

Principles of Biomedical Science

Period 6-7

Hello, Period 6-7. This week the Respawn case moves toward its answer: the tissue slides on Wednesday, the logic tree on Thursday after your first unit test, and the evidence board on Friday. Every **S** number below is a section of the Story of the Week in this packet, every **R** number is a reference page, and every **A** number is a labeled artifact.

Unit 1 Test: Thursday, October 1. 40 minutes, on paper, at the start of class. It covers what we have done in class so far this unit.

1. Read the **Study Guide**: https://mendozabiomed.org/exams/study-guides/PBS_unit-1-medical-investigation_endunit_guide.pdf
2. Take the **Practice Test**, then check the key at the end: https://mendozabiomed.org/exams/study-guides/PBS_unit-1-medical-investigation_on_practice-test.pdf
3. Use the 6 Rs: Record and Reduce your notes early in the week, Review and Recite the night before, then Reflect and Revise after the practice test. (Both links are also in the "Unit 1 Test prep" box under Sources on every day page.)

Monday, Sept 28 · John Carroll bioethics debate 2 **S1, R6**

Question: *Should we ban antibiotic use in livestock?* John Carroll University, our partner college, leads the first 40 minutes. Bring your preparation assignment; the day page calls it "the strongest evidence you will carry into the room." Sides are assigned in the room, so you may argue the side you disagree with. Under both sides sits one idea, selective pressure: an antibiotic kills the germs it can and leaves the resistant ones to multiply (R6). A rebuttal answers the other side's strongest point, not its weakest. Second half, 40 to 80 minutes, is PLTW work, picking up where you left off: In myPLTW, open Principles of Biomedical Science > Lesson 1.2 Master the Morgue > Activity 1.2.2 Time of Death.

Turn in: your five-box debate worksheet (your side, your three strongest arguments, the opposing point, your answer to it, where you stand now) at the end of the session (Schoolology: Wk6 CER: JCU bioethics 2). Absent? Write the CER described on the day page when you return.

Today's page: <https://mendozabiomed.org/learn/pltw-pbt%40p67/day/2026-09-28>

Tuesday, Sept 29 · Catch-up day **S2**

First, check everything due since your last catch-up day and turn in anything you still owe: D08 Maybe Is a Result (Sep 17), D09 Whose Blood, Whose DNA (Sep 18), the JCU bioethics 1 CER (Sep 21), D10 Barcodes and Panels (Sep 22), D12 The Clock in the Body (Sep 23), D13 Autopsy Day (Sep 24), the Week 5 Review Record (Sep 25), and Monday's debate worksheet. Then the rest of the period is Research Track time. A good use of spare minutes: the Unit 1 practice test.

Turn in: anything you still owe, each to its own Schoolology assignment.

Today's page (it may not open until Monday morning): <https://mendozabiomed.org/learn/pltw-pbt%40p67/day/2026-09-29>

Wednesday, Sept 30 · Investigation Day 14, The Fabric Under the Lens **S3, R7 to R12, A2, A3**

Histology is "reading tissue under a microscope" (R8). Learn the four tissue families (R10), then read five printed slide cards, Exhibits 016 to 020: three case slides and two healthy reference slides (A3). Daily Evidence Sheet, Day 14, Part B tells you: "Describe what you SEE before you name what it MATCHES." Edema is "swelling from fluid where it should not be" (R12); magnification turns a picture into a real size (R9, A2). Before class: the Histology: Four Tissue Types simulation, the pre-lab gate. PLTW: In myPLTW, open Principles of Biomedical Science > Lesson 1.2 Master the Morgue > Activity 1.2.4 Histology, and finish its analysis section using your reference comparisons.

Turn in: Daily Evidence Sheet, Day 14, every Part complete, as one PDF to Wk6 D14 · The Fabric Under the Lens (PLTW 1.2.4).

Today's page: <https://mendozabiomed.org/learn/pltw-pbt%40p67/day/2026-09-30>

Thursday, Oct 1 · UNIT 1 TEST, then Investigation Day 16, The Tree Resolves **S4, R2 to R4, R13, R14**

Test first: 40 minutes, on paper, in class. Bring a pencil. Then bring every thread to one table. Day 16, Part B: "Lay the six threads side by side," one thread per team lane: scene, trace, serology and DNA, chemistry, medical findings, records (R13). Part C: draft your manner-and-cause claim (R2) with "at least four exhibits by E-number across at least three threads" and "the strongest limitation. Stop there." That stopping point is your claim ceiling (R4). The logic tree (R3) is your map of possible answers; each person of interest closes with one of three sentences (R14). PLTW: In myPLTW, open Principles of Biomedical Science > Lesson 1.2 Master the Morgue > Project 1.2.6 Case Closed, the evidence planning task; your Day 16 work is the John Hay version and counts the same.

Turn in: Daily Evidence Sheet, Day 16, every Part complete, as one PDF to Wk6 D16 · The Tree Resolves (PLTW 1.2.6) by 11:59 PM tonight. Start it in class and finish at home.

Today's page: <https://mendozabiomed.org/learn/pltw-pbt%40p67/day/2026-10-01>

Friday, Oct 2 · Investigation Day 17, Build the Board **S5, R15, R16, A1**

Build your team's evidence board from the card kit (A1 shows the layout). Day 17, Part B: "Every line gets one label word: supports, excludes, times, or locates" (R15). Then another team cross-examines your board; the rule is "attack the reasoning, never the people." Find your single point of failure, the one card carrying too many links alone (R16). "If the board cannot show it, the report cannot claim it." PLTW: In myPLTW, open Principles of Biomedical Science > Lesson 1.2 Master the Morgue > Project 1.2.6 Case Closed: record your team's tentative claim and the number of corroborating and conflicting links in your notebook entry and in myPLTW.

Turn in: Daily Evidence Sheet, Day 17, every Part complete, as one PDF to Wk6 D17 · Build the Board (PLTW 1.2.6).

Today's page: <https://mendozabiomed.org/learn/pltw-pbt%40p67/day/2026-10-02>

Each day's page has the steps, readings and links; Schoolology holds the one assignment for each day. Absent? Open that day's page, follow the steps, and see me when you return. Questions? Ask me in class or message me in Schoolology. **Go Hornets!** Mr. Mendoza

The Story of the Week

Respawn is a made-up case, written for this class, but the science inside it is real. Each section below walks you through one class day: what was done first, what happened next, what we were trying to find, which method we used, and what signal made the invisible visible. Each one stops right where your own thinking begins, and points you to the exact page to open.

S1 Monday, Sept 28 · The Valley and the Stream



The debate scenario, pictured: an isolated valley, a treated herd, and the stream below it. This is a photo-style illustration, not the real place.

Picture a valley so far from anything that the loudest sound is water moving over rocks. No factories, no highway, just pasture, cattle, and a clear stream. That is the scenario John Carroll University will read aloud on Monday, word for word from your day page: a bacterial outbreak hits the local livestock, so the community treats the herds with a large course of antibiotics. Weeks later, researchers find three things in the stream: antibiotic traces, a shifted bacterial population, and new antibiotic resistance genes.

Walk the chain the way a scientist would. **First** the animals got sick, and people did the reasonable thing: they gave medicine. An antibiotic is a drug that kills bacteria or stops them from multiplying. **Then** something happened that nobody could see. Every herd of cattle carries billions of bacteria in its gut. Most of them die when the drug arrives. A few carry a gene, a short stretch of DNA, that lets them survive: maybe it builds an enzyme that breaks the drug apart, maybe a pump that pushes the drug back out. Those survivors now have the pasture to themselves, and they multiply. That filtering is called **selective pressure** (R6). The antibiotic did not create the resistance; it chose who got to stay.

Next, water moved. The CDC explains that resistant germs spread between people, animals, and the environment, and that manure spread on fields can carry drug residues and resistant germs into soil, then into groundwater and streams through runoff. So the **goal** of the researchers in the scenario was to find out whether the drug, and the

bacteria it favored, had left the farm. What they report is the **signal**: antibiotic traces, a different mix of bacteria, and resistance genes that were not there before.

Now the debate. The case for a ban, from your day page: "Even low concentrations of antibiotics apply selective pressure, favoring resistant strains and spreading resistance genes through the environment and into the food chain." The case against: "Antibiotics do degrade in the environment through biodegradation, hydrolysis and photolysis." In plain words, microbes eat the drug, water breaks it apart, and sunlight breaks it apart, at rates that depend on pH, temperature and sunlight. Both sentences are science. Neither one, by itself, tells you what a community should do. That is where values enter: whose animals, whose water, whose health, and who pays. Which side you can make stronger in 40 minutes is yours to find out.

Now open your preparation assignment and Monday's day page, Part 1, "Know by the end." Then fill the five boxes of the John Carroll worksheet: your side, your three strongest arguments, the opposing point, your answer to it, and where you stand now. After the debate: In myPLTW, open Principles of Biomedical Science > Lesson 1.2 Master the Morgue > Activity 1.2.2 Time of Death, and pick up where you left off.

What this lesson was trying to teach

A strong decision separates what science can measure (how much drug reaches the stream, how fast it breaks down, which genes spread) from what people value (food supply, farm income, human health). The day page puts it this way: "Use science to estimate consequences, then state the value judgment and tradeoff that determine the decision." The skill is arguing an assigned side with checkable reasons, and answering the other side's strongest point directly.

If we had the full lab

Nobody in our class tested water on Monday; the debate uses the scenario only. Here is how environmental scientists actually test a stream like this one, so you know what the scenario's three findings would rest on.

1. **Sample.** Wearing gloves, a scientist fills sterile bottles with stream water above and below the farm, labels each bottle with place, date and time, and keeps them on ice so the bacteria do not grow or die on the way to the lab.
2. **Count resistant bacteria.** A measured volume of water is pulled through a membrane filter with pores 0.45 micrometers wide, too small for bacteria to pass. The filter goes face up on agar (a jelly of nutrients) called TBX, which turns *E. coli* colonies blue. One plate has plain TBX; a second has TBX plus the antibiotic cefotaxime at 4 micrograms per milliliter, the method in the World Health Organization's Tricycle protocol. Plates sit at 35 C for 22 to 24 hours. The **indicator** is the blue colony: blue colonies on the antibiotic plate divided by blue colonies on the plain plate gives the share of *E. coli* that resist the drug.
3. **Count resistance genes.** DNA is pulled out of the filtered bacteria and run through quantitative PCR, a machine that copies one chosen gene over and over while a fluorescent dye glows brighter with each copy. The sooner the glow rises, the more copies of that resistance gene were in the water. Reviews of livestock manure describe exactly this method for resistance genes.
4. **Measure the drug itself.** Antibiotic traces are measured with liquid chromatography and tandem mass spectrometry, the approach in the US EPA's Method 1694 for pharmaceuticals in water.
5. **Safety and cleanup.** Treat every environmental sample as if it could carry disease: lab coat, gloves, eye protection, no food, disinfect the bench, and sterilize used plates in an autoclave before disposal.

How it connects to Monday: each of the scenario's three findings (drug traces, a shifted population, new genes) comes from one of these tests. When you argue, you can ask what each test can and cannot show. A gene count shows the gene is there; it does not, by itself, show a person got sick.

The PLTW connection

The debate is John Hay's bioethics partnership with John Carroll University. The day page sends the second half of class to PLTW: In myPLTW, open Principles of Biomedical Science > Lesson 1.2 Master the Morgue > Activity 1.2.2 Time of Death, "picking up where last class stopped." Your Respawn worksheet The Clock in the Body

(D12, Sep 23) was built for the same lesson; its day page says it "practices reading a rate, stating an assumption and intersecting independent estimates."

S2 Tuesday, Sept 29 · The Quiet Day



A catch-up desk: the sheets you still owe, your notebook, and your phone to scan pages into one PDF.

Tuesday has no new case evidence. It has something more useful: time. A catch-up day works in two steps, the same way on every catch-up day this year. **First**, you read down the list of everything due since the last catch-up day and check it against Schoology. **Then**, whatever you still owe, you finish and submit, each piece to its own assignment. Only after that does the rest of the period become Research Track time.

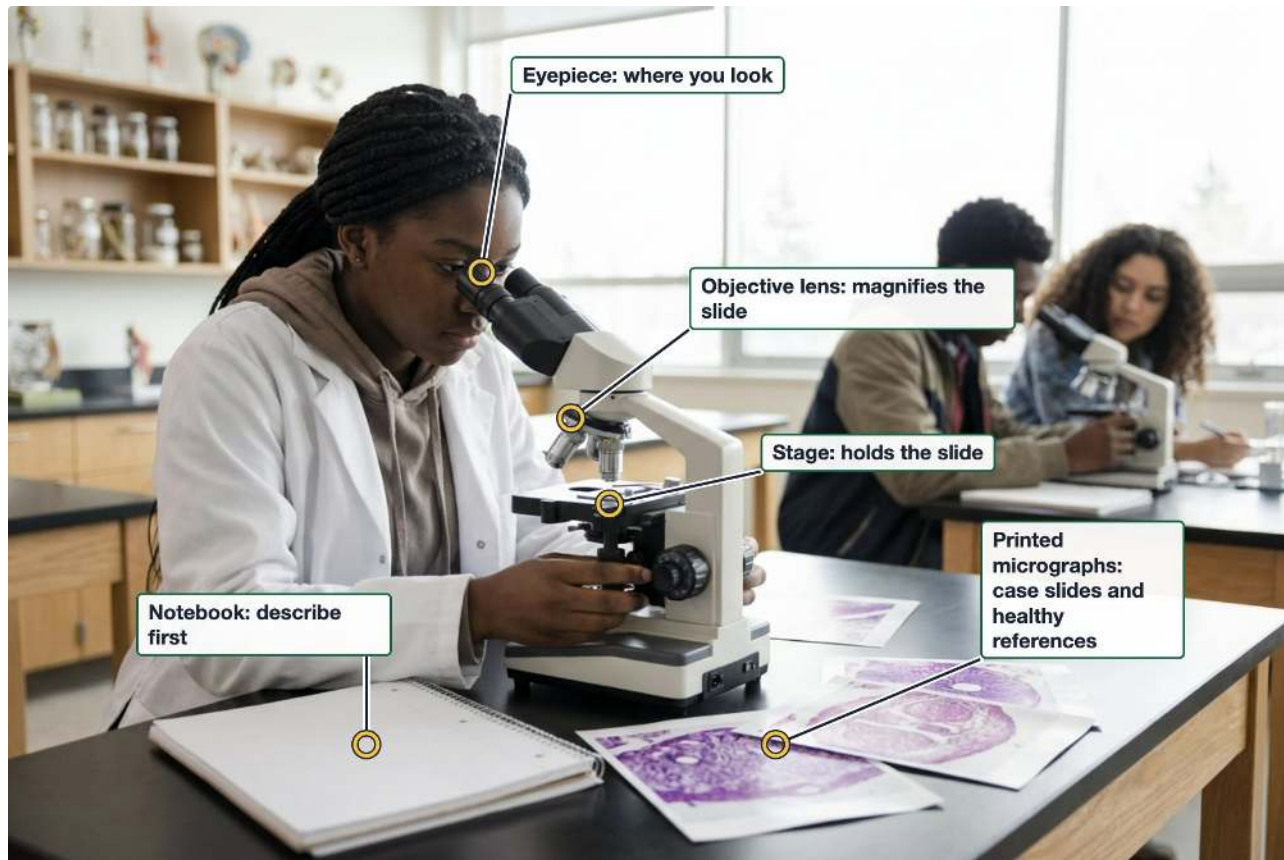
Your list since the last catch-up day: D08 Maybe Is a Result (Sep 17), D09 Whose Blood, Whose DNA (Sep 18), the JCU bioethics 1 CER on ELISA testing (Sep 21), D10 Barcodes and Panels (Sep 22), D12 The Clock in the Body (Sep 23), D13 Autopsy Day (Sep 24), the Week 5 Review Record (Sep 25), and Monday's debate worksheet. The one that matters most for this week is D13: Wednesday's slides were chosen to answer the questions your Day 13 findings sheet left open, so a missing D13 makes Wednesday harder.

A clean submission is one PDF per assignment, with your period and investigator code on the page, never your name on the sheet itself. Scan each page flat, in order, in good light.

Now open Tuesday's day page (it may not load until Monday morning) and your Schoology course. Check off every item above. Then open the Research Track and take the next session you have not done. Spare minutes go to the Unit 1 practice test.

What this day is for

Tuesday is a catch-up day, not a lesson day, so it has no lab box. Its one skill is honest bookkeeping: knowing exactly what you have finished before the test on Thursday.



Reading tissue: the microscope on the left, the printed slide cards on the right. On Wednesday you work from printed micrographs, photographs taken through a microscope.

On Autopsy Day, Day 13, the medical examiner looked at the organs with the naked eye and wrote down what they saw. Your Day 14 pack names what that kind of looking can do: "Yesterday's organ findings said WHERE; today's slides say WHAT PROCESS." The eye can see that an organ is swollen, torn, or heavy. It cannot see why.

So the examiner did what real pathologists do. **First**, small pieces of tissue were taken from the places that raised questions. **Then**, in a real lab, those pieces would be preserved in formalin, soaked in wax, and sliced thinner than a hair, about 5 micrometers, so light can pass through them (R7). A slice that thin is nearly invisible, so the **next** step is the stain. Two dyes do the work. **Hematoxylin** colors cell nuclei, the command centers of cells, deep purple. **Eosin** colors the rest pink: the body of each cell, muscle fibers, and the fibers that pack tissue together. Water, air and fluid take up almost no dye at all, so they stay pale (R8). That color code is the **indicator** that makes the invisible visible. A wide pale gap where tissue should be tight means something is filling the space. A crowd of small, dark purple dots means many small cells have arrived.

The **goal** on Wednesday is to name the process behind each organ finding. The **method** is histology, reading tissue under a microscope, and it has one rule that never bends: compare against healthy tissue. Your day page says it plainly: "diagnosis is based on deviation from normal." That is why your card set has two kinds of cards. Exhibits 017, 019 and 020 are case slides. Exhibits 016 and 018 are healthy references, and they stay on the table while you read (A3 shows the pairs). Every organ is woven from four tissue families: epithelial for linings and coverings, connective for support and packing, muscle for pulling, and nervous for signaling (R10). The pack's analogy is a shirt: "check the fabric, not just the shirt."

Then you read each case slide in three moves, the same discipline the sheet has used since Day 1. **Describe** what you see, with no pattern words yet: spaces, cells, shapes. **Name** the pattern your description earns. **Connect** it to one Day 13 finding. The worked example on sheet page 2 does this once on a training card, T-4, a thigh muscle from a crush injury, so you can watch the moves before you make your own. Use the magnification printed on each card

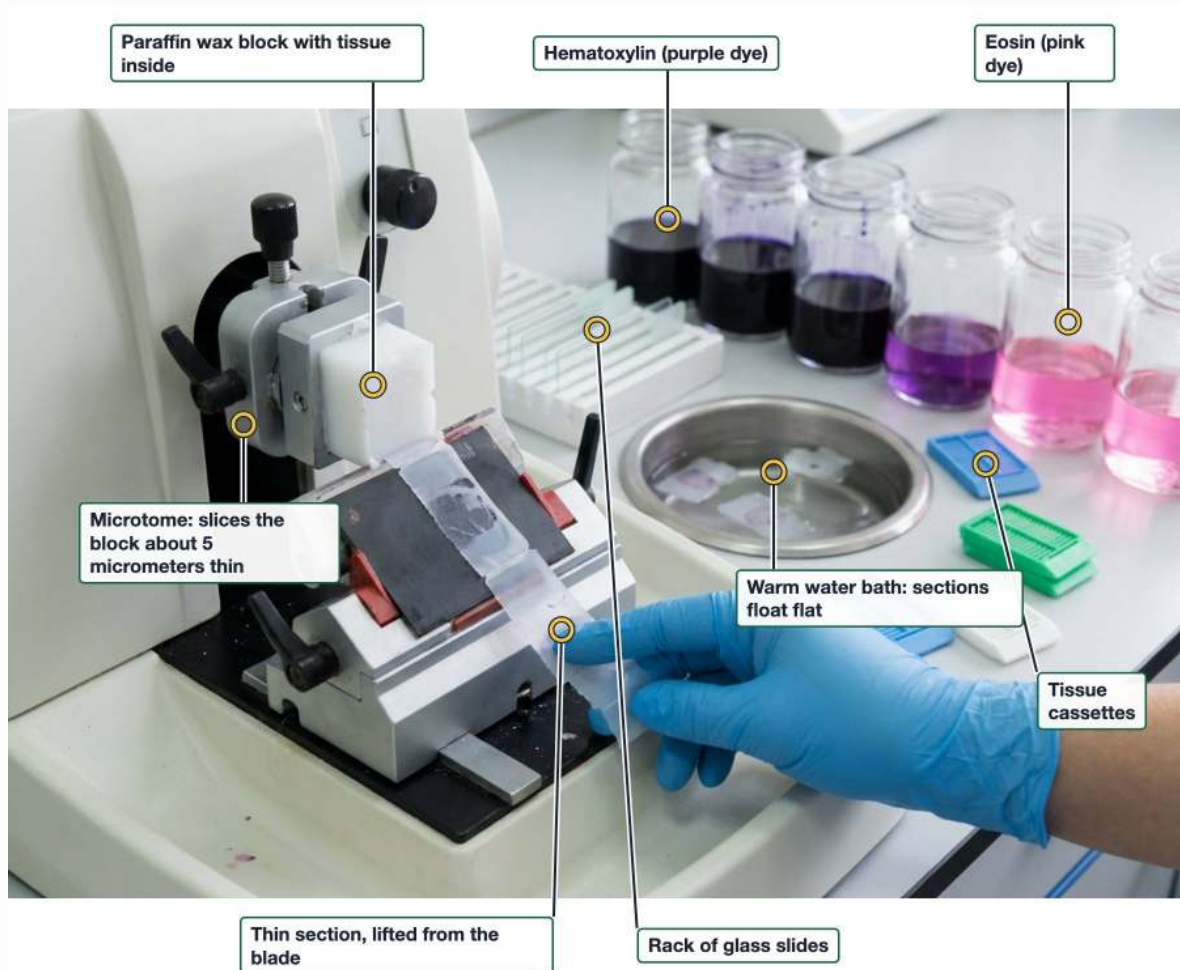
to size what you see (R9, A2). What you call each case slide, and which finding it explains, is your work. The story stops here.

Now open Daily Evidence Sheet, Day 14, Part A, and read the briefing before you touch a slide card. Then Part B: "Describe what you SEE before you name what it MATCHES."

What this lesson was trying to teach

Organs are built from four tissue families, and disease or injury changes the weave. A pathologist recognizes that change as a difference from healthy reference tissue, never from one slide alone. The skills: describe before you name, cite a visible feature for every call, and use magnification to estimate real size.

If we had the full lab



A hospital histology bench: the microtome, the warm water bath, the slide rack, and the staining jars of hematoxylin and eosin. You did not cut or stain tissue this week; this is where your printed cards would have come from.

1. **Fix.** Each tissue piece, no thicker than about half a centimeter, drops into buffered formalin in a labeled plastic cassette. Formalin locks proteins in place so the tissue stops decaying. Fixing and processing take hours, not minutes.
2. **Process and embed.** A machine moves the cassettes through stronger and stronger alcohol to pull out the water, then xylene, then melted paraffin wax. The tissue is set in a wax block.
3. **Cut.** A microtome shaves ribbons of wax about 5 to 10 micrometers thick. The ribbon floats flat on a warm water bath and is scooped onto a glass slide.
4. **Stain.** The slide passes through jars: xylene and alcohol to remove the wax, hematoxylin (nuclei turn purple), a rinse, eosin (everything else turns pink), then alcohol and xylene again. A thin glass coverslip is glued on top.

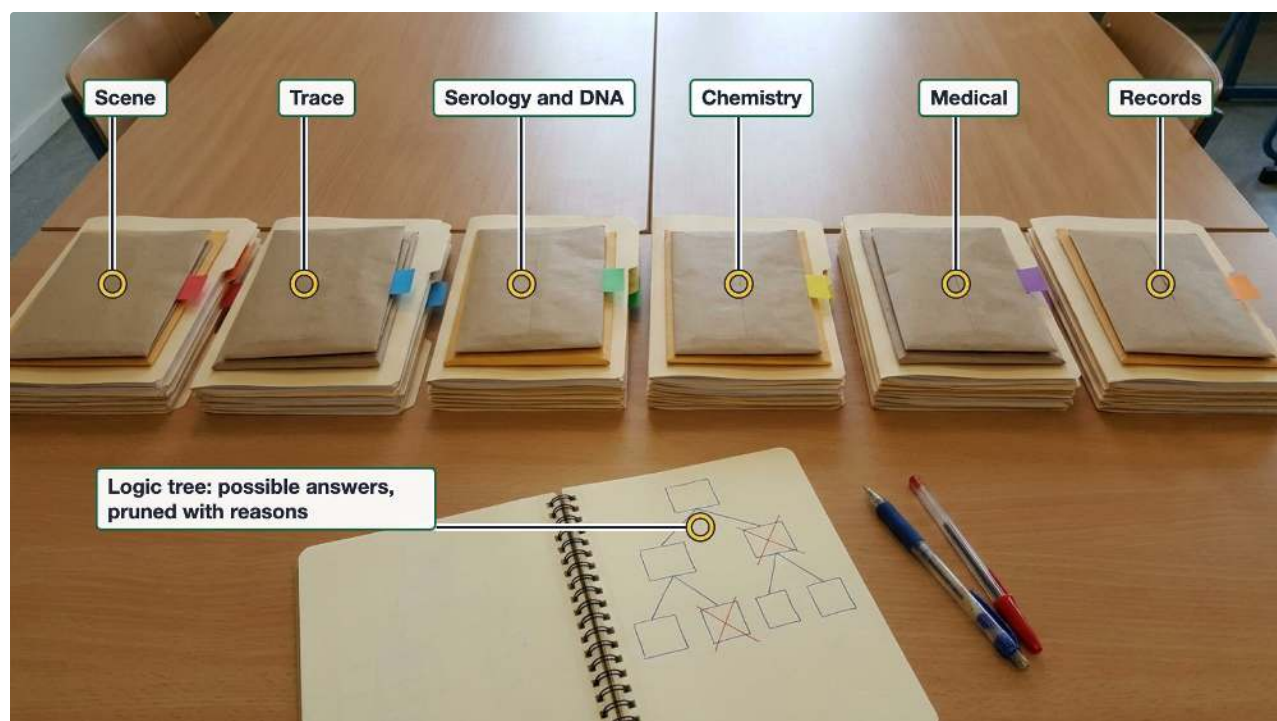
5. **Read.** A pathologist compares the stained case slide with healthy tissue at low, then high, magnification. For some questions a special stain is added, such as immunohistochemistry, which uses an antibody to color one chosen protein brown.
6. **Safety.** The National Cancer Institute notes that formaldehyde is classified as a known human carcinogen, so formalin work happens in a fume hood with gloves, goggles and a lab coat. Microtome blades are razor sharp and are handled with the guard on.

How it connects: your printed cards are the last photograph at the end of steps 1 to 4. On Wednesday you did step 5, the reading, which is the part a pathologist is paid for. The simulation Histology: Four Tissue Types is your pre-lab practice for that step.

The PLTW connection

In myPLTW, open Principles of Biomedical Science > Lesson 1.2 Master the Morgue > Activity 1.2.4 Histology. The portal's direction: "Finish its analysis section using your reference comparisons," then mark it complete. The Respawn slide cards practice the same skill that activity asks for: reading tissue against a healthy reference.

S4 Thursday, Oct 1 · Six Threads, One Table



Six piles, one per thread, and the logic tree in the notebook. Two exhibits from the same pile are one voice, not two.

Thursday begins quietly: the Unit 1 Test, 40 minutes, on paper, pencils only. Then the room changes gears. Every exhibit the case has produced since the first day lands on one table.

Think about how the evidence got here. **First**, six teams each worked one lane, which the sheet calls a **thread**: scene, trace, serology and DNA, chemistry, medical findings, and records. **Then**, day by day, each thread added exhibits, each one with its own number. Until today, most of those exhibits were read one at a time. Today's **goal** is to find out which branch of the logic tree (R3) is still standing when all six threads are read together.

The **method** is corroboration (R13), which the pack defines as "when independent evidence lines agree," like "two witnesses who never met telling the same story." Two threads are independent when neither depends on the other's method or sample. That detail matters. A hair read under the microscope and the DNA from that same hair are two cards, but one sample, so they count as one voice. The **signal** you are looking for is a count: how many independent

threads hold up a branch. The rule on your sheet is at least four exhibits across at least three threads. The pack explains why: "One line persuades; three lines conclude."

Records get special attention on Thursday. The D16 pack says the final records exhibits release today and close the open threads: an HR memo, a group chat, a delivery invoice, and a livestream log. Records "are time-stamped by machines and third parties," which makes them the skeleton the softer estimates hang on. In the pack's words: "Your time-of-death window bends; a door log does not."

Then every person of interest leaves the table in one of three states (R14): cleared by evidence, implicated by evidence, or not established by evidence. The difference between "we could not prove it was them" and "the evidence shows it was not them" is the difference between two sentences a court would treat very differently. The sheet's worked example, the Larkspur greenhouse on pages 2 to 4, is a made-up practice case that runs this whole process once. Your own case, and your own claim, are yours. The story stops here.

Now open Daily Evidence Sheet, Day 16, Part A, and read the briefing. Then Part B: "Lay the six threads side by side." Part C is your draft claim: "Stop there. Nothing is final tonight."

What this lesson was trying to teach

Cases close when independent lines of evidence agree, and each line earns trust from how it was collected: controls, an unbroken chain of custody, and a machine or third-party time stamp count for more than one person's memory. The skills: count independent threads honestly, close each person of interest with the sentence the evidence earned, and write a claim that stops at its ceiling.

If we had the full lab



A forensic toxicology lab: a scientist loads a sample vial into a gas chromatograph with a mass spectrometer (GC-MS).

On Thursday your exhibits arrived as printed cards. In a real medical examiner's office, the chemistry and records threads behind those cards come from labs and companies. Here is what that work looks like; none of it happened in our room.

1. **Collect.** At autopsy, blood is drawn with a needle from the femoral vein in the upper leg, the site reviews prefer because it is less affected by chemical changes after death. Tubes are sealed, labeled, and logged on a chain-of-custody form (R1).
2. **Screen.** A fast immunoassay, a test where antibodies grab one family of drugs and produce a signal, checks the blood for many drug classes at once. A screen says "maybe."
3. **Confirm.** Anything the screen flags is confirmed by gas chromatography with mass spectrometry, or liquid chromatography with tandem mass spectrometry. The first half separates the chemicals in the sample; the second weighs each one, which identifies it by name and amount. The indicator is a peak on a graph at the time and weight that match a known standard.
4. **Protein markers.** Some blood proteins, like the tryptase value in your chemistry exhibits, are measured on serum with an immunoassay analyzer. A review of postmortem tryptase warns that the number must be read together with the case history, the scene, and the autopsy, never alone.
5. **Records.** Door logs, HR files, invoices and platform logs are requested from the companies that keep them, with their metadata (the machine's own record of when something was sent or entered).

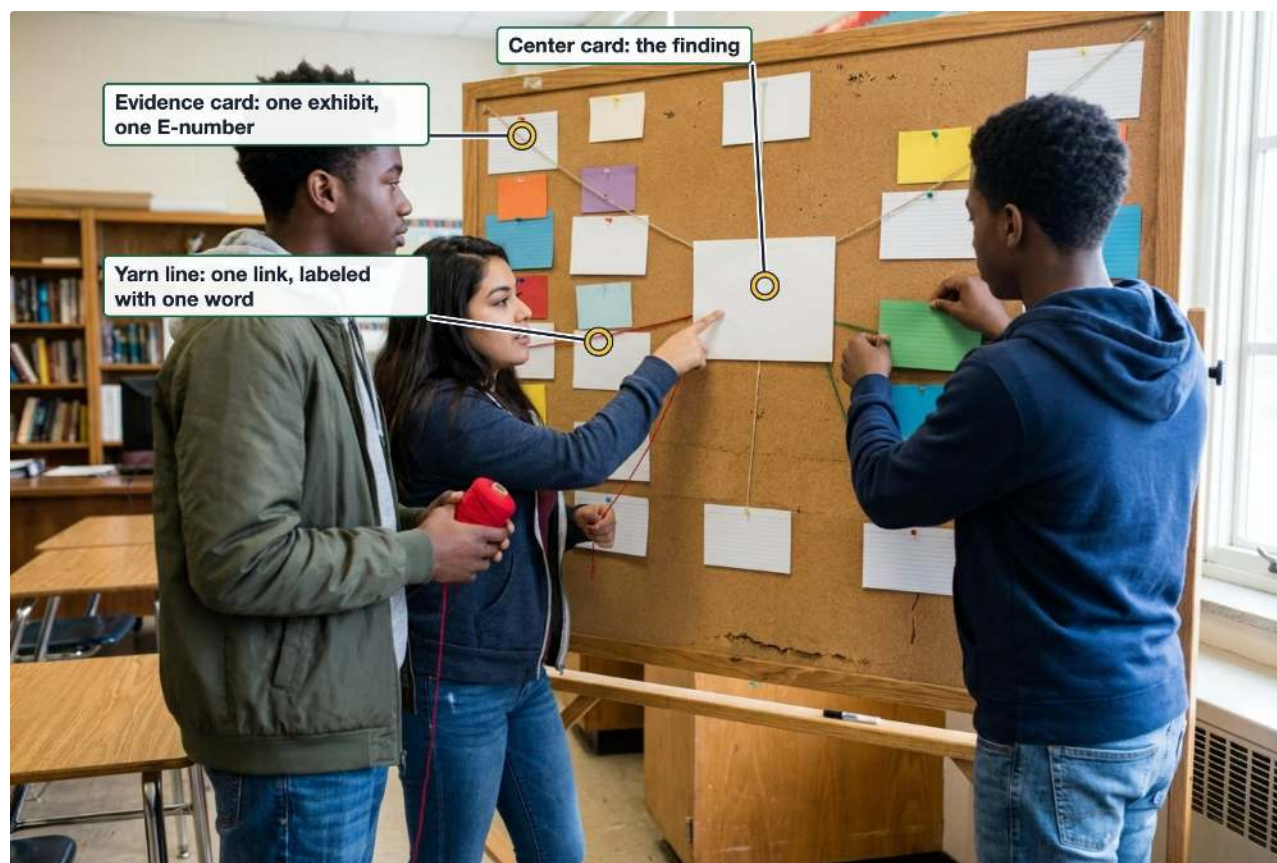
6. **Safety.** Blood is treated as infectious: gloves, eye protection, lab coat, and sharps in a puncture-proof container.

How it connects: the lab's job ends with numbers and documents. The last step, the one you did Thursday, is the medical examiner's: weighing every thread together.

The PLTW connection

In myPLTW, open Principles of Biomedical Science > Lesson 1.2 Master the Morgue > Project 1.2.6 Case Closed. The portal says it "holds the PLTW planning task; the evidence planning sheet on this page is the John Hay version and counts the same." Laying the Respawn threads side by side and weighing each one is the planning that project asks for.

S5 Friday, Oct 2 · An Argument With Geography



Building the board: one center card, evidence cards around it, and a labeled line for every link.

By Friday your team has a draft claim. Friday asks a harder question: can anyone else follow it? The pack's answer is the evidence board, "an argument with geography."

First, the center card goes up: the finding your team drafted on Thursday. **Then** the evidence cards go around it, one card per exhibit, each carrying its E-number. **Next** come the lines. Every line gets one word, and only four words are allowed: **supports**, **excludes**, **times**, **locates** (R15). A line with no word is decoration. Each thread gets its own color, so anyone can see which kind of evidence carries each link. People who were cleared stay on the board with their clearing evidence attached, "because showing why the innocent are innocent is half the finding."

The **goal** is to expose the weakest link before the report does. The **method** is cross-examination: another team reads your board cold and attacks it. The protocol is professional: "attack the reasoning, never the people; every attack cites the board itself; the defending team answers from exhibits or concedes honestly." The **signal** you watch for is visible on the board itself: how many colors reach the center, and whether one card sits on too many lines. That card is your **single point of failure** (R16), like "one bolt holding the whole shelf."

The sheet's worked example returns to the made-up greenhouse. In that practice board, three of five support paths ran through one card, the thermostat log: 3 divided by 5 is 60 percent. The fix was not more string. It was connecting two other cards straight to the center on their own evidence, which dropped the share to 1 in 5, 20 percent. Your board, your count, and your repair are yours. The story stops here.

Now open Daily Evidence Sheet, Day 17, Part A. Then Part B: "Every line gets one label word: supports, excludes, times, or locates."

What this lesson was trying to teach

"If the board cannot show it, the report cannot claim it." A conclusion is strong when several independent paths reach it, and weak when everything runs through one card. The skills: label every link, make independence visible, find the single point of failure, and take a hard question without taking it personally.

Beyond the classroom

Friday was already hands-on: you built a real board. Here is what a real crime lab or medical examiner's office adds.

1. **Technical review.** Accreditation standards for forensic labs require a second qualified analyst to review the notes, data and conclusions in a case file before a report is released. It is a formal version of your cross-examination.
2. **A permanent record.** The board, or the case summary chart that replaces it, is photographed and filed. In your room, Team A photographs the final board.
3. **Court.** In a trial, the analyst's conclusions are cross-examined by an attorney whose job is to find the weakest link. The analyst answers from the record or says what the evidence cannot show.

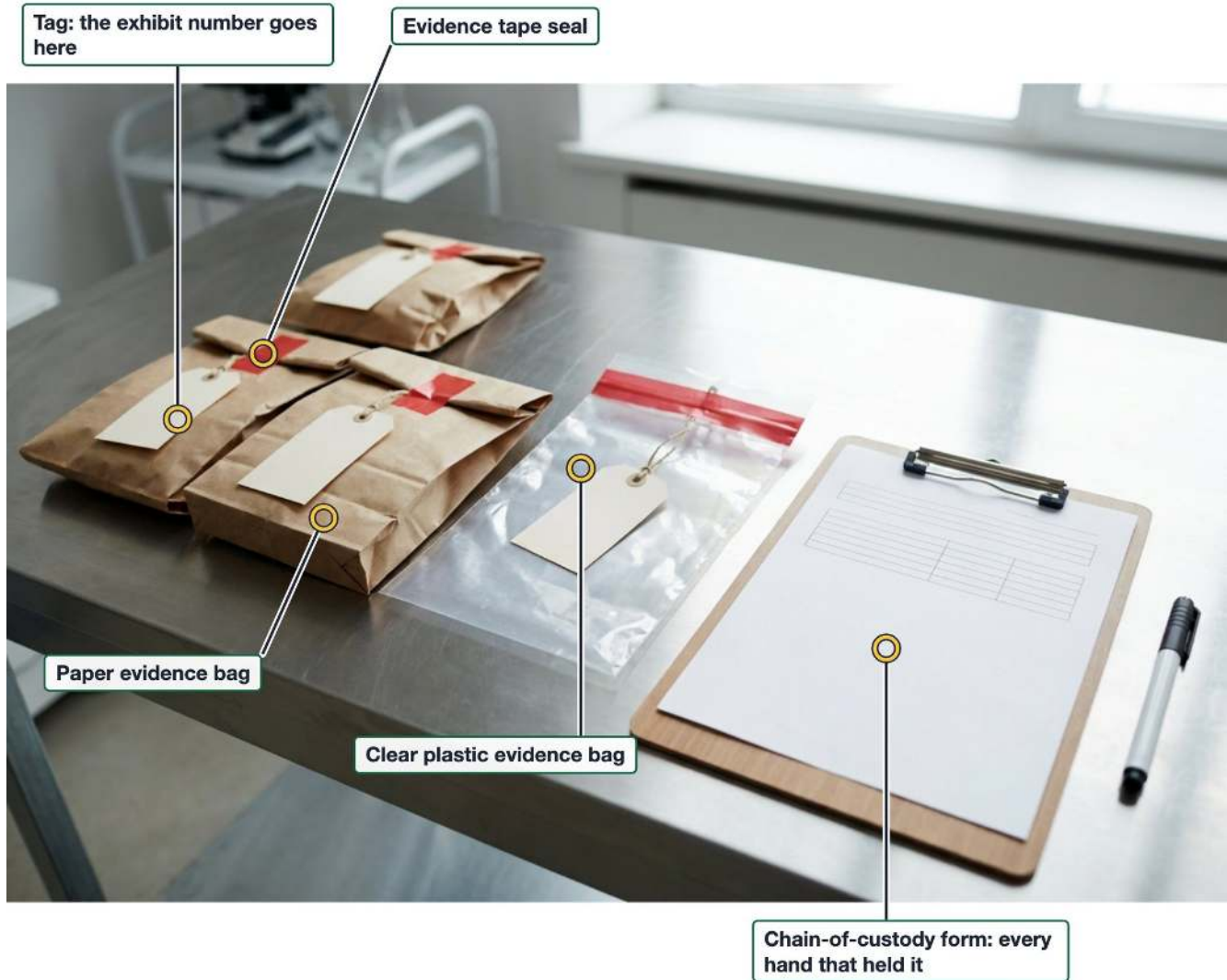
The PLTW connection

In myPLTW, open Principles of Biomedical Science > Lesson 1.2 Master the Morgue > Project 1.2.6 Case Closed. The portal asks you to record your team's tentative claim and the number of corroborating and conflicting links in your notebook entry, "the John Hay version of the Project 1.2.6 board task; it counts the same." Record the same two things in myPLTW.

Reference pages

One page of plain explanation per word or tool this week uses. Each label on each picture points to the thing it names.

R1 Exhibit, E-number, and chain of custody



PLAIN DEFINITION

An **exhibit** is one numbered piece of evidence. Its number (E10, DOC-6, Exhibit 017) never changes. The **chain of custody** is the written record of every person who held it, when, and why.

WHAT IT LOOKS LIKE

A sealed bag or card with a tag, sealed with evidence tape, plus a form with one row per hand-off.

WHAT IT IS FOR

It proves the thing tested in the lab is the same thing found at the scene, untouched in between.

HOW TO READ IT

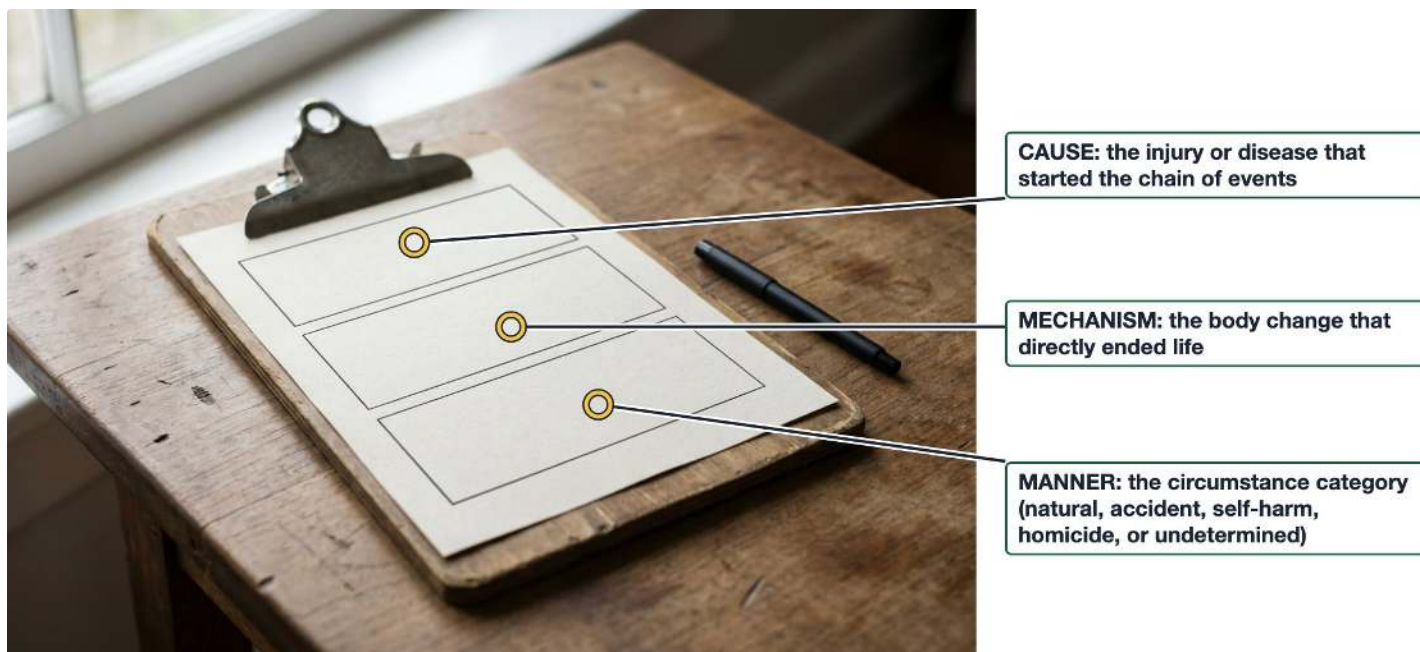
Your case uses two levels of numbers. E12 is the whole slide set in the evidence log; the individual slide cards inside it carry Exhibit numbers 016 to 020. Cite whichever your sheet asks for.

COMMON MISTAKE

Citing an exhibit by description ("the hair") instead of its number. Every Day 16 and Day 17 item asks for E-numbers.

Where you meet it this week: Day 16 Part B ("E-numbers") and Part C ("at least four exhibits by E-number"); Day 17 build standard ("every card carries its E-number").

R2 Cause, mechanism, and manner of death



PLAIN DEFINITION

Cause: the injury or disease that started the chain of events. **Mechanism:** the change inside the body that directly ended life, such as blood loss or the airway closing. **Manner:** the category of circumstance: natural, accident, self-harm (suicide), homicide, or undetermined.

WHAT IT LOOKS LIKE

Three separate boxes on a death certificate or case report. Each gets its own evidence.

WHAT IT IS FOR

Keeping medical questions (what happened in the body) apart from circumstance questions (how it came about).

HOW TO READ IT

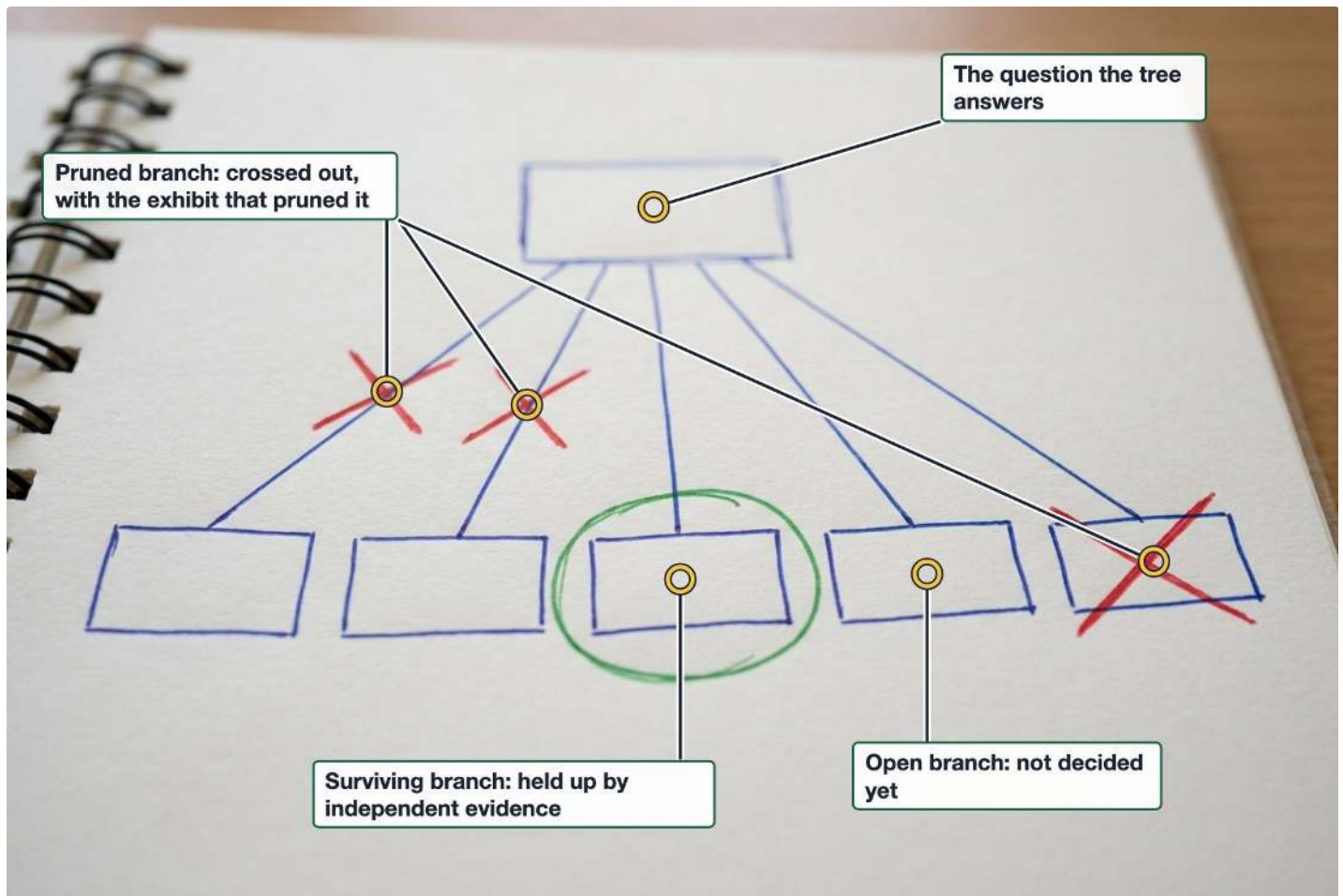
Tissue and lab findings speak mostly to cause and mechanism. Manner usually needs scene and records evidence too. The D14 sheet: "Tissue findings support mechanisms; they do not name manners."

COMMON MISTAKE

Treating a mechanism as a manner. The same mechanism can happen by accident or on purpose.

Where you meet it this week: Day 14 claim ceiling; Day 16 Part C ("Draft the manner-and-cause claim").

R3 Logic tree and pruning



PLAIN DEFINITION

A **logic tree** starts with one question and branches into every possible answer. **Pruning** means crossing out a branch, with the exhibit that ruled it out written beside it.

WHAT IT LOOKS LIKE

A diagram in your notebook: the question on top, one branch per possible manner, red cross-outs with E-numbers, one branch circled.

WHAT IT IS FOR

Making sure you consider every answer before you pick one, and showing exactly why each one fell.

HOW TO READ IT

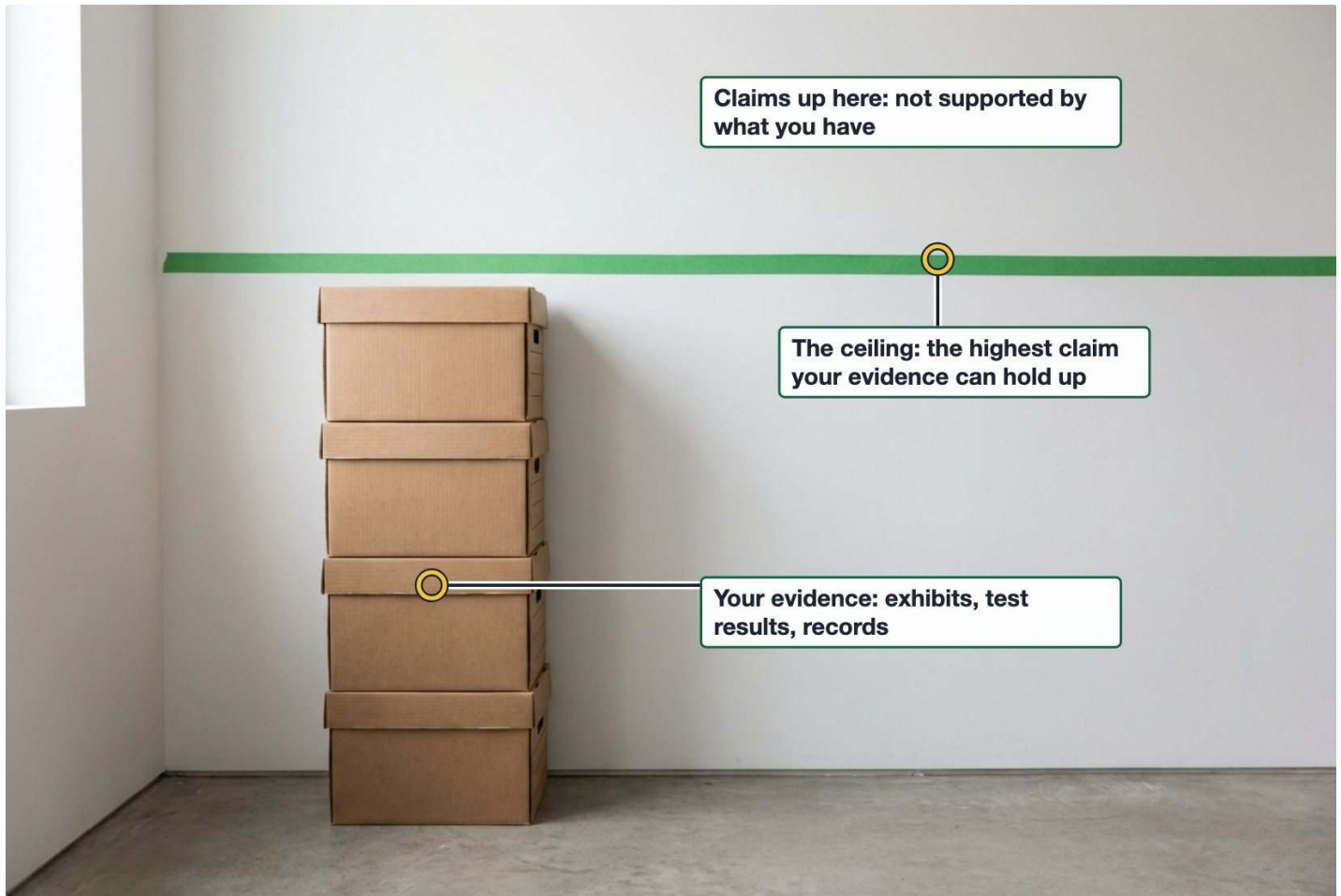
A branch survives only when independent evidence holds it up. On Day 16, the rule is two independent threads for a branch to survive, and four exhibits across three threads for your claim.

COMMON MISTAKE

Crossing out a branch with no reason written. The worked example's honest wording: "no exhibit supports it," not "proven impossible."

Where you meet it this week: Day 14 ("The tree prunes further today"); Day 16 ("resolve the logic tree"); Day 16 notebook page "Logic tree: final pruning inked."

R4 Claim ceiling



PLAIN DEFINITION	The claim ceiling is the highest claim your evidence can hold up. Anything above it is a guess, however true it may feel.
WHAT IT LOOKS LIKE	A sentence printed in a box on every Daily Evidence Sheet, and the last sentence of a good claim.
WHAT IT IS FOR	Keeping your writing honest, and keeping a classroom finding from pretending to be a court verdict.
HOW TO READ IT	Ask: which of my exhibits supports each word of my sentence? Remove any word no exhibit supports.
COMMON MISTAKE	Writing past the ceiling because the story feels finished. Day 16: "states its strongest limitation, and stops there."

Where you meet it this week: Day 14 Part C, Day 16 Part C, Day 17 Part C; the "What the evidence can and cannot prove" box on every day page.

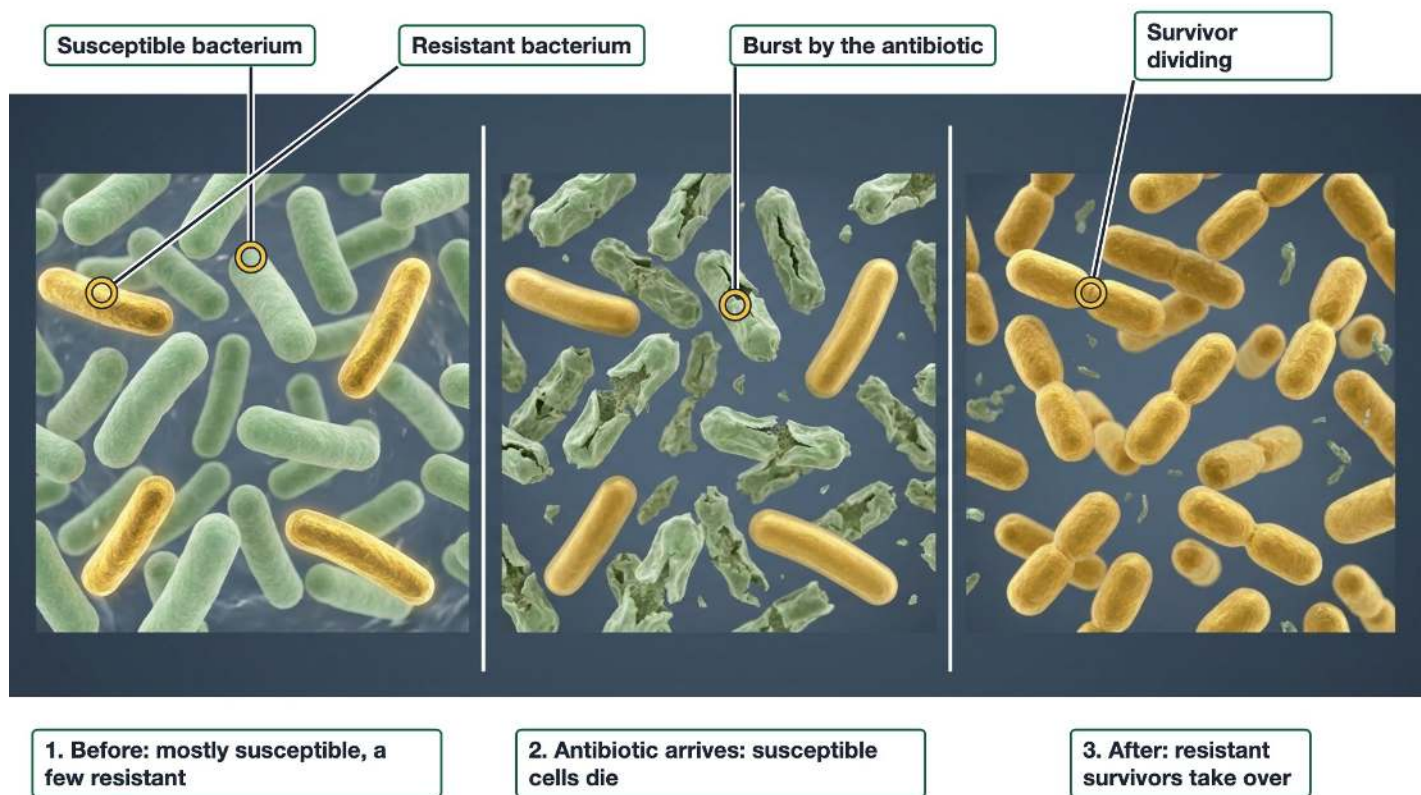
R5 CER: Claim, Evidence, Reasoning



PLAIN DEFINITION	A three-part way to write a scientific argument: the claim answers the question, the evidence is the data that backs it, and the reasoning is the science rule that connects the two.
WHAT IT LOOKS LIKE	Three short parts, usually followed by one limitation sentence.
WHAT IT IS FOR	Making an argument someone else can check, piece by piece.
HOW TO READ IT	Every claim sentence should point to at least one piece of evidence, and the reasoning should say why that evidence matters.
COMMON MISTAKE	Evidence with no reasoning: listing exhibits without saying what rule connects them to the claim.

Where you meet it this week: Monday's JCU worksheet and the absent-student CER; Wednesday's day page ("Write a CER"); the claim paragraphs on Days 16 and 17.

R6 Antibiotic resistance and selective pressure

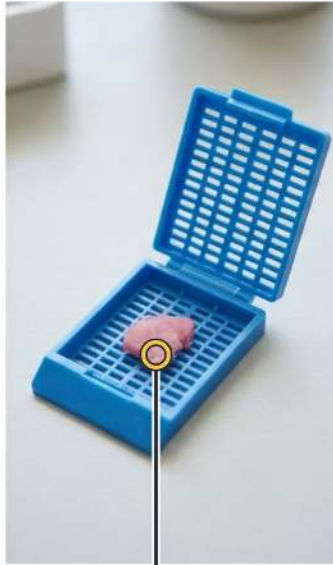


The bacteria are drawn as a model; real bacteria are not colored.

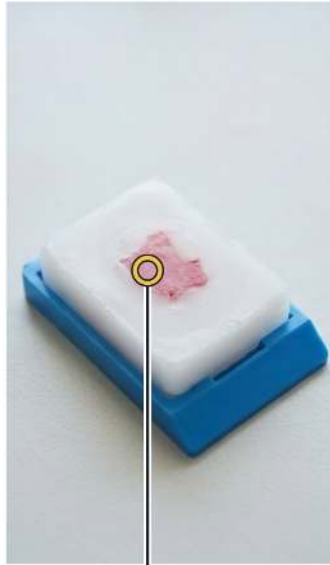
PLAIN DEFINITION	An antibiotic kills bacteria or stops them from multiplying. Resistance is a bacterium's ability to survive the drug, usually because of a gene it carries. Selective pressure is what happens when the drug removes the susceptible bacteria and leaves the resistant ones to multiply.
WHAT IT LOOKS LIKE	Under a microscope, nothing; resistant and susceptible bacteria can look identical. The difference shows only when the drug is present.
WHAT IT IS FOR	Explaining why antibiotic use anywhere (in people, animals, or water) can raise the share of resistant bacteria.
HOW TO READ IT	Ask two questions: how many bacteria resist, and how many resistance genes are present? A rising share after drug exposure is the footprint of selection. Bacteria can also pass resistance genes to one another.
COMMON MISTAKE	Thinking the antibiotic creates resistance on purpose, or that the bacteria <i>get used to</i> the drug. The drug selects survivors that already carried the trait.

Where you meet it this week: Monday's debate: the day page's "The case for" sentence ("Even low concentrations of antibiotics apply selective pressure").

R7 How a tissue slide is made



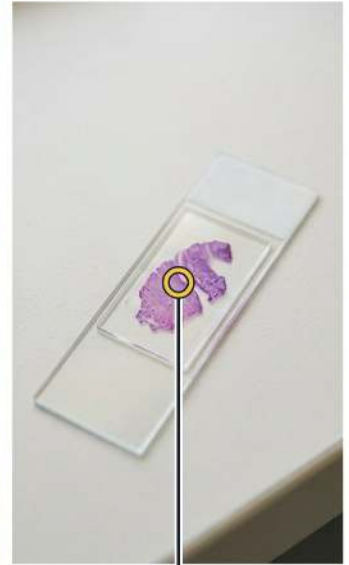
1. Fixed tissue in a plastic cassette



2. Soaked in paraffin wax and set in a block



3. Sliced about 5 micrometers thin



4. Stained with H and E, sealed under a coverslip

PLAIN DEFINITION

A **tissue slide** is a slice of tissue thin enough for light to pass through, stained with dyes and sealed on glass.

WHAT IT LOOKS LIKE

A glass slide about the size of a stick of gum, with a pink and purple smear under a thin glass coverslip.

WHAT IT IS FOR

Letting a pathologist see cells and their arrangement, which the naked eye cannot.

HOW TO READ IT

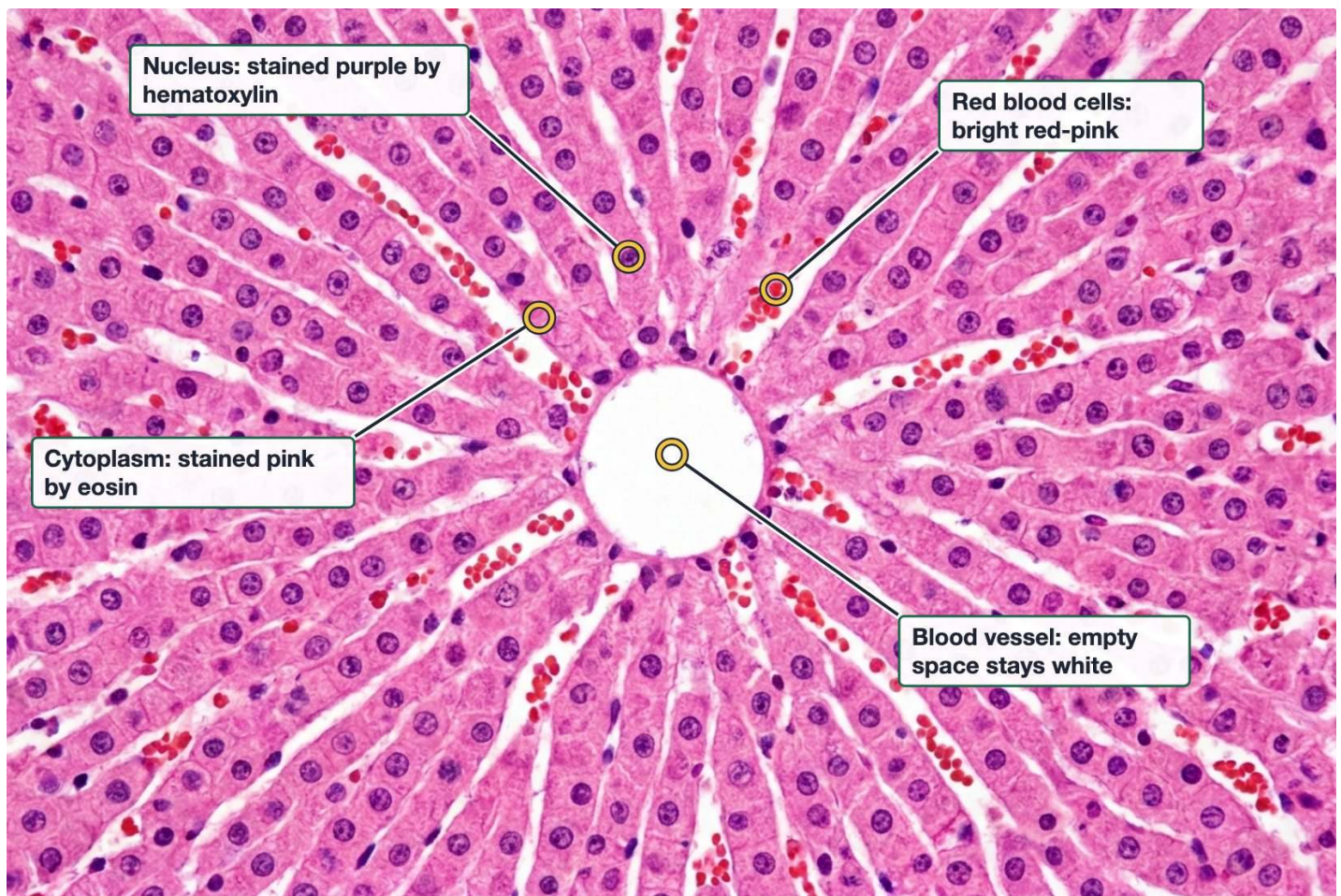
Four steps: fix (formalin stops decay), embed (wax makes it firm), cut (about 5 to 10 micrometers thin on a microtome), stain (usually H and E, R8).

COMMON MISTAKE

Forgetting that the slide is a thin flat slice of a 3D organ. A thick cut or a weak stain can mimic disease; that is why every case slide is read beside a healthy reference.

Where you meet it this week: Wednesday's day page ("Two variables that affect slide interpretation are the quality of the staining ... and the thickness and angle of the tissue section"); the full-lab box in S3.

R8 Reading an H and E stain



Healthy liver tissue, shown only to teach the colors. It is not a case slide.

PLAIN DEFINITION	H and E stands for hematoxylin and eosin, the two dyes used on most tissue slides. Hematoxylin colors nuclei purple or blue; eosin colors most other material pink or red.
WHAT IT LOOKS LIKE	Pink tissue dotted with purple nuclei. Red blood cells look bright red-pink; spaces holding air or fluid stay white or pale.
WHAT IT IS FOR	Showing where the cells are (purple dots), what holds them together (pink), and where something is missing or added (pale gaps, extra dots).
HOW TO READ IT	Scan low power first. Then ask: are the nuclei evenly spaced, or crowded? Is the pink tight, or pushed apart by pale space?
COMMON MISTAKE	Calling every white area "damage." Blood vessels and air sacs are supposed to be open spaces; compare with the reference card.

Where you meet it this week: Every slide card on Wednesday (Exhibits 016 to 020); histology is "reading tissue under a microscope" (D14 sheet).

R9 The light microscope, magnification, and the field



PLAIN DEFINITION

Magnification is how many times larger the image is than the real object. The **field** is the whole circle you see through the eyepiece or on the printed card.

WHAT IT LOOKS LIKE

Each slide card prints its magnification, such as 100x or 200x.

WHAT IT IS FOR

Turning a picture into a real size. The D14 worked example: "At 200x the whole printed field is about 1 millimeter across in real life."

HOW TO READ IT

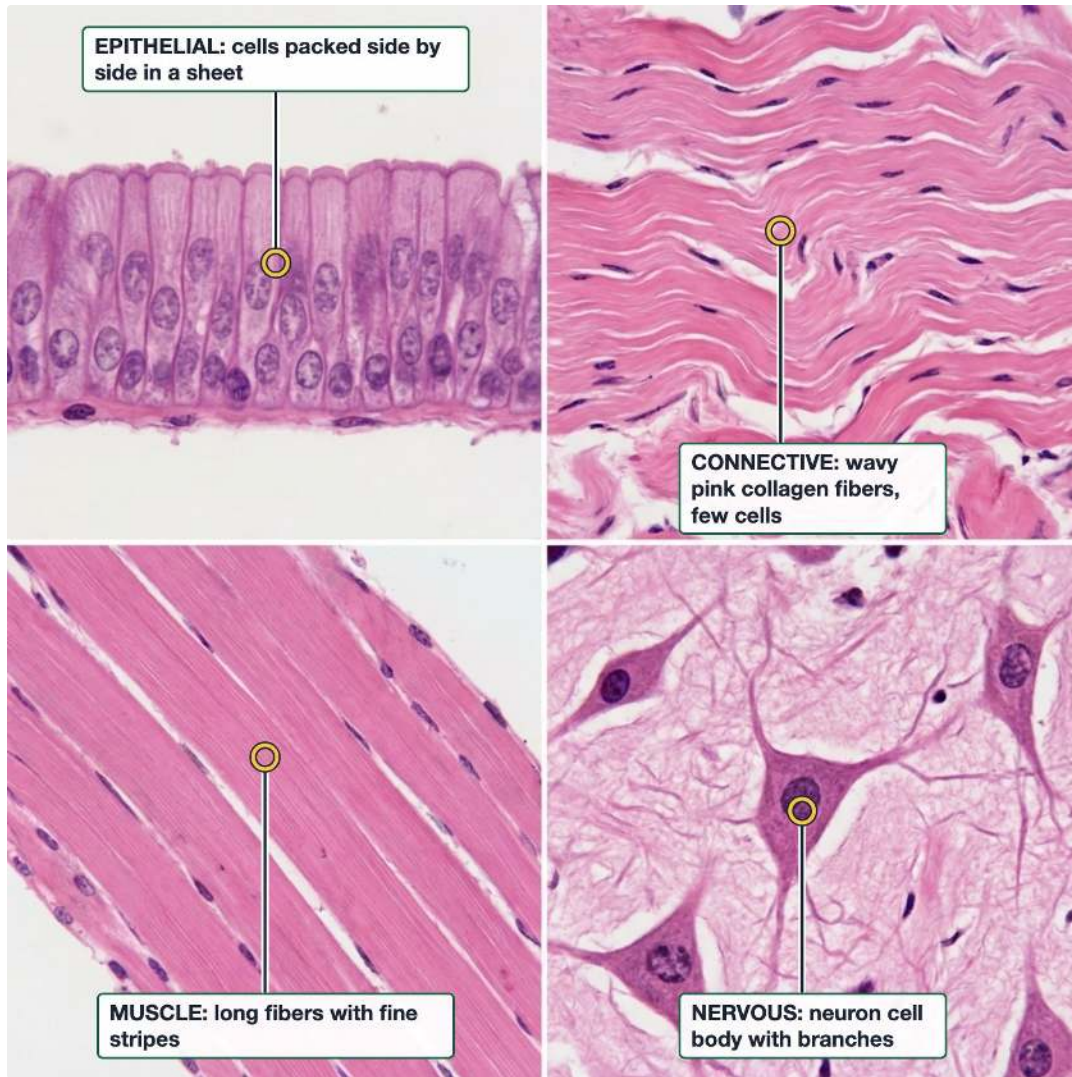
Total magnification = eyepiece times objective (10x times 10x = 100x). To size an object, divide the real field width by how many of that object fit across it (A2). 1 millimeter = 1,000 micrometers.

COMMON MISTAKE

Reporting more precision than a printed image allows. The worked example says "precise to about the nearest few micrometers."

Where you meet it this week: D14 Part B vocabulary (field, magnification) and item B3.

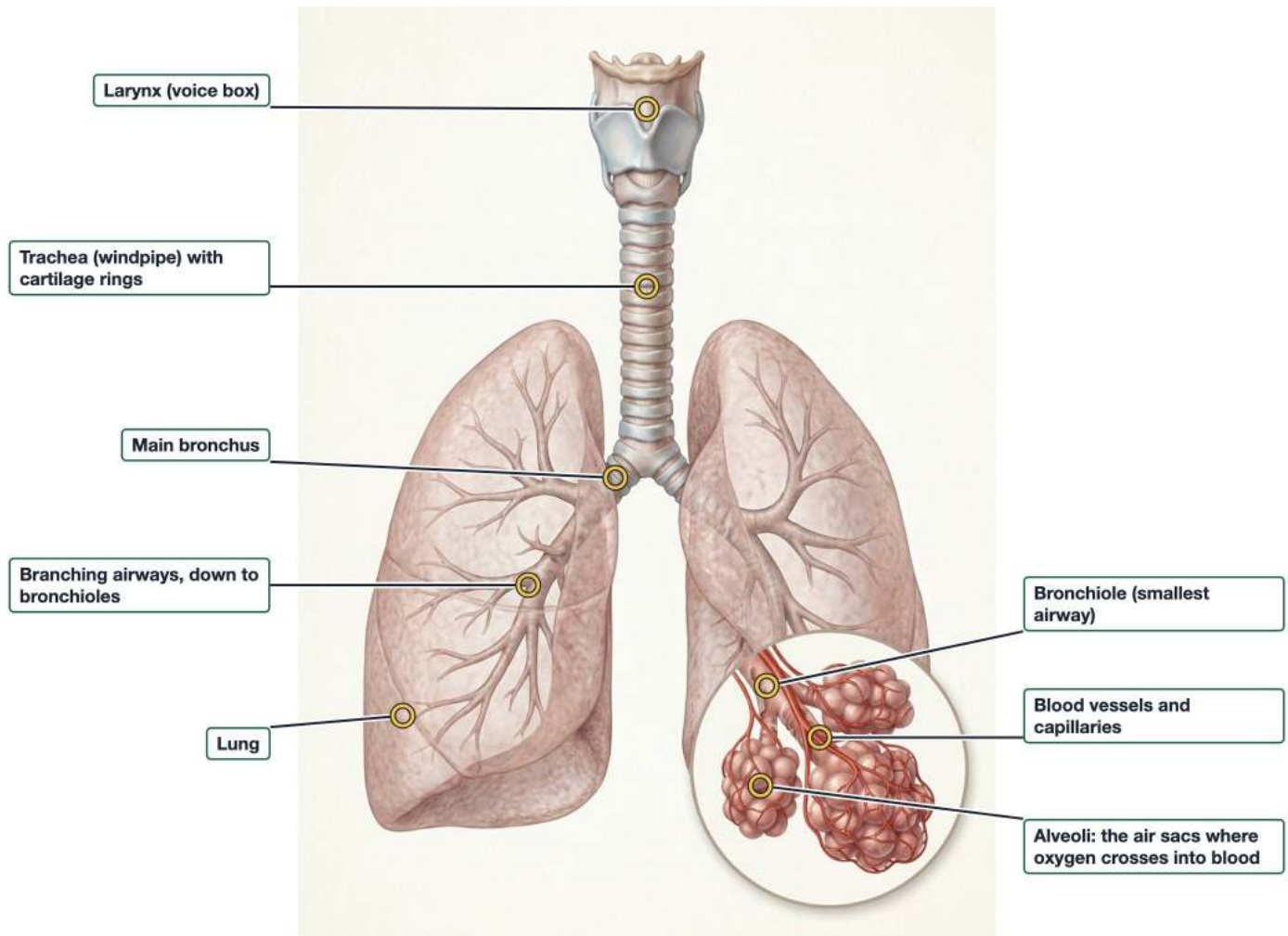
R10 The four tissue families



PLAIN DEFINITION	Every organ is woven from four tissue families. Epithelial: covering and lining sheets. Connective: support and transport (bone, blood, the fibrous packing). Muscle: contraction. Nervous: signaling. (Definitions from the D14 pack.)
WHAT IT LOOKS LIKE	Epithelial: cells packed edge to edge in a sheet. Connective: fibers with scattered cells. Muscle: long fibers, often with fine stripes. Nervous: large cell bodies with branches.
WHAT IT IS FOR	Naming what a tissue is before deciding whether it looks normal.
HOW TO READ IT	Find the family first, then compare with a healthy reference of the same family.
COMMON MISTAKE	Expecting one family per field. The pack: "real slides mix families in one field."

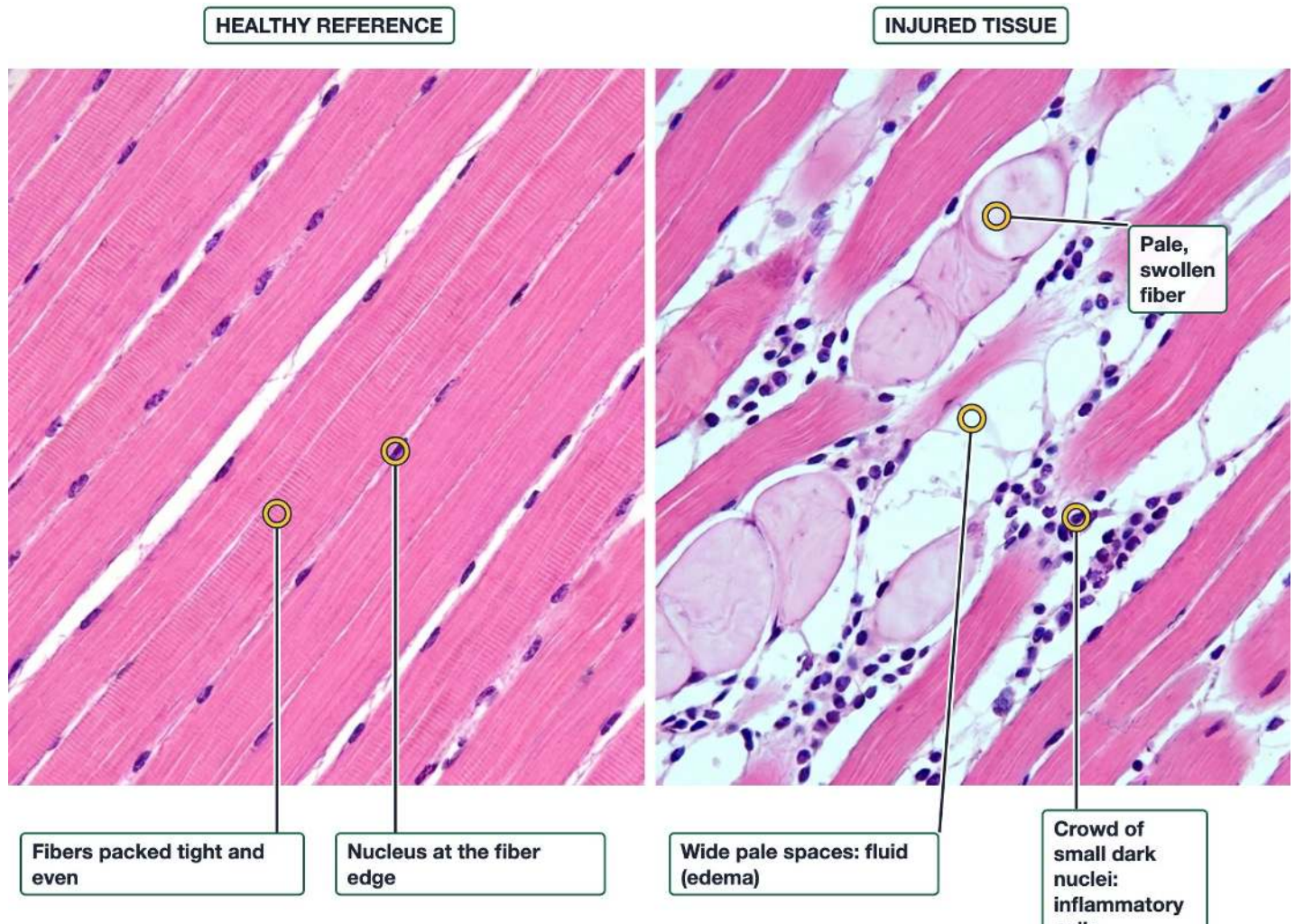
Where you meet it this week: D14 Part A item A1 and Part E item E3; the Histology: Four Tissue Types simulation.

R11 The airway, from larynx to air sacs



PLAIN DEFINITION	The airway carries air from the throat to the lungs. The larynx (voice box) sits at the top; the trachea (windpipe) runs down the neck; it splits into two bronchi , which branch into smaller and smaller bronchioles , ending in alveoli , the tiny air sacs where oxygen crosses into blood.
WHAT IT LOOKS LIKE	On a slide, an airway is a round opening lined by epithelium; lung tissue looks like fine lace because it is mostly thin-walled air sacs.
WHAT IT IS FOR	Locating where each Day 14 slide came from in the body.
HOW TO READ IT	Two words from the D14 sheet: submucosa is "a slim under-layer of connective tissue" beneath a lining; air sacs are the alveoli.
COMMON MISTAKE	Mixing up the larynx (in the neck) with the lungs (in the chest). They are different organs on different cards.

Where you meet it this week: Wednesday's slide cards: Exhibits 016 and 017 (larynx), 018 and 019 (lung).

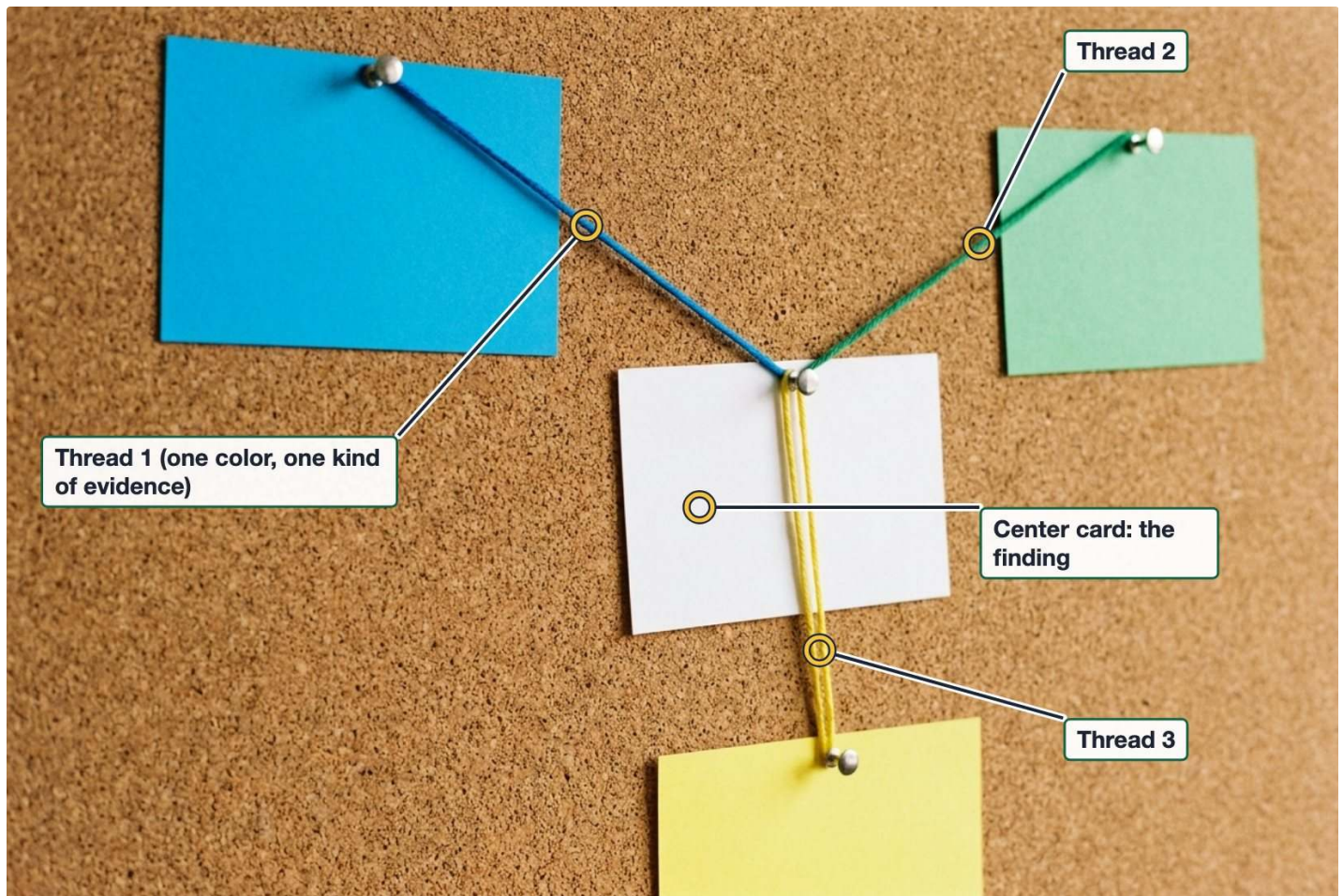


Skeletal muscle, healthy and after a crush injury, like training card T-4. It is not a Respawn slide.

PLAIN DEFINITION	Edema: "swelling from fluid where it should not be" (D14). Inflammation: the body's response crew, small immune cells with dark nuclei, arriving in injured tissue. Vital response: signs such as bleeding into tissue or arriving immune cells that show an injury happened while the person was alive.
WHAT IT LOOKS LIKE	Edema: wide pale spaces between structures that should be tight, "a waterlogged sponge." Inflammation: small dark purple dots crowding in.
WHAT IT IS FOR	Naming the process under an organ finding: fluid, a response, or damage.
HOW TO READ IT	Always lay the healthy reference beside the case slide. The pattern is the difference between them, not the case slide alone.
COMMON MISTAKE	Naming the pattern before describing it. The pack: "Name first and you start seeing what the name predicts."

Where you meet it this week: D14 Part B, Part D ("Use histology and edema"), Part E item E1; the training card T-4 on sheet page 2.

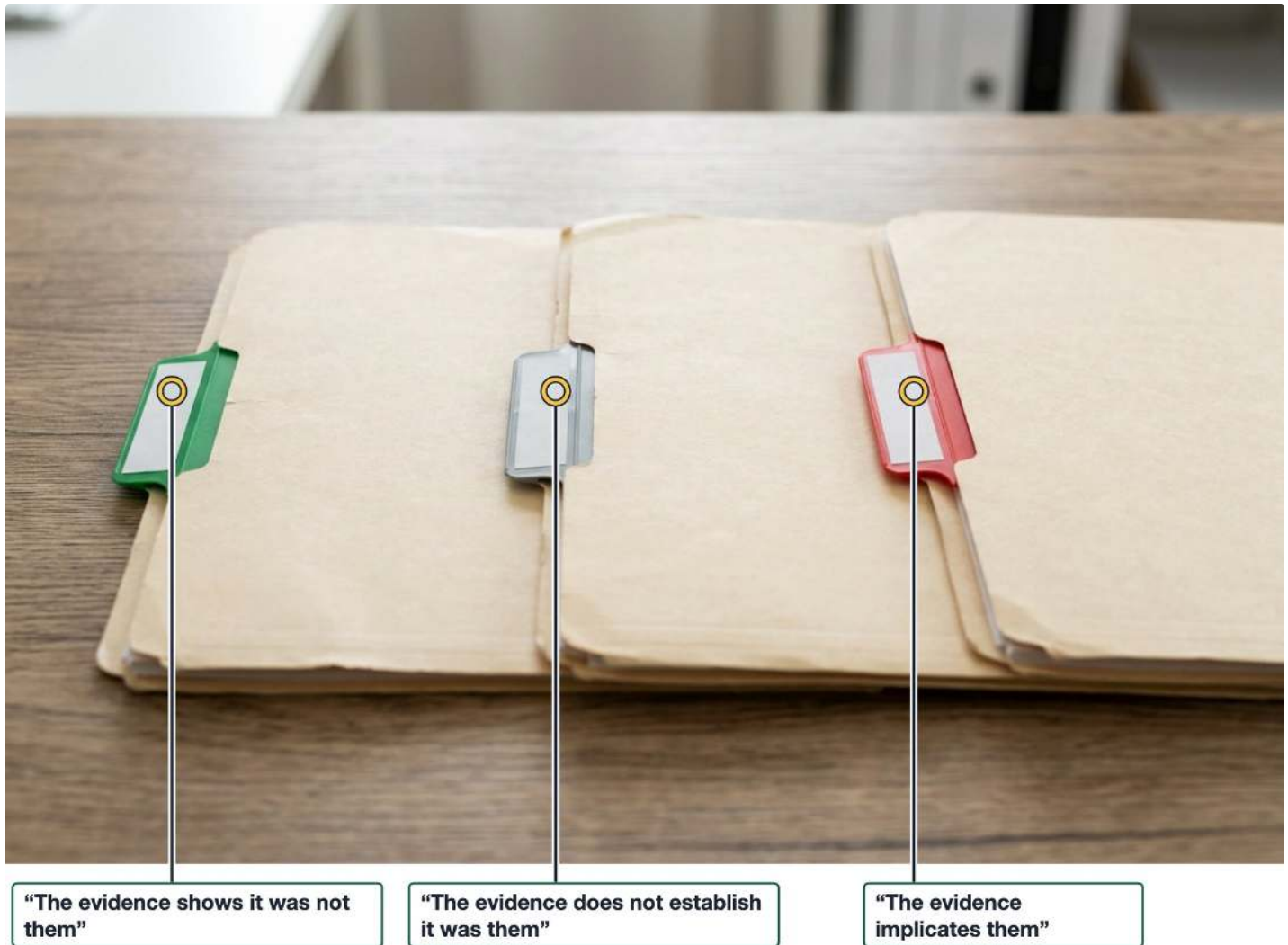
R13 Corroboration and independent threads



PLAIN DEFINITION	To corroborate is when "independent evidence lines agree" (D16). A thread is "one team's lane of evidence: scene, trace, serology and DNA, chemistry, medical findings, records." Two threads are independent when "neither one depends on the other's method or sample."
WHAT IT LOOKS LIKE	Separate lines of different colors reaching the same center card.
WHAT IT IS FOR	Deciding whether a conclusion is strong. The pack: "A conclusion that needs only one thread to be wrong is weak."
HOW TO READ IT	Count threads, not cards. Two cards from the same sample or the same thread are "one voice, not two."
COMMON MISTAKE	Counting every exhibit as a separate thread and overstating how strong the claim is.

Where you meet it this week: Day 16 Part B, items B1 and B3, and Part D ("Use corroborate and exonerate").

R14 Cleared, not established, implicated



PLAIN DEFINITION	Every person of interest leaves the case in one of three states: cleared by evidence, not established by evidence, or implicated by evidence. To exonerate is "to clear a suspect with evidence" (D16).
WHAT IT LOOKS LIKE	Three different sentences, one per person, each ending with the E-number that decides it.
WHAT IT IS FOR	Keeping "we could not prove it" apart from "the evidence shows it was not them."
HOW TO READ IT	Ask: does an exhibit rule this person out, or is there simply no exhibit either way?
COMMON MISTAKE	Writing <i>cleared</i> when you only mean <i>not proven</i> . Those are different sentences.

Where you meet it this week: Day 16 item B2, E2, and the matrix resolution sentences on the turn-in slip; Day 17 (cleared people stay on the board).

R15 The evidence board



PLAIN DEFINITION	An evidence board is "an argument with geography" (D17): the finding in the center, evidence cards around it, and labeled lines showing what each card does.
WHAT IT LOOKS LIKE	Cards with E-numbers, colored lines by thread, and a one-word label on every line.
WHAT IT IS FOR	Letting anyone follow your reasoning and attack its weakest link.
HOW TO READ IT	The four line labels, from the D17 sheet: supports = evidence FOR the finding it connects to; excludes = rules something or someone out; times = fixes a moment or window; locates = fixes a place or position.
COMMON MISTAKE	Unlabeled string. The sheet: "A line with no label is decoration."

Where you meet it this week: Day 17 Part B, items B1 and B3, and the board rubric self-check. A1 is a labeled layout.

R16 Single point of failure and cross-examination



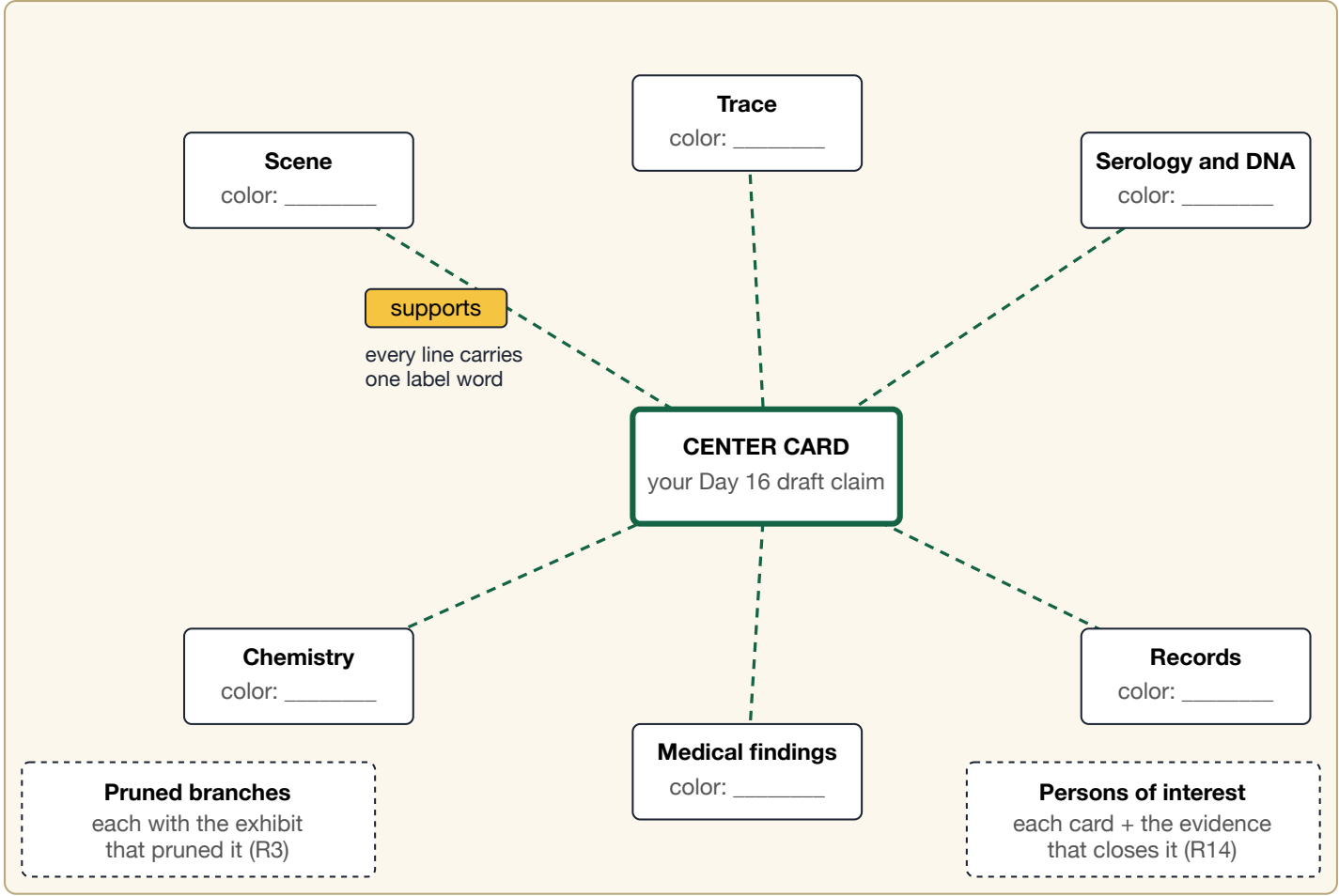
PLAIN DEFINITION	A single point of failure is "one card that carries several links by itself, so if it falls, everything hanging on it falls too." Cross-examination: "another team reads your board cold and attacks the reasoning, never the people." (Both from D17.)
WHAT IT LOOKS LIKE	One card with many lines running through it; or, in the analogy, "one bolt holding the whole shelf."
WHAT IT IS FOR	Finding the weak spot before the report is written.
HOW TO READ IT	Count all support paths to the center, count how many pass through one card, and divide. Repair by connecting other cards straight to the center on their own evidence.
COMMON MISTAKE	Repairing by adding more string. The worked example: repair "by adding independent paths, not by adding more string."

Where you meet it this week: Day 17 items B2, B3, C1, D1 and E3.

Artifacts

Labeled tools for this week's work. They support the Daily Evidence Sheets; they do not replace any Part of them.

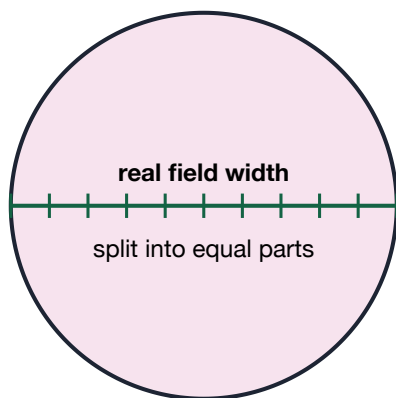
A1 Evidence board layout (Friday, Day 17)



HOW TO USE IT Pin the center card first. Give each of the six threads its own zone and color; the card kit does not fix colors, so write the color your class assigned in each blank. Every line gets one label word: **supports**, **excludes**, **times**, or **locates** (R15). Keep pruned branches and every person of interest on the board with the evidence that closed them.

WHAT IT IS NOT A finished board. Which cards go where, and which lines you draw, are your team's Part B work.

A2 Field-size helper and H and E color key (Wednesday, Day 14)



The field: the whole circle

Size of one object =

real field width $\div$ how many of that object fit across

Unit ladder

1 millimeter (mm) = 1,000 micrometers (μm)

0.1 mm = 100 μm 0.01 mm = 10 μm

From the D14 worked example

At 200x the printed field is about 1 mm across in real life.

A nucleus that spans 1/100 of it is about 0.01 mm = 10 μm .

H AND E COLOR KEY

Purple or blue dots: nuclei (hematoxylin). **Pink:** cell bodies, muscle fibers, connective fibers (eosin). **Bright red-pink discs:** red blood cells. **White or pale:** open space, air, or fluid.

PRECISION

A size read off a printed image is an estimate. Round it and say so, as the worked example does.

A3 The Day 14 slide cards and their pairs

Card	Organ (see R11)	Kind of card	Magnification	Read it beside
Exhibit 016	Larynx (voice box) lining	Healthy reference	100x	Exhibit 017
Exhibit 017	Larynx	Case slide	100x	Exhibit 016
Exhibit 018	Lung	Healthy reference	100x	Exhibit 019
Exhibit 019	Lung	Case slide	100x	Exhibit 018
Exhibit 020	Skin at the brow wound margin	Case slide	200x	No healthy skin card; the D14 sheet says to use the healthy epithelial and connective cards

All five cards belong to the medical thread and to evidence-log entry E12 (R1). The pattern each case slide shows is yours to describe and name in Part B.