions that remain**
Who is involved?	The people who were involved in the case are Anna Garcia.	Who else was here and why were they there.
What happened?	She was killed by someone or a lot of people.	Why would they do that to Anna Garcia and not someone else?
Where did it happen?	It happened in Anna Garcia's lab when she was doing her experiments or work.	When was it happening why would they leave there evidence laying around.
When did it happen?	I don't know when it happened.	Was the time planned out or did it happen when the person saw her.
Why did it happen?	I don't know how it happen but I have theories	Why did the person do this.

Day 1: Common Search Methods

Date:

Instructions: *Review the following search methods and decide which is the best method to use to investigate the scene of Anna Garcia's death. Explain why you selected the choice that you did.*

Method	Pattern	Use
Link Method	Method is not a geometric pattern or easily definable. There is no set pattern. The method requires the investigator to be able to form logical links between crime scene activity and the likely places additional evidence could be found at the scene as a result.	Method seeking to find associations between evidence. Investigators evaluate the scene and then proceed through the area in a systematic and logical fashion. Based on the notion that one type of evidence leads to another. Works with large and small, indoor and outdoor crime scenes.
Line (Strip) Method		Used on large, outdoor crime scenes. Members of the search team are arranged at regular intervals, usually arm's length, and then proceed to search along straight lines.
Grid Method		Used on large, outdoor crime scenes. Searchers follow the first line pattern and search in the same manner as the line method. Once the first line pattern is complete, searchers realign on the other line pattern.

Zone Method		Used on crime scenes that are readily definable zones, such as in houses or buildings. Teams are assigned small zones for searching, and then other appropriate searching methods are employed in each zone.
Spiral Method (Inward or Outward)		Used on crime scenes with no physical barriers, such as open water. Can either begin at the critical point of the crime scene (outward spiral) or the outer-edge of the crime scene (inward spiral).
Wheel or Ray Method		Used on small, circular crime scenes. Investigators start from a critical point and travel outward along many straight lines from this point.

Questions

Anna Garcia was found inside a small laboratory. She was found lying faceup on the floor next to a lab table. Which search method would be the best method to investigate this scene?

Method (circle/highlight):

Link Line/Strip Grid Zone Spiral Wheel/Ray

Why did you choose this method? We chose this method because of how we get to start from the middle and then look at the small details. _____

_____

Day 1: Evidence Log

Date:

Instructions: *Log all of the evidence found at the scene by filling in the chart below. Include a description of the evidence, questions we need answered about the evidence, possible explanations for why the evidence is there, and next steps we can take to learn more about the evidence.*

	Description of Evidence	**Questions We Need Answered**	**Possible Explanations**	**Next Steps and Tests**
1	She was working and planned to meet someone.	The person's DNA.	She was working and then someone comes out of nowhere and attacks her.	Taking fingerprints.
2	She might have had an allergic reaction.	Who prevented her from meeting the person?	She tried to use her ampepen but the person stopped her and killed her.	Camera evidence.
3	She had a meeting and then someone killed her.	Who else was there by checking their DNA	She got hit in the head several times and then left her dead.	DNA from someone elses.
4				

	Description of Evidence	Questions We Need Answered	Possible Explanations	Next Steps and Tests
5				
6				
7				
8				
9				

Day 2: Persons of Interest

Date:

Dominique Hall

Dominique Hall is a 19-year-old college student. She is a classmate of Anna Garcia. Dominique claims she last saw Anna at a study group meeting at 5:30 p.m. the day before she was found dead. It is well known that Dominique and Anna were highly competitive. Anna recently won a prestigious scholarship that Dominique wanted.

Dr. Elsie Opal

Dr. Elsie Opal is a 50-year-old college professor. She is Anna's academic advisor. Dr. Opal claims she last saw Anna during her office hours at 10:00 a.m. the day before Anna was found dead. Dr. Opal and Anna have a friendly working relationship. However, Dr. Opal recently declined to write a recommendation letter for Anna for an internship application.

Eric Piedmont

Eric Piedmont is a 20-year-old college student. He is Anna's boyfriend and claims he last saw her at lunch at noon the day before she was found dead. Friends noted that Eric and Anna were recently seen arguing, but they seem to have reconciled.

Sam Greene

Sam Greene is a 20-year-old college student. She and Anna play on the same soccer team. Sam and Anna were recently seen arguing after a soccer tournament when Sam blamed Anna for their loss. Sam also claims Anna collided with her during their 3:00 p.m. soccer practice the day before she was found dead.

Taylor Diaz

Taylor Diaz is a 19-year-old college student. He is a classmate and friend of Anna Garcia. He claims he last saw her when they were working together in the lab at 1:00 p.m. the day before she was found dead. Taylor found Anna dead in the research lab. He says that he immediately walked out of the lab, closed the door, and called the police.

***Instructions**: Read the persons of interest descriptions above. Then, fill in the chart below with at least 2 possible motives/reasons each suspect might have for killing Anna Garcia.*

Suspect	**Motives**
Sam Greene	● They were Arguing with Anna after they lost a match.
Taylor Diaz	● He was the last person with her and saw her dead.
Eric Piedmont	● He is her boyfriend and they argured before and he saw her at lunch time before she was dead.
Dr. Elsie Opal	● She saw her at 10:00 am and declined a letter for Anna recommandation letter.
Dominique Hall	● She wanted the place where Anna Garcia is in and is a very competitive person.

Day 2: Examining Trace Evidence

Date:

Station 1: A Hairy Situation

Instructions: *Fill in the data table with your observations about the hair left at the scene. Then, identify whose hair was found at the scene. Explain how you know.*

Sample	Observations			
Scene Sample	***Color*** ***The hair was brwonish***	***Texture*** ***I didnt feel the hair***	***Size*** ***The size was pretty long, not much.***	***Other Attributes***

The hair left at the scene belongs to _Anna Garcia _____.

I know this because___We checked the hair from the sample and from Anna Garcia and they match_____.

Station 2: Patterns in Our Prints

Instructions: *Fill in the data table with your observations about the fingerprints found at the scene, including the ridge patterns and two to three minutiae. Then, identify whose fingerprints were found at the scene. Explain how you know.*

Sample	Fingerprint	Ridge Pattern	Minutiae
Handwritten note		Loop	

Glassware		Whorl	
Your fingerprint		I didnt do it	

The fingerprint left on the handwritten note belongs to ____Anna Garcia _____.

I know this because ___We Checked the fingerprint to see if they match and they did.

The fingerprint left on the glassware belongs to __Anna Garcia

_____.

I know this because _____They match from their fingerprints.

Station 3: Digital Evidence

Instructions: *Create a timeline of the places Anna Garcia has been and the people she was with over the last five days by filling in the chart below. Include information about the date and time, location, a description of what was posted, people Anna was with, concerns related to her health, and any other important information. You may use a drawing, chart, list, etc. to make your timeline. Then, answer the questions that follow.*

What are the most important pieces of information in the timeline that might be connected to the case?

Who met her, why did they met with her, and how can we check when she died.

DAY 3: BLOOD IDENTITY

Date:

Instructions: *Complete the tests below to determine if the red droplets found at the scene were blood, and if so, whose blood it is.*

Part 1: Kastle-Meyer Test

Background: The Kastle-Meyer Test is a presumptive blood test. The test uses an indicator called phenolphthalein, which reacts with iron in hemoglobin. This test will let us know whether a red substance might be blood. If a sample contains blood, the substance will turn pink. If a sample does not contain blood, there will be no color change. However, this test can produce false positives, since other substances can also contain iron.

We will test a sample we know is blood to serve as a positive control. A positive control is a sample we expect to test positive. We will test water to serve as a negative control. A negative control is a sample we expect to test negative. We will also test the two scene samples - one from the edge of the table and one from the floor.

Pre-Lab Questions:

1. What substance does the Kastle-Meyer Test test for?

2. In which cells can this substance be found?

3. What will we observe if the test result is positive?

4. What will we observe if the test result is negative?

Procedure:

1. Moisten a cotton swab with water.
2. Rub the cotton swab to pick up the sample.
3. Add two drops of 95% ethanol.
4. Add two drops of phenolphthalein.
5. Add two drops of hydrogen peroxide.
6. Repeat with all four samples: water, blood, edge of table (sample 1), floor (sample 2)
7. Observe samples for color change.

Data:

Table 1: *Results of Kastle-Meyer Test on Samples from Anna Garcia Scene*

Sample	Color Change Result (+/-)
Blood (Positive Control)	
Water (Negative Control)	
Edge of Table (Scene Sample 1)	
Floor (Scene Sample 2)	

Analysis:

1. Did the scene samples test positive?

2. Does this mean that the samples are definitely blood? Why or why not?

3. What should we do next to confirm these results?

4. What should you do if both the water and the blood give the same result? Why?

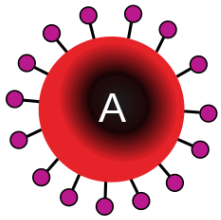
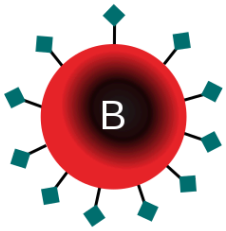
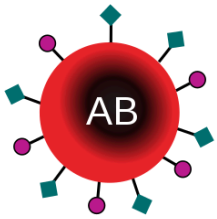
Part 2: Blood Type Test

Background: The Blood Type Test is a confirmatory blood test. The test determines if a blood sample is Type A, Type B, Type AB, or Type O. Blood type is determined by proteins on the surface of red blood cells. Red blood cells with A proteins are Type A; red blood cells with B proteins are Type B; red blood cells with both A and B proteins are Type AB; red blood cells with no proteins are Type O.

We can figure out which type of blood is present by mixing it with two different substances which react with the proteins on red blood cells. Anti-A serum will react only with A proteins, and Anti-B serum will react only with B proteins. If a reaction occurs, you will observe agglutination, or clumping, of the sample.

We will use Type A, Type B, Type AB, and Type O as controls. We will test the scene samples from the floor and table. We will also compare the blood from our persons of interest.

See the diagram below to compare the different blood types.

	Type A	Type B	Type AB	Type O
Red Blood Cell				
Proteins	A proteins	B proteins	A and B proteins	No proteins

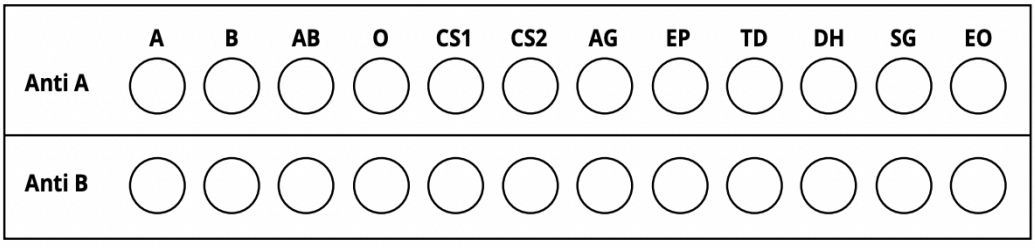
Pre-Lab Questions:

Fill in the chart below with whether agglutination will or will not occur. **Remember, Anti-A serum will react only with A proteins, and Anti-B serum will react only with B proteins. If a reaction occurs, you will observe agglutination, or clumping, of the sample.**

	Type A	Type B	Type AB	Type O
Proteins Present (A or B)				
Mixed with Anti-A serum (Agglutination or no reaction)				
Mixed with Anti-B serum (Agglutination or no reaction)				

Procedure:

1. Obtain a microtiter plate and label it as follows:



2. Using a different pipette tip for each sample, add 50 uL of each sample into the two corresponding wells
3. Using a new pipette tip, add 50 uL of anti-A serum to each of the wells in the anti-A row. The same tip can be used for all 12 samples.
4. Using a new pipette tip, add 50 uL of anti-B serum to each of the wells in the anti-B row. The same tip can be used for all 12 samples.
5. Let the samples rest for 5-10 minutes.
6. Observe the wells to determine if agglutination has taken place. You will see a thick and grainy mixture if agglutination has occurred.

Data: Fill in the bubbles in which agglutination occurred. Then, use this information to determine the blood type of each sample.

Table 2: *Results of Blood Type Test on Samples from Anna Garcia Scene*

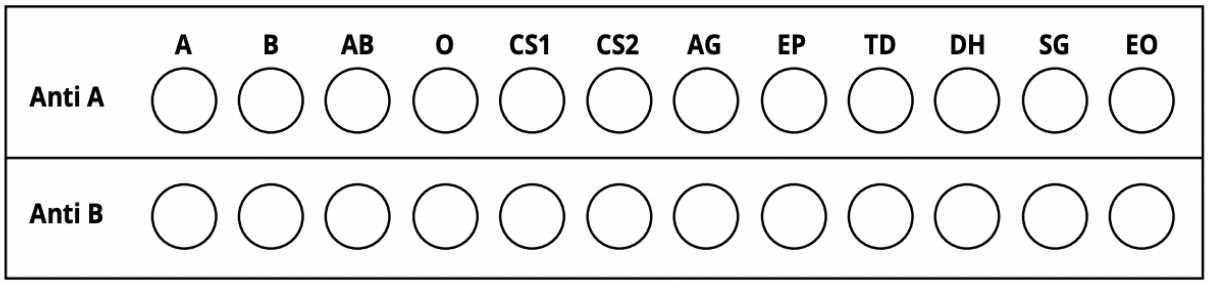


Table 3: *Results of Blood Type Test on Samples from Anna Garcia Scene*

Sample	Blood Type
A	
B	
AB	
O	
Scene 1 (Table)	
Scene 2 (Floor)	
Anna Garcia	
Eric Piedmont	
Taylor Diaz	
Dominique Hall	
Sam Greene	
Dr. Elsie Opal	

Analysis:

1. Did the scene samples test positive? If so, what blood type are the samples?

2. Does this mean that the samples are definitely blood? Why or why not?

3. Which samples acted as the controls in this test?

4. At this point in the investigation, are there any suspects we can rule out? Why or why not?

Day 4: DNA Fingerprinting

Date:

Background:
We can use DNA fingerprinting to figure out whose DNA was left at the crime scene. This process occurs in multiple steps:

- **DNA Extraction:** DNA is removed from cells.
- **DNA Amplification:** DNA is copied many times so there is enough to study.
- **Restriction Digestion:** DNA is cut into smaller pieces (which will end up being the bands on the DNA fingerprint).
- **Gel Electrophoresis:** The small DNA fragments (from above) are separated into bands.

The resulting band patterns can be used to compare DNA from different sources. Identical DNA will result in identical band patterns.

Pre-Lab Questions:

1. What are some potential sources of DNA from the crime scene?

The blood, the hair, and the note.

2. Why is it useful to analyze the DNA from a potential crime scene?

To find out who was there at the crime scene.

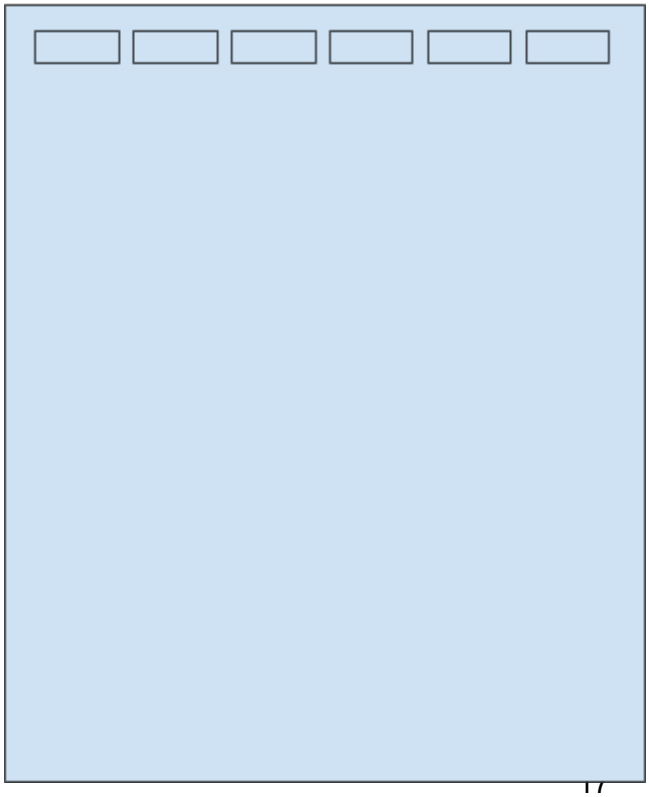
Materials	Safety
Out materials manager is:	Our safety manager is:
● 1 agarose gel (be careful with it!) ● 1 electrophoresis chamber and power supply ● Buffer solution ● 1 micropipette ● 1 box of micropipette tips ● 6 DNA samples ○ DNA ladder ○ “Blood” from Crime Scene: Table ○ “Blood” from Crime Scene: Floor ○ Eric Piedmont ○ Dominique Hall ○ Anna Garcia ● 1 light box	● Goggles and gloves required when working with the samples ● Lab coat optional

Procedure
Our procedure manager is:
1. Collect all required materials. 2. Place the gel in the electrophoresis chamber with the wells closest to the negative end. 3. Fill the chamber with enough buffer to cover the gel. 4. Load 35 uL of each sample into the wells. *5. Fill in the diagram below indicating which sample was placed in each well.* 6. Close the electrophoresis chamber, connect it to a power supply, and turn it on. 7. Check the gel every 10 minutes. 8. When the loading dye reaches the end of the gel, turn off the power. 9. Visualize the gel using a light box. 10. Take a picture of the gel. *11. Fill in the bands that appear on the diagram below.*
Clean Up
Our clean up manager is:
1. Return the buffer to the large beaker. 2. Discard the used pipette tips, the small plastic tubes with leftover DNA samples, and the used gel. 3. Return all tools to the supply table. 4. Throw away used gloves. 5. Return goggles.

Data:

1. Fill in the diagram with the names of the samples placed in each well and the bands that appeared. You can double click on the image and add the bands in on Google docs, or you can draw it in your notebook and upload a picture.

Figure 1: DNA fingerprinting results



Analysis:

1. Why did we only analyze the DNA from Eric Piedmont, Dominique Hall, and Anna Garcia?

2. What patterns do you notice?

3. Are both blood samples from the same person? How do you know?

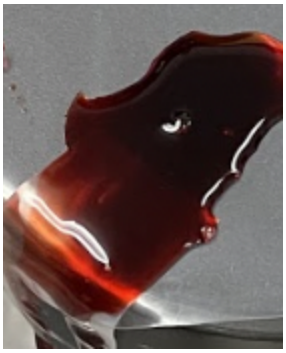
4. Whose blood was found at the scene? How do you know?

DAY 5: BLOOD SPATTER ANALYSIS

Date:

The following blood samples were found at the scene of Anna Garcia's death.

<u>This sample was found on the table.</u>



What observations can you make about the blood sample?
She was brutally hit and then she was left there and it spilled.

Predict where this blood might have come from.

<u>This sample was found on the floor.</u>

What observations can you make about the blood sample?
The blood fell from her when she was hitted by it.

Predict where this blood might have come from.
Her face if she was smashed from the ground.

Day 6: Anna Garcia's Autopsy

Date:

Following an investigation of the evidence left at the crime scene, an autopsy was performed on Anna Garcia. An autopsy is a medical procedure in which a medical examiner analyzes a body to determine the cause of death.

You will be conducting four activities as part of Anna Garcia's autopsy: a time of death analysis, a toxicology screening, a histological analysis of brain tissue, and a heart dissection.

Autopsy Station 1: Time of Death

Background:
Taylor Diaz found Anna Garcia face up on the floor of the lab at 10:00am. We have also created a timeline of the events leading up to Anna's body being found (Review Trace Evidence Stations Activity). Now, we will look more closely at changes to Anna's body to give us a more accurate idea of when she died.

Part 1: Timeline of Changes

Instructions: *Read the slides about the changes that occur to the body after death, including algor mortis, rigor mortis, livor mortis, and decomposition. Then, fill in the timeline below with a description of changes that occur at each time. Make sure to include when algor mortis, rigor mortis, and livor mortis start and stop, and when decomposition begins.*

Time After Death	Description of Signs
0 hours	● Algor Mortis
2-4 hours	● Clouding of Corneas ● Rigor Mortis ● Livor Mortis: Starts ● Insect Activity
8-12 hours	● Livor Mortis: Middle
24 hours	● Livor Mortis: Ends
36 hours	

36-48 hours	● Decomposition

Part 2: Insect Activity

Insect activity can also provide clues about how long a person has been dead. The presence of eggs, larva, or full-grown bugs provide a timestamp for how long the body has been decaying.

Blowflies are commonly found at sites of decay. They descend upon a dead body soon after death. Because the stages of their life cycle are well documented, the ages of insects found on a dead body give clues to when the person died. There are several types of blowflies including flesh flies and blue bottle flies.

Instructions: *View the images of the life cycle of the blowfly and answer the questions below.*

1. Which stages of blowfly did we find on Anna Garcia?

The stage 6 of the blowfly in Anna Garcia, they are fully grown Adult flies.

2. What might this suggest about how long she has been dead?

This suggests to us about how long she has been dead for a few hours and the flies will find a mate and lay eggs.

Part 3: Rate of Cooling

Instructions*: Analyze the Rate of Cooling Data. Answer the questions below.*

1. Why did the hot dogs start at 37°C?

They were started at 37°C because of how they represent the human body.

2. What happened to the temperature of the hot dogs as time passed?

Start to rise or it cools down.

3. How did the temperature of the water bath affect the temperature change of the hot dogs?

When the temperature was warm the temperature of the hot dog would go up, and when the temperature of the water was cool the temperature of the dog would go down.

Part 4: Anna Garcia's Time of Death

ASK MS. MACRI FOR THE CHANGES DISCOVERED ON ANNA GARCIA'S BODY!

Instructions: *Calculate Anna Garcia's time of death using the Glaister Equation. Answer the questions below*.

Glaister Equation: _____

Solve for Anna Garcia's Time of Death:

1. Using all the data available including the Glaister Equation, insect activity, and timeline of physical changes, what is the best approximation of Anna Garcia's time of death?

10:30 pm

2. Is the time of death consistent with the timeline of events we created from Anna Garcia's smartphone data?
   Dr. Opal and then be at the lab to set up.

Autopsy Station 2: Histological Analysis of Brain Tissue

Background:

Histology is the study of the microscopic anatomy of tissues, and histologists are the professionals who perform this work. During the autopsy on Anna Garcia, the medical examiner noticed an open wound on her forehead. The medical examiner also noticed a bruise above Anna's right eyebrow. The presence of this laceration and bruise may indicate possible damage to the brain. To determine whether or not any brain injury occurred, the brain needs to be removed and evaluated macroscopically, and then thinly sliced sections of the brain need to be reviewed microscopically.

Pre-Lab Questions:

1. What evidence do we have that Anna Garcia suffered a brain injury?

2. Look back at your timeline on page 11. When might Anna Garcia have suffered a head injury, that could have also caused a brain injury?

3. Read the information sheet about concussions. Why are concussions, particularly repeated concussions, so dangerous?

Part 1: MRI Scans

Following the removal of Anna's brain, a gross anatomical examination occurs. Because of the potential head trauma, her brain was subjected to a magnetic resonance imaging (MRI) scan. This is a medical imaging technique used to take pictures of the soft tissues of the body, like the brain. MRI scanners use magnetic fields and radio waves to generate images of the organs in the body and can help reveal damage.

Your Task: **Analyze the MRI scans at the station to see normal brain tissue, brain tissue with a traumatic brain injury (TBI), and brain tissue with chronic traumatic encephalopathy (CTE).**

A Traumatic Brain Injury (TBI) is a dysfunction of the brain caused by an outside force to the head. Chronic Traumatic Encephalopathy (CTE) is a progressive degeneration, and/or death, of nerve cells caused by repeated head injuries, such as repeated concussions.

Instructions*: Fill in the chart below with your observations of the differences between the three brain MRIs.*

MRI Scan	Observations

Normal Brain Tissue	
Traumatic Brain Injury	
Chronic Traumatic Encephalopathy	

Part 2: Histological Images

Histologists look at all the tissues of the body to help a medical examiner determine the cause of death. Blunt force trauma, lack of oxygen, chemical exposure, and bacterial infections, among other things, leave characteristic markings on tissues. Histologists are trained to spot these variations in tissues that provide clues as to what happened to an individual prior to their death.

Following extraction of a brain, thinly sliced sections are created and these pieces of brain tissue are placed on glass slides. The slides are then stained so that the cells that make up the tissue and the structures within these cells can be seen under a microscope. To the right, you can see normal and damaged brain tissue.

Your Task: **Use a microscope to analyze the prepared slides with tissue from a healthy brain and tissue from a brain with a traumatic brain injury.**

Instructions*: Fill in the chart below with your observations of the differences between the two slides.*

Tissue Sample	Observations
Normal Brain Tissue	
Traumatic Brain Injury	

Part 3: Anna Garcia's Brain

ASK MS. MACRI FOR THE MRI SCAN OF ANNA GARCIA'S BRAIN AND THE SLIDE WITH HER BRAIN TISSUE!

***Instructions**: Fill in the chart below with your observations about Anna Garcia's MRI scan and histological slide.*

Anna Garcia's Test	Observations
MRI Scan	
Histological Slide	

Analysis Questions:

1. Does Anna Garcia have a traumatic brain injury or chronic traumatic encephalopathy? How do you know?

2. Did problems with Anna Garcia's brain contribute to her death? Why or why not?

Day 7: Toxicology Screening

Background:
Toxicology is the field of science that studies the effects of chemicals, such as drugs (over-the-counter, prescription, and illicit), alcohol, poisons, metals, and gasses on the human body. Ingestion of some toxins, in any amount, can be harmful or deadly. Other substances, however, may only be harmful in larger amounts or doses. For example, you can safely take a pain reliever for a headache, but taking too much may result in nausea, vomiting, unusual bleeding, and other dangerous side effects. A safe dosage for an individual depends on factors such as height and weight. Reactions to medications or chemicals also depend on what other substances a person has in their system. For example, it can be very dangerous to take some medications while under the influence of alcohol.

Upon analysis of Anna Garcia's stomach, the medical examiner found a partially digested pill. We will conduct a presumptive test to determine if this pill is aspirin, acetaminophen, oxycodone, or ecstasy. The medical examiner also sent some of Anna Garcia's body fluids for further drug testing. We will use these results to confirm our results from the presumptive pill test.

Instructions*: Complete the lab activity following the procedure at the station to determine the identity of the pill in Anna's stomach. Then, analyze the remainder of Anna Garcia's toxicology report. Answer the questions below.*

Purpose: We are conducting this analysis to figure out which drugs were in Anna Garcia's body at the time of her death.

Pre-Lab Questions:

1. What evidence do we have that Anna Garcia may have ingested or inhaled any drugs?
What we have is that in her story she had a headache and then she took pills.
And the chemicals from her notebook that was in her lab.

2. What do you hypothesize is the identity of the pill in Anna Garcia's stomach?

Procedure:

Follow the procedure provided at your station. Fill in the data table on the next page as you conduct the test.

Data:

Table 1: Observations from Presumptive Pill Identity Test

	Aspirin	**Acetaminophen**	**Oxycodone**	**Ecstasy**	**Anna Garcia's Pill**
Appearance	Like a rock	Like a rock	Like a pond of water	Like a rock	Like a rock
Water	Like a rock	Like a rock	Like a pond of water	Like a rock not really change	Like a rockish but not much
pH	Turns red	Like a brown and greenish pond	Green water	It shrunk and color like reddish	It turned red
Hydrochloric Acid	Like a bigger rock	Tiny pebbles	Water with like dust	Rock but dissolved	More of an bigger rock
Ferric Nitrate	Like a black ball	The same but watery	It turned orange	It turned yellow	Like a black ball

Analysis:

1. What is the identity of the pill found in Anna Garcia's stomach? How do you know?

The pill that wa inside was Aspirin

***Instructions**: Read the toxicology report for Anna Garcia. Then, fill in the chart below indicating if each substance was found in a harmful dose in Anna Garcia. Answer the questions below.*

Table 2: Results of Toxicology Screening

Substance	**Was it found in Anna? (yes/no)**	**Was the dose/amount harmful? (yes/no)**
Caffeine	no	
Ethanol	no	
Opiates	no	
Methamphetamine	no	
Cocaine	no	
Cannabinoids (Marijuana)	no	

Acetylsalicylic Acid (Aspirin)	yes	no

Analysis:

1. Is it likely that Anna Garcia overdosed on any drugs? Why or why not?

No because she had a decent amount of it.

2. Do the results from the toxicology screening confirm your results from the pill identity lab?

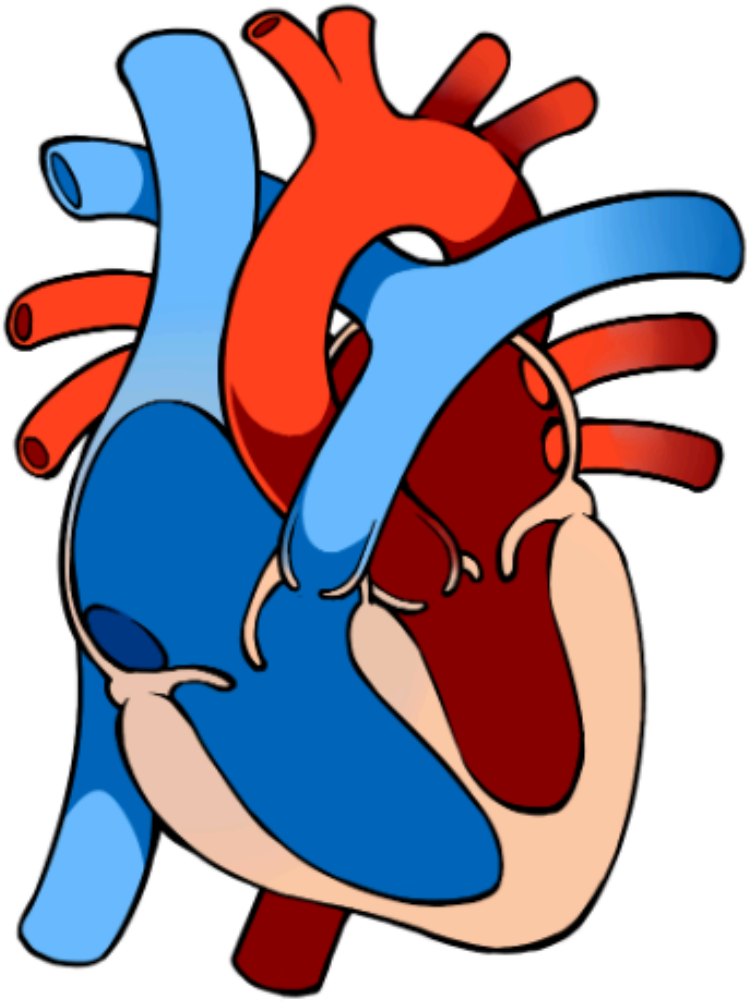
No not much and it was ok nothing really bad happened.

DAY 8: GROSS ANATOMY EXAMINATION OF ANNA GARCIA'S HEART

Date:

Part 1: Heart Diagram

Instructions: *Label the heart chambers, vessels, and valves listed below. Then, draw arrows to show the pathway of blood through the heart.*



Label:

Heart Chambers:

- Left atrium
- Right atrium
- Left ventricle
- Right ventricle

Vessels:

- Aorta
- Superior vena cava
- Inferior vena cava
- Pulmonary artery
- Pulmonary vein

Valves:

- Tricuspid valve
- Bicuspid/mitral valve
- Aortic valve
- Pulmonic valve

Part 2: Heart Observations

To determine whether any abnormalities exist in Anna's heart, you need to know what to look for. The medical examiner has challenged you to use what you now know about normal heart anatomy to see if you can pinpoint issues with other hearts.

Instructions: *Observe the prepared dissected hearts and fill in the table below.*

Heart Station	Disease/Disorder	Observations of Heart Abnormalities	Symptoms/Signs
1	**poor diet and being overweight.**	**The 65 year old woman's heart is way bigger than a regular heart.**	**She had trouble exercising, persistent wheezing and coughing, shortness of breath, swollen legs and feet, and rapid heart beat.**
2	**Heart disease and lung cancer**	**He is a 57 year old man of normal weight and smoked, had a stressful job and complained he had nausea during car rides.**	**Had nausea during car rides**
3	**Ventricular Septal Defect. A Long hole connects the Ventricles**	**It has holes in the hearts like 2 stripes and a horizontal line. She was a 27 year old woman**	**Her husband noticed she had a blue tinge sometimes. She fainted spells, swollen fingers, and frequent colds and respiratory infections.**
4	**Was Healthy no health concerns or past hospitalizations**	**He felt ill before he laid down and then apparently died in his sleep. His wife said that he got bitten by a dog one week before in the leg. He had no health concerns or past hospitalizations.**	**Fever, chills, coughing, pain in the elbows and knees, and nausea.**
5	**Normal heart.**	**The heart was normal and it was a regular size and does not stink bad.**	**There are no symptoms because the heart was like any others.**

Part 3: Anna Garcia's Heart

Instructions*: Complete the steps of the dissection according to the procedure below. Then answer the questions that follow.*

Procedure:

1. Put on goggles and gloves.
2. Obtain a dissecting tray and set of dissecting tools.
3. Obtained a heart from Ms. Macri.
4. Hold the heart with the front facing you and the tubes sticking up from the top. It should be oriented to match the diagram you completed earlier.
5. Cut the heart in half to separate the front and back.
6. Compare the heart to the heart stations you observed earlier.

Analysis:

1. What observations can you make about Anna Garcia's heart?

Her heart matches the heart that was bigger and

2. Should Anna Garcia be diagnosed with any of the disorders observed earlier? Why or why not?

3. Did problems with Anna Garcia's heart contribute to her death? Why or why not?

What Happened to Anna Garcia?

Date:

We have thoroughly reviewed the evidence left behind at the scene of Anna Garcia's death. We analyzed hair, fingerprints, smartphone data, blood, DNA, and her body. We determined her time of death, completed a drug test, and observed her brain and heart tissue.

Your Task: Construct an argument to justify Anna Garcia's **manner** AND **cause** of death using evidence.

Remember the difference between manner and cause of death:

Manner of Death: circumstances in which the death occurred
- Homicide
- Suicide
- Accidental
- Natural

Cause of Death: specific injury or disease that leads to death
- Heart attack
- Cancer
- Stroke
- Infection
- Bleeding out
- Traumatic brain injury
- Kidney failure
- Etc.

Make your claim based on the evidence we have uncovered!

Most Likely Manner of Death: _____

Most Likely Cause of Death: _____

Evidence I will use to support my claim:
- _____
- _____
- _____

Counterevidence: _____

Rebuttal: _____

_____

In your argument, make sure to include at least THREE pieces of evidence, reasoning, and one piece of counter evidence with a rebuttal. The rubric is attached. You may write your argument on the lines below or type your argument and staple it to the back of this packet.

Argument Rubric

	0	1	2
Claim	No Claim	Claim is unclear or unconnected to the rest of the argument	Claim is present, clear, and establishes what the argument will be about
Includes information from evidence	Mentions no pieces of evidence	Mentions 1-2 pieces of evidence	Mentions 3-4 pieces of evidence
Explanation of evidence	Only mentions pieces of evidence, but provides no description OR Discussion of evidence is entirely inaccurate	Describes information in some of the pieces of evidence OR Includes some inaccuracies in the discussion of evidence	Fully and accurately describes information in all relevant pieces of evidence
Reasoning	Does not explain how reasons support claim	Attempts to explain how reasons support claim	Fully explains the connections between the reasons and the claim
Addresses and refutes counter-evidence	Does not mention counter-evidence	Mentions counter-evidence, but does not explain it OR Counter-evidence discussed is not relevant to argument	Fully explains and refutes relevant counter-evidence

Name: _____

Score: _____

Comments: _____

_____

_____

_____

_____

_____