MI

WORKED EXEMPLAR LIBRARY

Medical Interventions / Genetics of Disease

2026-2027 | 77 distinct lesson models | John Hay Biomedical

Use this library to see the structure, evidence, units, vocabulary, and reasoning expected in strong work. Each worked response uses a parallel case or practice item so it guides without giving away the assignment answer.

HOW TO USE THIS LIBRARY

1. Open the Schoology assignment and read its exact title.
2. Find the matching lesson title in this library.
3. Copy the structure and level of detail, not the model's wording or data.
4. Create your own response and check it against the model.
5. Submit one PDF. Put your first and last name in the document header. Name the file: FirstName LastName - Assignment Title - YYYY-MM-DD.pdf.

myPLTW contains the curriculum activities. Schoology is the only place completed work is turned in.

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WORKED EXEMPLAR 01 OF 77

Welcome, expectations, and how this class works

Week 1 | Mon, Aug 24, 2026 | Gend Orientation

TODAY'S GOAL

Learn how Medical Interventions runs day to day, agree on our classroom routines and expectations, and set a personal goal for the semester.

WHAT A FINISHED PRODUCT LOOKS LIKE

Day 1 exit ticket: goal, expectation, and a question

Completes: Completes the orientation goal-setting task: a semester goal, a classroom expectation in the student's own words, and one question.

WORKED MODEL

Goal: Pass the WebXam and keep an A by turning in every notebook page on time.
Expectation in my own words: My phone stays in my bag so I can focus from bell to bell.
My question: How many times can I retake a mastery check?

BUILD YOUR OWN

Keep the model's structure. Replace the prompt, facts, measurements, and evidence with your own. Check units, scientific vocabulary, and whether the conclusion goes beyond the evidence.

WEBXAM-STYLE FOLLOW-UP PRACTICE

Why do science labs use standard operating procedures (SOPs)?

A. To make class periods longer
B. To keep results consistent and keep people safe
C. To replace the teacher
D. To avoid having to take notes

Practice check: B. To keep results consistent and keep people safe

SOPs are agreed steps that make results repeatable and keep everyone safe, which is why every lab class starts with routines.

WHERE THIS LIVES AND WHERE TO SUBMIT

https://mendozabiomed.org/learn/pltw-gend/day/2026-08-24/exemplar

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WORKED EXEMPLAR 02 OF 77

How to use the class website

Week 1 | Tue, Aug 25, 2026 | Gend Orientation

TODAY'S GOAL

Learn to navigate mendozabiomed.org/learn: find each day's target, checklist, resources, and tracker, then open the matching Schoology assignment to submit your work.

WHAT A FINISHED PRODUCT LOOKS LIKE

Website scavenger hunt answers

Completes: Completes the website orientation: the student locates the day's objective, opens a resource, and finds where to submit.

WORKED MODEL

Today's objective (copied from today's page): set up Cornell notes and take a first page.
Resource I opened: the Cornell note-taking guide.
Where I submit: on Schoology, plus a myPLTW screenshot.

BUILD YOUR OWN

Keep the model's structure. Replace the prompt, facts, measurements, and evidence with your own. Check units, scientific vocabulary, and whether the conclusion goes beyond the evidence.

WEBXAM-STYLE FOLLOW-UP PRACTICE

A complete daily lab-notebook record should always include which set of parts?

A. Just the final answer
B. A dated entry with the objective, the data, and the analysis
C. Only a drawing
D. The teacher's name

Practice check: B. A dated entry with the objective, the data, and the analysis

A traceable record has a dated entry with the objective, the data or observations, and the analysis, so anyone can follow what was done.

WHERE THIS LIVES AND WHERE TO SUBMIT

https://mendozabiomed.org/learn/pltw-gend/day/2026-08-25/exemplar

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WORKED EXEMPLAR 03 OF 77

Cornell notes and the 6 Rs

Week 1 | Wed, Aug 26, 2026 | Gend Orientation

TODAY'S GOAL

Learn the 6 Rs Cornell note process and what good notes look like here, then set up your notebook and take your first Cornell page.

WHAT A FINISHED PRODUCT LOOKS LIKE

Worked Cornell page (cues, notes, summary)

Completes: Models the notebook sample: a Cornell page with cue questions, notes, and a summary that answers the essential question.

WORKED MODEL

Cue questions: What are the 6 Rs? What goes in each Cornell column?
Notes: The 6 Rs are Record, Reduce, Recite, Reflect, Review, Revise. Record notes on the right during class, then reduce them into cue questions on the left.
Summary: The 6 Rs turn notes into a study cycle: record, question, then keep revisiting until the ideas stick.

BUILD YOUR OWN

Keep the model's structure. Replace the prompt, facts, measurements, and evidence with your own. Check units, scientific vocabulary, and whether the conclusion goes beyond the evidence.

WEBXAM-STYLE FOLLOW-UP PRACTICE

In the claim, evidence, reasoning (CER) format used in this class, the evidence is:

A. Your opinion
B. The data or observations that support the claim
C. A guess
D. The title of the lab

Practice check: B. The data or observations that support the claim

Evidence is the actual data or observations; reasoning then explains how that evidence supports the claim.

WHERE THIS LIVES AND WHERE TO SUBMIT

https://mendozabiomed.org/learn/pltw-gend/day/2026-08-26/exemplar

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WORKED EXEMPLAR 04 OF 77

Lab safety, myPLTW, and how to submit

Week 1 | Thu, Aug 27, 2026 | Gend Orientation

TODAY'S GOAL

Pass a lab-safety check and sign the safety contract, tour the myPLTW web portal, and learn exactly how to submit each kind of work.

WHAT A FINISHED PRODUCT LOOKS LIKE

Lab-safety scavenger hunt and SDS find

Completes: Completes the safety SOP check: the student locates safety equipment and reads the handling information on an SDS before any lab.

WORKED MODEL

Eyewash station: back left sink. Fire blanket: by the door. SDS binder: shelf under the fume hood.
From the SDS, the storage rule I recorded: store in a cool, ventilated cabinet away from acids.
PPE I will wear: goggles, gloves, and an apron.

BUILD YOUR OWN

Keep the model's structure. Replace the prompt, facts, measurements, and evidence with your own. Check units, scientific vocabulary, and whether the conclusion goes beyond the evidence.

WEBXAM-STYLE FOLLOW-UP PRACTICE

Before handling a chemical, where do you find its handling, storage, and first-aid information?

A. The textbook index
B. The Safety Data Sheet (SDS)
C. The class website calendar
D. The grade book

Practice check: B. The Safety Data Sheet (SDS)

The SDS is the standard document that lists handling, storage, first-aid, and disposal for a chemical.

WHERE THIS LIVES AND WHERE TO SUBMIT

https://mendozabiomed.org/learn/pltw-gend/day/2026-08-27/exemplar

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WORKED EXEMPLAR 05 OF 77

WebXam pretest and goal setting

Week 1 | Fri, Aug 28, 2026 | Gend Orientation

TODAY'S GOAL

Take an ungraded baseline WebXam pretest for 072130 Genetics of Disease to see where you start, then set a mastery goal and reflect on week 1.

WHAT A FINISHED PRODUCT LOOKS LIKE

Baseline goal statement

Completes: Completes the pretest goal-setting: the student reads a baseline result and writes a specific growth goal.

WORKED MODEL

My baseline pretest showed I am strongest on lab safety and weakest on data analysis.
Mastery goal: By the WebXam, I will read a data table and write a correct CER without help.
Two routines I will keep: checking the website before class, and taking Cornell notes every day.

BUILD YOUR OWN

Keep the model's structure. Replace the prompt, facts, measurements, and evidence with your own. Check units, scientific vocabulary, and whether the conclusion goes beyond the evidence.

WEBXAM-STYLE FOLLOW-UP PRACTICE

What does an ungraded baseline pretest measure?

A. Your final grade
B. Where you start, so growth can be measured
C. Your attendance
D. Nothing useful

Practice check: B. Where you start, so growth can be measured

A baseline pretest captures your starting point; comparing it to later results shows how much you have grown.

WHERE THIS LIVES AND WHERE TO SUBMIT

https://mendozabiomed.org/learn/pltw-gend/day/2026-08-28/exemplar

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WORKED EXEMPLAR 06 OF 77

Lab safety and SDS practical

Week 2 | Mon, Aug 31, 2026 | Launch Safety

TODAY'S GOAL

Practice the safety rules and learn to read a Safety Data Sheet so you can work safely with lab materials all year.

WHAT A FINISHED PRODUCT LOOKS LIKE

Safety exit ticket

Completes: A short written check that proves you can name lab safety rules and point to emergency equipment from memory before you sign the lab safety contract.

WORKED MODEL

Two safety rules I will follow:
- Put goggles and gloves on before opening any chemical, and remove gloves inside-out so I never touch the outside.
- Always know where the eyewash and spill kit are before I start, not after something spills.

One piece of emergency equipment and where it lives:
- The eyewash station is on the left side of the back sink. If a chemical splashes my eyes, I walk straight to it and rinse for 15 minutes with my eyes open while a partner gets the teacher.

From the SDS for the chemical I read (Section 2 hazards, Section 4 first aid): it can irritate eyes, so the first-aid step is to flush with water for several minutes and remove contact lenses if present.

ALSO DUE TODAY

Sign the safety contract after you can explain two rules and one equipment location.

BUILD YOUR OWN

Keep the model's structure. Replace the prompt, facts, measurements, and evidence with your own. Check units, scientific vocabulary, and whether the conclusion goes beyond the evidence.

WEBXAM-STYLE FOLLOW-UP PRACTICE

A lab worker spills a chemical on their skin and needs to know the immediate first-aid steps. Which numbered section of the 16-section Safety Data Sheet should they read first?

A. Section 2 (Hazard identification)
B. Section 4 (First-aid measures)
C. Section 9 (Physical and chemical properties)
D. Section 13 (Disposal considerations)

Practice check: B. Section 4 (First-aid measures)

Section 4 of an SDS is titled First-aid measures and gives the exact steps to take after exposure, such as flushing skin or eyes, which is what the worker needs immediately.

WHERE THIS LIVES AND WHERE TO SUBMIT

https://mendozabiomed.org/learn/pltw-gend/day/2026-08-31/exemplar

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WORKED EXEMPLAR 07 OF 77

Lab notebook and portfolio

Week 2 | Tue, Sep 1, 2026 | Launch Safety

TODAY'S GOAL

Set up the notebook and digital portfolio habits you will use to document every investigation this year.

WHAT A FINISHED PRODUCT LOOKS LIKE

Six-part notebook entry

Completes: Your first complete lab notebook entry, written so a stranger could repeat exactly what you did, then photographed and uploaded to your digital portfolio.

WORKED MODEL

Date: August 25, 2026

Question: Where is the emergency safety equipment in our lab, and how do I read an SDS?

What I did: I walked the room and located the eyewash, fire blanket, sharps container, and spill kit. I put on goggles and gloves, then removed the gloves inside-out. I opened the SDS for one chemical and read Section 2 and Section 4.

Data: Eyewash is at the back-left sink. Fire blanket is by the door. The SDS listed eye irritation as a hazard (Section 2) and said to flush eyes with water for 15 minutes (Section 4).

What it means: I now know where to go in an emergency and how to find first-aid steps for any chemical we use.

Next step: Practice the inside-out glove removal one more time so it is automatic.

ALSO DUE TODAY

Confirm you can log in to Schoology and upload your photo to the portfolio folder.

BUILD YOUR OWN

Keep the model's structure. Replace the prompt, facts, measurements, and evidence with your own. Check units, scientific vocabulary, and whether the conclusion goes beyond the evidence.

WEBXAM-STYLE FOLLOW-UP PRACTICE

A classmate's notebook entry says only: "Did the safety lab. It went fine." Why would this entry fail the standard for a scientific lab notebook?

A. It is written in pen instead of pencil
B. It does not include enough detail for someone else to repeat the procedure
C. It is missing the page number
D. It does not use any scientific vocabulary

Practice check: B. It does not include enough detail for someone else to repeat the procedure

A lab notebook entry must be specific enough that another person could repeat the exact procedure. "Did the safety lab, it went fine" records no procedure, no data, and no interpretation, so it cannot be repeated or trusted.

WHERE THIS LIVES AND WHERE TO SUBMIT

https://mendozabiomed.org/learn/pltw-gend/day/2026-09-01/exemplar

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WORKED EXEMPLAR 08 OF 77

Bioethics debate: isolation vs autonomy

Week 2 | Wed, Sep 2, 2026 | Outbreak

TODAY'S GOAL

Debate whether public health can require isolation during an outbreak, weighing community safety against personal freedom.

WHAT A FINISHED PRODUCT LOOKS LIKE

Worked CER on a parallel case

Completes: A written claim-evidence-reasoning argument on a parallel public-health policy (mandatory seatbelt laws), modeling the same claim, evidence, reasoning, and rebuttal structure without taking a position on the isolation question students must argue.

WORKED MODEL

Claim: States should be able to require drivers and passengers to wear seatbelts, using education and reminders first, but keeping the law in place because the safety gain is large and the burden is small.

Evidence: In a crash, an unbelted person keeps moving at the car's original speed until something stops them, often the windshield, dashboard, or another passenger. A seatbelt holds the body against the seat and spreads the stopping force across the strong bones of the chest and hips. Crash data collected after seatbelt laws passed show fewer deaths and serious injuries per crash. Unbelted occupants also raise costs that fall on others, because emergency care and long-term treatment are frequently paid through shared insurance and public funds.

Reasoning: A personal choice stays fully personal only when its effects stay with the person making it. A seatbelt decision does not stay fully personal, because an unbelted body can strike and injure other people in the car, and the medical costs are shared by the wider community. Requiring the belt is a narrow rule, since buckling takes seconds, costs nothing, and does not stop anyone from driving where they want. The law limits freedom only at the exact point where one choice creates real risk and cost for others.

Rebuttal: Some classmates argue that seatbelt use should be left entirely to the individual because a driver mainly risks their own body. That view protects personal choice but overlooks the passengers who can be hurt by an unbelted occupant and the shared costs of severe injuries. A required belt, paired with clear education about why it works, respects personal choice as much as possible while still preventing harm that reaches beyond the single driver.

ALSO DUE TODAY

Post to Schoology discussion and read two classmates' positions.

BUILD YOUR OWN

Keep the model's structure. Replace the prompt, facts, measurements, and evidence with your own. Check units, scientific vocabulary, and whether the conclusion goes beyond the evidence.

WEBXAM-STYLE FOLLOW-UP PRACTICE

During an outbreak, a person has tested positive and is showing symptoms, while their roommate was exposed but has no symptoms and no positive test yet. Which terms correctly describe what each person undergoes?

A. The sick person is quarantined; the exposed roommate is isolated

B. The sick person is isolated; the exposed roommate is quarantined

C. Both are isolated because they live together

D. Both are quarantined because an outbreak is occurring

Practice check: B. The sick person is isolated; the exposed roommate is quarantined

Isolation separates people who are confirmed ill, so it applies to the symptomatic, test-positive person. Quarantine separates people who were exposed but are not yet known to be sick, so it applies to the roommate.

WHERE THIS LIVES AND WHERE TO SUBMIT

https://mendozabiomed.org/learn/pltw-gend/day/2026-09-02/exemplar

Submit in Schoology. Submit one PDF. Put your first and last name in the document header. Name the file: FirstName LastName - Assignment Title - YYYY-MM-DD.pdf.

WORKED EXEMPLAR 09 OF 77

Signs vs symptoms

Week 2 | Thu, Sep 3, 2026 | Outbreak

TODAY'S GOAL

Tell the difference between signs and symptoms and use both to begin describing a mystery illness.

WHAT A FINISHED PRODUCT LOOKS LIKE

Signs-and-symptoms chart

Completes: A two-column chart sorting clinical clues from patient cases into objective signs and subjective symptoms, with a one-sentence disease-category prediction.

WORKED MODEL

From three patient cases, I sorted each clue by whether a doctor can measure it (sign) or only the patient can report it (symptom).

Why both matter: signs give measurable evidence anyone can verify, while symptoms reveal what the patient is experiencing that a test might miss, so together they point toward a diagnosis.

Prediction: the fever plus rash pattern fits an infectious (pathogen-caused) illness, so I would start there.

ALSO DUE TODAY

Keep in notebook; photograph and upload to portfolio by Friday.

BUILD YOUR OWN

Keep the model's structure. Replace the prompt, facts, measurements, and evidence with your own. Check units, scientific vocabulary, and whether the conclusion goes beyond the evidence.

WEBXAM-STYLE FOLLOW-UP PRACTICE

A patient tells the nurse, "I feel dizzy and my stomach hurts." The nurse measures a temperature of 38.9 C and sees a rash. Which of the patient's clues is a symptom rather than a sign?

A. The temperature of 38.9 C
B. The visible rash
C. The dizziness the patient reports
D. The nurse's measurement of vital signs

Practice check: C. The dizziness the patient reports

A symptom is subjective and reported by the patient. Dizziness can only be felt and described by the patient, not measured

by the nurse, so it is a symptom.

WHERE THIS LIVES AND WHERE TO SUBMIT

https://mendozabiomed.org/learn/pltw-gend/day/2026-09-03/exemplar

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WORKED EXEMPLAR 10 OF 77

Pathogen categories

Week 2 | Fri, Sep 4, 2026 | Outbreak

TODAY'S GOAL

Compare bacteria, viruses, fungi, and parasites so you can reason about what might cause an outbreak.

WHAT A FINISHED PRODUCT LOOKS LIKE

Pathogen comparison table

Completes: A four-row comparison of bacteria, viruses, fungi, and parasites covering size, cell status, an example disease, treatment, and a distinguishing feature, plus a leading-suspect sentence.

WORKED MODEL

Leading suspect: my outbreak clues (fever, rash, spread person-to-person, and no response to antibiotics in a similar past case) best fit a virus, because viruses are not cells and antibiotics cannot target them.

ALSO DUE TODAY

Keep in notebook; photograph and upload to portfolio by Friday.

BUILD YOUR OWN

Keep the model's structure. Replace the prompt, facts, measurements, and evidence with your own. Check units, scientific vocabulary, and whether the conclusion goes beyond the evidence.

WEBXAM-STYLE FOLLOW-UP PRACTICE

A patient has a viral respiratory infection. Their doctor refuses to prescribe an antibiotic. What is the best biological reason antibiotics would not help?

A. Viruses are too large for antibiotics to reach

B. Viruses are not cells and lack the bacterial structures antibiotics target

C. Antibiotics only work if taken within one hour of infection

D. Viruses live outside the body, so antibiotics cannot find them

Practice check: B. Viruses are not cells and lack the bacterial structures antibiotics target

Antibiotics work by attacking structures bacteria have, such as a cell wall or bacterial ribosomes. Viruses are not cells and do not have these structures, so there is nothing for the antibiotic to target.

WHERE THIS LIVES AND WHERE TO SUBMIT

https://mendozabiomed.org/learn/pltw-gend/day/2026-09-04/exemplar

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WORKED EXEMPLAR 11 OF 77

Outbreak relationship map

Week 3 | Tue, Sep 8, 2026 | Outbreak

TODAY'S GOAL

Build a relationship map linking patients, places, and times to find how an outbreak might be spreading.

WHAT A FINISHED PRODUCT LOOKS LIKE

Outbreak relationship map

Completes: A node-and-link diagram connecting patients by shared places and times, with the likely common source circled and a one-sentence testable hypothesis.

WORKED MODEL

I drew each patient as a node and connected any two who shared a place or event. The earliest cases (Patient A on day 1 and Patient B on day 1) both ate at the same restaurant on the same day, so I circled that restaurant as the likely source.

Hypothesis: the outbreak began at the downtown restaurant on August 28, and the disease spread through contaminated food served that day.

ALSO DUE TODAY

Photograph and upload to portfolio; bring to Friday's CER writing session.

BUILD YOUR OWN

Keep the model's structure. Replace the prompt, facts, measurements, and evidence with your own. Check units, scientific vocabulary, and whether the conclusion goes beyond the evidence.

WEBXAM-STYLE FOLLOW-UP PRACTICE

An epidemiologist maps five cases of food poisoning. Four of the five ate at the same cafeteria on the same day before getting sick. What does this shared exposure most likely point to?

A. The cafeteria meal on that day is a likely common source of the outbreak
B. The disease is genetic and runs in families
C. The fifth person caused the outbreak
D. The outbreak cannot have a single source because not everyone ate there

Practice check: A. The cafeteria meal on that day is a likely common source of the outbreak

Epidemiologists look for a common exposure shared by the earliest and most cases. When four of five cases share one cafeteria meal on one day, that meal is the strongest candidate for the source of the outbreak.

WHERE THIS LIVES AND WHERE TO SUBMIT

https://mendozabiomed.org/learn/pltw-gend/day/2026-09-08/exemplar

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WORKED EXEMPLAR 12 OF 77

Outbreak CER submission

Week 3 | Wed, Sep 9, 2026 | Outbreak

TODAY'S GOAL

Write and submit a complete CER that names the likely pathogen and source for the outbreak case.

WHAT A FINISHED PRODUCT LOOKS LIKE

Worked CER on a parallel case

Completes: A complete claim-evidence-reasoning argument on a parallel outbreak scenario, naming the likely pathogen type and source and proposing a confirmatory test, modeled so students can see the format and depth without seeing the answer to their own case.

WORKED MODEL

This is a worked model for a DIFFERENT outbreak than the one you must argue today. Use it to see how a CER is built, not to copy an answer.

Claim: The summer illnesses were most likely caused by a parasitic pathogen spread through contaminated water at the community swimming pool during the week of July 12.

Evidence:
- Signs and symptoms: swimmers had watery diarrhea (symptom) and low-grade fever (sign) that lasted more than a week, a pattern that fits a lingering gut infection rather than a quick one.
- Pathogen table: the long incubation period of about a week and the poor response to standard antibiotics point to a parasite, not bacteria or a virus.
- Relationship map: the sick swimmers had all used the same pool during the same week, and none of the people who stayed out of the water got sick, marking the pool as the common source.

Reasoning: Each piece of evidence narrows the cause. The drawn-out diarrhea and mild fever rule in a gut infection, the long incubation and antibiotic resistance rule in a parasite, and the shared pool exposure links the cases to one place and time. Together they support a waterborne parasitic outbreak.

Confirmatory test: collect stool samples from patients and a water sample from the pool, then examine both under a microscope and run PCR to confirm the same parasite species is present in both.

ALSO DUE TODAY

Submit on Schoology; confirm it shows as turned in.

BUILD YOUR OWN

Keep the model's structure. Replace the prompt, facts, measurements, and evidence with your own. Check units, scientific vocabulary, and whether the conclusion goes beyond the evidence.

WEBXAM-STYLE FOLLOW-UP PRACTICE

Which outbreak conclusion is best supported as a scientific claim?

A. "It is bacterial because bacterial infections are the most common."

B. "It is a foodborne bacterial outbreak: cases share a meal exposure, symptoms fit a gut infection, and an earlier similar case responded to antibiotics."

C. "It is probably a virus, but we have not looked at the case data."

D. "We cannot conclude anything until every single person in the city is tested."

Practice check: B. "It is a foodborne bacterial outbreak: cases share a meal exposure, symptoms fit a gut infection, and an earlier similar case responded to antibiotics."

A strong CER claim is backed by several independent lines of evidence. This option ties together the shared exposure (relationship map), the symptom pattern, and the antibiotic response, which is exactly how a defensible outbreak conclusion is built.

WHERE THIS LIVES AND WHERE TO SUBMIT

https://mendozabiomed.org/learn/pltw-gend/day/2026-09-09/exemplar

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WORKED EXEMPLAR 13 OF 77

DNA sequencing basics

Week 3 | Thu, Sep 10, 2026 | Pathogen Id

TODAY'S GOAL

Explain how DNA sequencing reads the order of bases and why that sequence can act as a fingerprint for an organism.

WHAT A FINISHED PRODUCT LOOKS LIKE

DNA sequencing vocab entry

Completes: A notebook entry listing the four DNA bases and their pairing rules, a two-sentence summary of what sequencing measures, and one question to carry into the BLAST lab.

WORKED MODEL

Four DNA bases and pairing rules:
- Adenine (A) pairs with Thymine (T).
- Cytosine (C) pairs with Guanine (G).

What sequencing measures (two sentences): DNA sequencing reads the exact order of the A, T, C, and G bases along a strand. Because each species has a different base order, that order acts like a fingerprint that can identify the organism.

Why a unique sequence can identify an unknown pathogen: no two species have the identical full sequence, so matching an unknown read to a database entry points to the species it came from.

My question for the BLAST lab: how close does a match have to be before we can trust that two sequences are from the same species?

ALSO DUE TODAY

Keep in notebook; bring to the computer lab Wednesday.

BUILD YOUR OWN

Keep the model's structure. Replace the prompt, facts, measurements, and evidence with your own. Check units, scientific vocabulary, and whether the conclusion goes beyond the evidence.

WEBXAM-STYLE FOLLOW-UP PRACTICE

A student claims a printout is a valid raw DNA sequencing read. Which sequence could be a genuine nucleotide read?

A. A U G C U A C G
B. A T C G G A T C
C. A T C X G A T Z
D. 1 2 3 4 5 6 7 8

Practice check: B. A T C G G A T C

A DNA read contains only the four DNA bases: A, T, C, and G. "A T C G G A T C" uses only those letters, so it is a valid DNA nucleotide read.

WHERE THIS LIVES AND WHERE TO SUBMIT

https://mendozabiomed.org/learn/pltw-gend/day/2026-09-10/exemplar

Submit in Schoology. Submit one PDF. Put your first and last name in the document header. Name the file: FirstName LastName - Assignment Title - YYYY-MM-DD.pdf.

WORKED EXEMPLAR 14 OF 77

BLAST computer lab

Week 3 | Fri, Sep 11, 2026 | Pathogen Id

TODAY'S GOAL

Use nucleotide BLAST to compare an unknown DNA sequence against a database and read the hit table.

WHAT A FINISHED PRODUCT LOOKS LIKE

BLAST hit-table lab record

Completes: An annotated screenshot of your nucleotide BLAST hit table showing the top organism and percent identity, a one-sentence identification, and the result of your control run.

WORKED MODEL

Workflow: I pasted the unknown sequence into nucleotide BLAST at NCBI and ran the search. I annotated the screenshot to circle the top hit's organism name and percent identity.

Top hit (example values): Escherichia coli, percent identity 99 percent, E-value 2e-120.

Control run: I ran the teacher's known control sequence and it returned its expected organism at high identity, which confirms the tool and my workflow are working.

Identification statement: The unknown sample is most likely Escherichia coli, based on the top hit at 99 percent identity and a very low E-value.

ALSO DUE TODAY

Upload screenshot to portfolio; bring notebook to Thursday's analysis session.

BUILD YOUR OWN

Keep the model's structure. Replace the prompt, facts, measurements, and evidence with your own. Check units, scientific vocabulary, and whether the conclusion goes beyond the evidence.

WEBXAM-STYLE FOLLOW-UP PRACTICE

A nucleotide BLAST search returns three hits. Which one is the best match for the unknown sequence?

A. Organism Y, because it appears last in the list

B. Organism W, because it has the highest percent identity and the lowest E-value

C. Organism X, because its numbers are in the middle

D. It is impossible to choose without running the search again

Practice check: B. Organism W, because it has the highest percent identity and the lowest E-value

The best BLAST match has the highest percent identity and the lowest E-value. Organism W has both (99 percent identity and an E-value of 1e-130), so it is the strongest match.

WHERE THIS LIVES AND WHERE TO SUBMIT

https://mendozabiomed.org/learn/pltw-gend/day/2026-09-11/exemplar

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WORKED EXEMPLAR 15 OF 77

E-value and query coverage

Week 4 | Mon, Sep 14, 2026 | Pathogen Id

TODAY'S GOAL

Interpret E-value and query coverage to judge how trustworthy a BLAST match really is.

WHAT A FINISHED PRODUCT LOOKS LIKE

BLAST results table with interpretation

Completes: Completes the BLAST evidence step of the pathogen-ID investigation: a recorded results table plus a defended best-match call.

WORKED MODEL

Best match: Staphylococcus aureus.
I chose it because it has the lowest E-value (2e-145, which is far closer to zero than any other row), the highest query coverage (99%, so almost my whole sequence aligned), and the highest percent identity (99.4%). Staphylococcus epidermidis is close, but it is lower on all three numbers, so it is the second choice, not the call. Bacillus subtilis (E-value 0.8) and E. coli (E-value 4.5) have E-values near or above 1, which means a match that good could easily happen by chance, so they are not trustworthy identifications.

ALSO DUE TODAY

Paste the screenshot of your BLAST hit table into your evidence log and write the one-sentence claim naming your pathogen.

BUILD YOUR OWN

Keep the model's structure. Replace the prompt, facts, measurements, and evidence with your own. Check units, scientific vocabulary, and whether the conclusion goes beyond the evidence.

WEBXAM-STYLE FOLLOW-UP PRACTICE

A student runs an unknown bacterial DNA sequence through nucleotide BLAST and gets the four hits in the table. Which result is the most trustworthy identification of the unknown?

A. Staphylococcus aureus

B. Staphylococcus epidermidis

C. Bacillus subtilis

D. Escherichia coli

Practice check: A. Staphylococcus aureus

S. aureus has the lowest E-value (2e-145, essentially zero, so the alignment is extremely unlikely to be chance), the highest query coverage (99% of the sequence aligned), and the highest identity (99.4%). All three signals point the same way, which is exactly what a confident identification looks like.

WHERE THIS LIVES AND WHERE TO SUBMIT

https://mendozabiomed.org/learn/pltw-gend/day/2026-09-14/exemplar

Submit in Schoology. Submit one PDF. Put your first and last name in the document header. Name the file: FirstName LastName - Assignment Title - YYYY-MM-DD.pdf.

WORKED EXEMPLAR 16 OF 77

Bioethics debate: who gets the test

Week 4 | Tue, Sep 15, 2026 | Elisa Dilution

TODAY'S GOAL

Debate how a limited supply of a new diagnostic test should be distributed when not everyone can be tested.

WHAT A FINISHED PRODUCT LOOKS LIKE

Worked CER on a parallel case

Completes: A written claim-evidence-reasoning argument on a DIFFERENT scarce-resource case (donor kidney allocation), modeling the exact CER format and depth, including a rebuttal that answers the strongest opposing framework, so students can copy the structure without seeing the answer to today's own prompt.

WORKED MODEL

Parallel case (not today's prompt): A transplant center has one donor kidney available and three patients who are medical matches on the waitlist. Patient A has waited four years, Patient B is nineteen years old and otherwise healthy, and Patient C is sicker and will likely decline fastest without the transplant. There is only one kidney. Who should receive it, and by what rule?\n\nClaim: When one donor kidney must be assigned among several matched patients, it should go to the patient who will gain the most healthy years of life from the transplant, balanced against how long each has already waited.\n\nEvidence: Organ allocation systems use several frameworks: longest time on the waitlist, sickest first, and expected benefit measured in life-years gained. Real transplant networks combine these, giving points for waiting time and for medical urgency while also weighing how well and how long the organ is likely to function in each recipient. A single donated organ that fails quickly in one patient could have given many working years to another.\n\nReasoning: A scarce organ produces the greatest good when it is placed where it will function longest and restore the most life, because a transplant that lasts fifteen years does far more than one that fails in two. Weighing waiting time alongside expected benefit keeps the rule from ignoring patients who have already sacrificed years in line, so the decision rewards both good outcomes and fair process rather than outcome alone.\n\nRebuttal: A strict sickest-first rule feels most compassionate because it rescues the person in the most immediate danger. But the sickest patient is sometimes the one whose body will reject or wear out the organ fastest, which can waste an irreplaceable kidney that would have thrived in a healthier match. Urgency matters, yet urgency by itself is not the same as the best and fairest use of a resource that no one can replace.

ALSO DUE TODAY

Post to Schoology discussion and read two classmates' rules.

BUILD YOUR OWN

Keep the model's structure. Replace the prompt, facts, measurements, and evidence with your own. Check units, scientific vocabulary, and whether the conclusion goes beyond the evidence.

WEBXAM-STYLE FOLLOW-UP PRACTICE

A clinic has only 20 tests for 100 people during an outbreak. Which choice best reflects a "most benefit" allocation framework rather than a "first-come" one?

A. Testing the first 20 people who arrived at the door
B. Testing the 20 people whose results would most change clinical decisions and reduce spread
C. Testing 20 people chosen at random
D. Refusing to test anyone until more tests arrive

Practice check: B. Testing the 20 people whose results would most change clinical decisions and reduce spread

A "most benefit" framework directs scarce resources where they do the most good. Testing the people whose results most change decisions and most reduce spread maximizes the benefit from each limited test.

WHERE THIS LIVES AND WHERE TO SUBMIT

https://mendozabiomed.org/learn/pltw-gend/day/2026-09-15/exemplar

Submit in Schoology. Submit one PDF. Put your first and last name in the document header. Name the file: FirstName LastName - Assignment Title - YYYY-MM-DD.pdf.

WORKED EXEMPLAR 17 OF 77

Concentration and serial dilution

Week 4 | Wed, Sep 16, 2026 | Elisa Dilution

TODAY'S GOAL

Calculate concentrations and plan a serial dilution so you can prepare known sample strengths.

WHAT A FINISHED PRODUCT LOOKS LIKE

Serial dilution plan

Completes: A worked parallel example on a different factor, a 1:2 titration: a four-step plan showing the concentration at each step, with a one-sentence prediction of how the signal changes down the series. Use it to model the format, then build your own plan for today's numbers.

WORKED MODEL

This is a parallel example on a 1:2 series, so you can see the format and then build your own plan for today's dilution.

A 1:2 dilution means one part sample to one part solvent, which makes each step half as concentrated as the step before.

Prediction: as concentration is cut in half at each step, the color or signal should get steadily weaker down the series, but more gradually than a tenfold series.

Why dilutions help: a row of known concentrations is exactly what you need to build a standard curve and read an unknown sample.

ALSO DUE TODAY

Keep in notebook; bring to Wednesday's lab prep session.

BUILD YOUR OWN

Keep the model's structure. Replace the prompt, facts, measurements, and evidence with your own. Check units, scientific vocabulary, and whether the conclusion goes beyond the evidence.

WEBXAM-STYLE FOLLOW-UP PRACTICE

You start with a sample at 500 ng/mL and perform three 1:10 serial dilutions in a row. What is the concentration after the third dilution?

A. 50 ng/mL
B. 5 ng/mL
C. 0.5 ng/mL
D. 0.05 ng/mL

Practice check: C. 0.5 ng/mL

Each 1:10 dilution divides the concentration by 10. Starting at 500: after one step 50, after two steps 5, after three steps 0.5 ng/mL.

WHERE THIS LIVES AND WHERE TO SUBMIT

https://mendozabiomed.org/learn/pltw-gend/day/2026-09-16/exemplar

Submit in Schoology. Submit one PDF. Put your first and last name in the document header. Name the file: FirstName LastName - Assignment Title - YYYY-MM-DD.pdf.

WORKED EXEMPLAR 18 OF 77

Antigen-antibody and ELISA model

Week 4 | Thu, Sep 17, 2026 | Elisa Dilution

TODAY'S GOAL

Explain how antigens and antibodies bind and run a model ELISA to see how that binding produces a signal.

WHAT A FINISHED PRODUCT LOOKS LIKE

Model ELISA data table

Completes: A data table of model ELISA wells with observed color and the concentration assigned from the standard curve, identifying which well is a positive result and why.

WORKED MODEL

Antibody specificity makes the test trustworthy because each antibody binds its matching antigen far more readily than anything else, so a strong color signal is good evidence the specific target is present, which is why you still read it against the negative control.

Positive result: Well 1 showed the strongest color and the highest concentration, so it is the positive result; the antigen was present at a high enough level to drive the enzyme color reaction.

ALSO DUE TODAY

Bring to Friday's submission session; photograph for portfolio.

BUILD YOUR OWN

Keep the model's structure. Replace the prompt, facts, measurements, and evidence with your own. Check units, scientific vocabulary, and whether the conclusion goes beyond the evidence.

WEBXAM-STYLE FOLLOW-UP PRACTICE

An ELISA is designed to detect one specific virus protein. Why does the antibody used in the test bind that protein and not the dozens of other proteins in the sample?

A. The antibody binds whichever protein is most abundant
B. The antibody has a binding site that fits only its specific antigen, like a lock and key
C. The antibody binds every protein equally and color sorts them out
D. The enzyme, not the antibody, decides what is detected

Practice check: B. The antibody has a binding site that fits only its specific antigen, like a lock and key

Antibodies are specific: their binding site matches the shape of only one antigen, like a lock and key. That specificity is why the ELISA detects the target protein and ignores the others.

WHERE THIS LIVES AND WHERE TO SUBMIT

https://mendozabiomed.org/learn/pltw-gend/day/2026-09-17/exemplar

Submit in Schoology. Submit one PDF. Put your first and last name in the document header. Name the file: FirstName LastName - Assignment Title - YYYY-MM-DD.pdf.

WORKED EXEMPLAR 19 OF 77

Dilution and ELISA model submission

Week 4 | Fri, Sep 18, 2026 | Elisa Dilution

TODAY'S GOAL

Submit your standard curve, model ELISA data, and interpretation to close the dilution week.

WHAT A FINISHED PRODUCT LOOKS LIKE

Dilution and ELISA model report

Completes: A packaged submission with the labeled standard curve, the model ELISA data table, a short interpretation of which samples were positive, and one source of error.

WORKED MODEL

Interpretation: Well 1 was positive because its color matched the most concentrated standard on my curve, while Well 4 was effectively negative. I knew this by reading each well's color signal across to the best-fit line and down to its concentration.

Source of error: reading colors by eye is subjective, so two people might assign slightly different concentrations to a medium-blue well; a plate reader would reduce this error.

For the wet lab I want to: pipette more carefully so my dilution steps are exactly tenfold.

ALSO DUE TODAY

Submit graph, data table, and interpretation on Schoology.

BUILD YOUR OWN

Keep the model's structure. Replace the prompt, facts, measurements, and evidence with your own. Check units, scientific vocabulary, and whether the conclusion goes beyond the evidence.

WEBXAM-STYLE FOLLOW-UP PRACTICE

A team reads their model ELISA colors by eye and assigns concentrations from a standard curve. Which is a real source of measurement error in this method?

A. Color judged by eye is subjective, so two readers may assign different concentrations to the same well
B. Standard curves cannot be used to read unknown samples

C. DNA bases were not included in the assay

D. The wells were labeled, which biases the result

Practice check: A. Color judged by eye is subjective, so two readers may assign different concentrations to the same well

Judging color intensity by eye is subjective and varies between people, so the same well can be read as slightly different concentrations. That is a genuine source of measurement error, which a plate reader reduces.

WHERE THIS LIVES AND WHERE TO SUBMIT

https://mendozabiomed.org/learn/pltw-gend/day/2026-09-18/exemplar

Submit in Schoology. Submit one PDF. Put your first and last name in the document header. Name the file: FirstName LastName - Assignment Title - YYYY-MM-DD.pdf.

WORKED EXEMPLAR 20 OF 77

Bioethics debate: false results

Week 5 | Mon, Sep 21, 2026 | Elisa Lab

TODAY'S GOAL

Debate the ethics of using a diagnostic test that sometimes gives false positives or false negatives.

WHAT A FINISHED PRODUCT LOOKS LIKE

Worked CER on a parallel case

Completes: A parallel worked claim-evidence-reasoning argument, on whether a cheap smoke-and-carbon-monoxide alarm that sometimes false-alarms and sometimes stays silent is ethical to require, with conditions and a rebuttal, modeling the CER format without answering today's own prompt.

WORKED MODEL

Note: This is a parallel model on a different scenario. It shows the shape of a strong claim-evidence-reasoning argument so you can build your own. It does not answer today's question about the diagnostic test.\n\nClaim: A cheap home alarm that sometimes sounds when there is no danger and sometimes fails to sound during a real hazard is still ethical to require in apartments, as long as it is paired with regular testing and clear instructions for what to do when it goes off.\n\nEvidence: A false alarm wakes a family for burnt toast, causing annoyance and, over time, a temptation to disable the unit. A missed alarm is far more serious, because carbon monoxide has no smell and a silent detector can let a family sleep through a deadly buildup. Manufacturers can shift this balance by changing the sensor's trigger level, trading fewer nuisance alarms for a higher chance of a missed one, or the reverse. Cheaper units test at lower accuracy than professional systems, but they still catch most real hazards.\n\nReasoning: The two errors do not carry equal weight. A false alarm costs minutes of sleep, while a missed alarm can cost a life, so a detector tuned to be sensitive protects against the worst outcome. Requiring an affordable unit means most homes have some protection instead of none, and the annoyance of occasional false alarms is a reasonable price for that coverage. Testing the unit monthly and teaching residents to evacuate rather than ignore it addresses the weaknesses without removing the protection.\n\nRebuttal: Some argue that an unreliable alarm should not be required, because a family that trusts a faulty unit may feel safe when they are not. But the alternative, requiring no alarm at all, leaves every home fully exposed. The answer is to keep the requirement and add habits that cover its blind spots, such as scheduled testing and a backup plug-in unit, not to abandon the safeguard because it is imperfect.

ALSO DUE TODAY

Post to Schoology discussion and read two classmates' positions.

BUILD YOUR OWN

Keep the model's structure. Replace the prompt, facts, measurements, and evidence with your own. Check units, scientific vocabulary, and whether the conclusion goes beyond the evidence.

WEBXAM-STYLE FOLLOW-UP PRACTICE

A screening test for a highly contagious disease is being designed. To best protect the community, which type of error should the test be tuned to avoid most, and why?

A. Avoid false positives, because telling healthy people they are sick is the worst possible outcome
B. Avoid false negatives, because a missed case can keep spreading the disease to others
C. Errors do not matter as long as the test is fast
D. Avoid both errors equally, since a screening test should be perfect

Practice check: B. Avoid false negatives, because a missed case can keep spreading the disease to others

For a highly contagious disease, a false negative tells a sick person they are healthy, so they can keep spreading it. A screening test is therefore tuned for high sensitivity to avoid missing cases, then confirms positives later.

WHERE THIS LIVES AND WHERE TO SUBMIT

https://mendozabiomed.org/learn/pltw-gend/day/2026-09-21/exemplar

Submit in Schoology. Submit one PDF. Put your first and last name in the document header. Name the file: FirstName LastName - Assignment Title - YYYY-MM-DD.pdf.

WORKED EXEMPLAR 21 OF 77

Wet ELISA lab

Week 5 | Tue, Sep 22, 2026 | Elisa Lab

TODAY'S GOAL

Run a real ELISA with positive and negative controls and record the color result for each well.

WHAT A FINISHED PRODUCT LOOKS LIKE

Wet ELISA data table

Completes: A recorded data table of each ELISA well with the reagent added and the color result, a note on whether the controls matched predictions, and a plate photograph.

WORKED MODEL

Control check: my positive control (A1) turned strong color and my negative control (A2) stayed clear, both matching my predictions, so I can trust this run.

Reading the samples: Patient sample 1 turned color (positive); Patient sample 2 stayed clear (negative).

Note: I added reagents in the exact order on my plan and kept the incubation times as written, which kept the binding chain intact.

ALSO DUE TODAY

Bring data table to Thursday's analysis; upload plate photo to portfolio.

BUILD YOUR OWN

Keep the model's structure. Replace the prompt, facts, measurements, and evidence with your own. Check units, scientific vocabulary, and whether the conclusion goes beyond the evidence.

WEBXAM-STYLE FOLLOW-UP PRACTICE

A student adds the ELISA reagents in the wrong order and skips part of an incubation time. Both controls come out the wrong color. What is the correct response?

A. Report the sample results anyway since the colors are recorded

B. Treat the run as invalid and repeat it, because out-of-order steps and failed controls mean the results cannot be trusted

C. Keep only the results that look the way they were expected

D. Adjust the recorded colors to match the predictions

Practice check: B. Treat the run as invalid and repeat it, because out-of-order steps and failed controls mean the results cannot be trusted

ELISA steps must be done in exact order and incubation times must be respected; doing otherwise breaks the binding chain. With both controls failing, the run is invalid and must be repeated, since no result from it can be trusted.

WHERE THIS LIVES AND WHERE TO SUBMIT

https://mendozabiomed.org/learn/pltw-gend/day/2026-09-22/exemplar

Submit in Schoology. Submit one PDF. Put your first and last name in the document header. Name the file: FirstName LastName - Assignment Title - YYYY-MM-DD.pdf.

WORKED EXEMPLAR 22 OF 77

Specificity vs sensitivity

Week 5 | Wed, Sep 23, 2026 | Elisa Lab

TODAY'S GOAL

Distinguish specificity from sensitivity and use your ELISA results to discuss how good the test is.

WHAT A FINISHED PRODUCT LOOKS LIKE

2x2 classification table

Completes: A two-by-two table sorting ELISA results into true and false positives and negatives, with a one-sentence judgment of the run's reliability that cites the controls.

WORKED MODEL

Definitions: sensitivity catches true positives (sick people who test positive); specificity avoids false positives (healthy people who test positive).

Reliability judgment: because my positive control turned color and my negative control stayed clear, I trust this run's specificity, and the one odd result looks like a sensitivity issue (a known-positive sample that read weak), not contamination.

ALSO DUE TODAY

Bring to Friday's report writing session; include in the lab report.

BUILD YOUR OWN

Keep the model's structure. Replace the prompt, facts, measurements, and evidence with your own. Check units, scientific vocabulary, and whether the conclusion goes beyond the evidence.

JOHN HAY BIOMEDICAL

MI Worked Exemplar Library

WEBXAM-STYLE FOLLOW-UP PRACTICE

A new test correctly identifies almost every truly sick person as positive, but it also flags many healthy people as positive. How would you describe this test?

A. High sensitivity but low specificity
B. Low sensitivity but high specificity
C. High sensitivity and high specificity
D. Low sensitivity and low specificity

Practice check: A. High sensitivity but low specificity

Catching almost every truly sick person means high sensitivity. Flagging many healthy people as positive means many false positives, which is low specificity.

WHERE THIS LIVES AND WHERE TO SUBMIT

https://mendozabiomed.org/learn/pltw-gend/day/2026-09-23/exemplar

Submit in Schoology. Submit one PDF. Put your first and last name in the document header. Name the file: FirstName LastName - Assignment Title - YYYY-MM-DD.pdf.

WORKED EXEMPLAR 23 OF 77

JCU bioethics 1: Should ELISA testing be mandatory?

Week 5 | Thu, Sep 24, 2026 | John Carroll University bioethics session

TODAY'S GOAL

Argue an assigned side of this question: Should ELISA testing for Novel Flu Syndrome be mandatory?

WHAT A FINISHED PRODUCT LOOKS LIKE

Worked debate worksheet on a parallel case: required carbon-monoxide screening in rental housing

Completes: A complete debate worksheet that names the assigned side, gives three evidence-based arguments, answers the strongest opposing point, and ends with the student's own position.

WORKED MODEL

Parallel case, not today's prompt: A city is deciding whether every rental unit must receive an annual carbon-monoxide detector check, even when the tenant has reported no problem.

Claim: The city should require the annual check because carbon monoxide cannot be seen or smelled, but it should fund the inspection so the rule does not shift the cost onto low-income tenants.

Evidence: Carbon monoxide can cause severe injury before a resident recognizes a symptom. A working detector provides an early warning, and inspection records can show whether the detector was present, powered, and within its service life.

Reasoning: A narrowly targeted check is justified when the hazard is hard to detect, the possible harm is serious, and the screening tool is low-risk. Covering the cost keeps the safety benefit from becoming an access barrier.

Strongest opposing point and response: Landlords may argue that annual checks are expensive and unnecessary in newer buildings. New equipment can still lose power or be installed incorrectly, so a short documented check protects residents while a public subsidy answers the strongest cost concern.

My position after the debate: I support the claim only with the limits named above. A strong ethics argument states the value being protected, uses evidence rather than preference, answers the best counterargument, and names the condition that could change the decision.

JOHN HAY BIOMEDICAL

MI Worked Exemplar Library

ALSO DUE TODAY

Submit one debate worksheet PDF in Schoology before the end of the block.

BUILD YOUR OWN

Keep the model's structure. Replace the prompt, facts, measurements, and evidence with your own. Check units, scientific vocabulary, and whether the conclusion goes beyond the evidence.

WEBXAM-STYLE FOLLOW-UP PRACTICE

Which new evidence would most strongly improve the argument in the parallel required carbon-monoxide screening in rental housing case?

A. A comparison of carbon-monoxide injuries in similar buildings before and after annual detector checks began
B. A tenant's statement that inspections feel reassuring
C. A poll showing most residents like smoke detectors
D. A landlord's claim that new buildings are always safe

Practice check: A. A comparison of carbon-monoxide injuries in similar buildings before and after annual detector checks began

This evidence measures the outcome the claim depends on and gives a comparison that can test whether the policy produces the stated benefit or harm.

WHERE THIS LIVES AND WHERE TO SUBMIT

https://mendozabiomed.org/learn/pltw-gend/day/2026-09-24/exemplar

Submit in Schoology. Submit one PDF. Put your first and last name in the document header. Name the file: FirstName LastName - Assignment Title - YYYY-MM-DD.pdf.

WORKED EXEMPLAR 24 OF 77

ELISA lab report submission

Week 5 | Fri, Sep 25, 2026 | Elisa Lab

TODAY'S GOAL

Submit a full ELISA lab report interpreting your controls, results, and the test's reliability.

WHAT A FINISHED PRODUCT LOOKS LIKE

Non-answer evidence audit scaffold

Completes: A blank evidence-and-limit structure for ELISA lab report submission. It models the required parts without supplying today's result, calculation, interpretation, or recommendation.

WORKED MODEL

Question or criterion: ____
Evidence ID and exact observation: ____
Second evidence ID and exact observation: ____
Reasoning rule: ____
Bounded conclusion: ____
Limitation or quality-control issue: ____
Next evidence needed: ____

BUILD YOUR OWN

Keep the model's structure. Replace the prompt, facts, measurements, and evidence with your own. Check units, scientific vocabulary, and whether the conclusion goes beyond the evidence.

WEBXAM-STYLE FOLLOW-UP PRACTICE

A student completes ELISA lab report submission and writes a conclusion from one classroom result. Which revision makes the conclusion most scientifically defensible?

A. Add the evidence source, comparison, reasoning rule, and a method-specific limitation.

B. Remove the limitation so the conclusion sounds more certain.

C. Replace the measured result with a personal opinion.

D. Call the classroom result a confirmed diagnosis.

Practice check: A. Add the evidence source, comparison, reasoning rule, and a method-specific limitation.

A defensible conclusion shows where the evidence came from, how the comparison supports the claim, and where the method stops.

WHERE THIS LIVES AND WHERE TO SUBMIT

https://mendozabiomed.org/learn/pltw-gend/day/2026-09-25/exemplar

Submit in Schoology. Submit one PDF. Put your first and last name in the document header. Name the file: FirstName LastName - Assignment Title - YYYY-MM-DD.pdf.

WORKED EXEMPLAR 25 OF 77

Bioethics debate: antibiotic stewardship

Week 6 | Mon, Sep 28, 2026 | Antibiotics

TODAY'S GOAL

Debate whether access to antibiotics should be limited to protect their effectiveness for everyone.

WHAT A FINISHED PRODUCT LOOKS LIKE

Worked CER on a parallel case

Completes: A written claim-evidence-reasoning argument (with a rebuttal) that models the exact CER format and depth on a different public-health policy question, so students can see the structure without seeing today's answer.

WORKED MODEL

Parallel case (not today's prompt): Should a city health department fund a clean-needle exchange, where people who inject drugs can trade used syringes for sterile ones, even though some residents worry it signals approval of drug use?\n\nClaim: A city should fund a supervised needle-exchange program, pairing free sterile syringes with safe disposal and referrals to treatment.\n\nEvidence: Sharing needles spreads bloodborne infections such as HIV and hepatitis C from one person to the next. The CDC reports that syringe-services programs are associated with large reductions in HIV and hepatitis C transmission and do not increase drug use, and that participants are more likely to enter treatment than people who do not use such programs.\n\nReasoning: A used needle is a shared route of infection: one contaminated syringe can pass a virus into someone who never used drugs, such as a partner, a child, or a health worker stuck by a discarded needle. Providing sterile syringes and safe disposal breaks that chain of transmission, protecting both the person who injects and the wider community, while the referrals give a realistic path toward stopping. The benefit reaches beyond the individual because infections prevented today are infections that cannot spread tomorrow.\n\nRebuttal: Some argue that handing out syringes encourages drug use and sends the wrong message. But the evidence shows these programs do not raise drug use and instead connect people to treatment, and untreated infections cost far more in suffering and health-care dollars than the syringes do. Clear rules, disposal boxes, and treatment referrals let a city lower disease spread without

ignoring the goal of helping people stop using.

ALSO DUE TODAY

Post to Schoology discussion and read two classmates' rules.

BUILD YOUR OWN

Keep the model's structure. Replace the prompt, facts, measurements, and evidence with your own. Check units, scientific vocabulary, and whether the conclusion goes beyond the evidence.

WEBXAM-STYLE FOLLOW-UP PRACTICE

A patient with a common cold (a viral illness) asks for antibiotics "just in case." Beyond simply not helping the cold, why is prescribing antibiotics here actually harmful at a population level?

A. The antibiotic will make the virus stronger
B. The antibiotic applies selection pressure to bacteria already present, favoring resistant ones
C. Antibiotics expire quickly, so they are wasted
D. The patient will become allergic to all future antibiotics

Practice check: B. The antibiotic applies selection pressure to bacteria already present, favoring resistant ones

Even when taken for a viral illness, an antibiotic still kills susceptible bacteria already living in the body, leaving resistant bacteria to survive and multiply. This selection pressure makes resistance more common over time.

WHERE THIS LIVES AND WHERE TO SUBMIT

https://mendozabiomed.org/learn/pltw-gend/day/2026-09-28/exemplar

Submit in Schoology. Submit one PDF. Put your first and last name in the document header. Name the file: FirstName LastName - Assignment Title - YYYY-MM-DD.pdf.

WORKED EXEMPLAR 26 OF 77

Disk diffusion and MIC lab

Week 6 | Tue, Sep 29, 2026 | Antibiotics

TODAY'S GOAL

Run a disk-diffusion test and connect zone of inhibition to minimum inhibitory concentration.

WHAT A FINISHED PRODUCT LOOKS LIKE

Disk-diffusion data table

Completes: A data table listing each antibiotic, its measured zone of inhibition in millimeters, and an effectiveness ranking, with a sentence connecting zone size to minimum inhibitory concentration.

WORKED MODEL

Connection to MIC: a larger zone of inhibition means the antibiotic stopped bacterial growth even where it had spread thin and dilute, which points to a lower minimum inhibitory concentration (less drug needed to work).

Comparison, with its limit: C produced the widest zone (22 mm), then A (18 mm), then B (9 mm). Zone width cannot rank different antibiotics against each other, because each drug diffuses through agar at its own rate and each has its own clinical breakpoint, so this ranks the zones, not the drugs.

ALSO DUE TODAY

Bring data table to Thursday's resistance analysis; photograph plate for portfolio.

BUILD YOUR OWN

Keep the model's structure. Replace the prompt, facts, measurements, and evidence with your own. Check units, scientific vocabulary, and whether the conclusion goes beyond the evidence.

WEBXAM-STYLE FOLLOW-UP PRACTICE

In a Kirby-Bauer disk-diffusion test, antibiotic disk X produces a 24 mm clear zone and disk Y produces a 7 mm clear zone on the same bacterial lawn. What can you conclude?

A. Antibiotic Y is more effective because a smaller zone means concentrated killing
B. Antibiotic X is more effective and likely has a lower MIC against this bacterium
C. Both antibiotics are equally effective since both made a zone
D. Zone size tells you nothing about effectiveness

Practice check: B. Antibiotic X is more effective and likely has a lower MIC against this bacterium

A larger clear zone means the antibiotic stopped growth even where it diffused far and grew dilute, indicating greater effectiveness and a lower minimum inhibitory concentration. So the 24 mm zone (X) is the more effective drug.

WHERE THIS LIVES AND WHERE TO SUBMIT

https://mendozabiomed.org/learn/pltw-gend/day/2026-09-29/exemplar

Submit in Schoology. Submit one PDF. Put your first and last name in the document header. Name the file: FirstName LastName - Assignment Title - YYYY-MM-DD.pdf.

WORKED EXEMPLAR 27 OF 77

Aseptic technique

Week 6 | Wed, Sep 30, 2026 | Culturing

TODAY'S GOAL

Practice aseptic technique so you can grow a pure culture without contaminating it or yourself.

WHAT A FINISHED PRODUCT LOOKS LIKE

Aseptic technique pre-lab

Completes: Completes the pre-lab prep for the culturing lab: an ordered aseptic procedure, a contamination-routes list, an explanation of why plates stay closed, safety rules, and a prediction of clean versus contaminated growth.

WORKED MODEL

Contamination routes (how unwanted organisms get in):
- Air currents carrying dust and microbes onto an open plate
- Skin contact from touching the agar or the loop tip
- Talking, coughing, or breathing over an open plate
- Unsterilized tools, like a loop that was not flamed

Aseptic technique, in order:
1. Clean the work surface and wash your hands, then put on gloves.
2. Light the burner and work in the rising warm air near the flame.
3. Flame the inoculating loop until it glows, then let it cool a few seconds.
4. Lift the plate lid only partway and only for as long as you need.
5. Streak the sample, then close the lid right away.
6. Re-flame the loop before setting it down so nothing is carried out.

Why minimize open time: Every second a plate is open, airborne microbes can settle on the agar. Keeping it open as briefly as possible lowers the chance that anything other than my sample starts growing.

Safety rule for cultures and waste: Treat every culture as if it could be harmful. Never open an incubated plate at your seat, and dispose of plates and used tools in the marked biohazard container, never the regular trash.

Prediction: A clean plate will show only one kind of colony along my streak lines. A contaminated plate will show extra colonies of different colors or shapes, often in spots where I did not streak.

ALSO DUE TODAY

Keep this pre-lab in your notebook and bring it to the culturing lab.

BUILD YOUR OWN

Keep the model's structure. Replace the prompt, facts, measurements, and evidence with your own. Check units, scientific vocabulary, and whether the conclusion goes beyond the evidence.

WEBXAM-STYLE FOLLOW-UP PRACTICE

While streaking a plate, a student sets down the inoculating loop on the bench, then picks it back up to keep streaking. Why does aseptic technique say to re-flame the loop instead?

A. Flaming makes the agar set faster
B. The bench surface can carry microbes that contaminate the loop and then the plate
C. A cool loop cannot pick up any bacteria at all
D. Re-flaming changes the color of the colonies so they are easier to count

Practice check: B. The bench surface can carry microbes that contaminate the loop and then the plate

The bench is not sterile, so a loop set on it can pick up stray microbes. Flaming the loop until it glows kills anything on it, so only the intended sample reaches the plate.

WHERE THIS LIVES AND WHERE TO SUBMIT

https://mendozabiomed.org/learn/pltw-gend/day/2026-09-30/exemplar

Submit in Schoology. Submit one PDF. Put your first and last name in the document header. Name the file: FirstName LastName - Assignment Title - YYYY-MM-DD.pdf.

WORKED EXEMPLAR 28 OF 77

JCU bioethics 2: Should we ban antibiotic use in livestock?

Week 6 | Thu, Oct 1, 2026 | John Carroll University bioethics session

TODAY'S GOAL

Argue an assigned side of this question: Should we ban antibiotic use in livestock?

WHAT A FINISHED PRODUCT LOOKS LIKE

Worked debate worksheet on a parallel case: restricting lawn fertilizer near a public lake

Completes: A complete debate worksheet that names the assigned side, gives three evidence-based arguments, answers the strongest opposing point, and ends with the student's own position.

WORKED MODEL

Parallel case, not today's prompt: A county is considering a seasonal ban on phosphorus lawn fertilizer near a lake where repeated algal blooms have lowered oxygen and killed fish.

Claim: The county should restrict phosphorus fertilizer during the high-runoff season while allowing documented exceptions for newly planted lawns.

Evidence: Runoff carries soluble phosphorus into the lake, algae use that nutrient to grow rapidly, and decomposition of the bloom consumes dissolved oxygen needed by fish. Water samples after heavy rain show the highest phosphorus levels near dense residential lawns.

Reasoning: The restriction targets the mechanism that links the human practice to the environmental harm. A narrow exception preserves legitimate use while preventing routine application when runoff risk is highest.

Strongest opposing point and response: Homeowners may argue that the rule limits normal property care. Phosphorus-free products remain available, and the exception allows use when a soil or planting need is documented, so the rule reduces harm without banning all lawn care.

My position after the debate: I support the claim only with the limits named above. A strong ethics argument states the value being protected, uses evidence rather than preference, answers the best counterargument, and names the condition that could change the decision.

ALSO DUE TODAY

Submit one debate worksheet PDF in Schoology before the end of the block.

BUILD YOUR OWN

Keep the model's structure. Replace the prompt, facts, measurements, and evidence with your own. Check units, scientific vocabulary, and whether the conclusion goes beyond the evidence.

WEBXAM-STYLE FOLLOW-UP PRACTICE

Which new evidence would most strongly improve the argument in the parallel restricting lawn fertilizer near a public lake case?

A. Lake phosphorus and dissolved-oxygen measurements before and after a matched shoreline community adopted the seasonal restriction

B. A homeowner's preferred fertilizer brand

C. The number of lawns visible from the lake

D. A fertilizer company's slogan about greener grass

Practice check: A. Lake phosphorus and dissolved-oxygen measurements before and after a matched shoreline community adopted the seasonal restriction

This evidence measures the outcome the claim depends on and gives a comparison that can test whether the policy produces the stated benefit or harm.

WHERE THIS LIVES AND WHERE TO SUBMIT

https://mendozabiomed.org/learn/pltw-gend/day/2026-10-01/exemplar

Submit in Schoology. Submit one PDF. Put your first and last name in the document header. Name the file: FirstName LastName - Assignment Title - YYYY-MM-DD.pdf.

WORKED EXEMPLAR 29 OF 77

Culturing and colony data lab

Week 6 | Fri, Oct 2, 2026 | Culturing

TODAY'S GOAL

Streak and incubate a culture, then count and describe colonies to gather data on bacterial growth.

WHAT A FINISHED PRODUCT LOOKS LIKE

Colony data table

Completes: Completes the culturing lab data collection: a colony count with morphology descriptions for target colonies and a separate tally for any contamination colonies.

WORKED MODEL

I streaked my plate using aseptic technique, labeled it with my initials, the date, and 'Sample 1,' and incubated it. After growth, I counted and described the colonies.

Target colonies: I counted 14 colonies that all looked the same, which suggests a pure culture descended from one strain. Each was small (about 1 mm), cream colored, round, and had a smooth edge.

Contamination: I found 2 colonies that looked different (larger, yellow, fuzzy edges). I did not count these as target colonies because they are a different organism. I recorded them separately so my analysis stays clean.

Conclusion note: Because almost all my colonies share one morphology, I am confident most of the plate is my target strain.

ALSO DUE TODAY

Photograph your plate and table and bring them to the mutation and HGT analysis.

BUILD YOUR OWN

Keep the model's structure. Replace the prompt, facts, measurements, and evidence with your own. Check units, scientific vocabulary, and whether the conclusion goes beyond the evidence.

WEBXAM-STYLE FOLLOW-UP PRACTICE

A student's incubated streak plate shows 18 small round cream colonies and 1 large fuzzy green colony. How should the green colony be handled in the colony data?

A. Record it separately as likely contamination, because its morphology differs from the target colonies

B. Add it to the target count, because every colony on the plate is part of the sample

C. Throw out the whole plate, because one different colony makes all the data useless

D. Count it as a target colony that simply grew faster than the others

Practice check: A. Record it separately as likely contamination, because its morphology differs from the target colonies

Each colony grows from one original cell, so colonies that share a morphology are likely the same strain. A single colony with a clearly different size, color, and edge is most likely a contaminant and should be tallied separately, not mixed into the target count.

WHERE THIS LIVES AND WHERE TO SUBMIT

https://mendozabiomed.org/learn/pltw-gend/day/2026-10-02/exemplar

Submit in Schoology. Submit one PDF. Put your first and last name in the document header. Name the file: FirstName LastName - Assignment Title - YYYY-MM-DD.pdf.

WORKED EXEMPLAR 30 OF 77

Mutation, HGT, and superbugs

Week 7 | Mon, Oct 5, 2026 | Culturing

TODAY'S GOAL

Explain how mutation and horizontal gene transfer spread resistance genes and create superbugs.

WHAT A FINISHED PRODUCT LOOKS LIKE

HGT and superbugs notebook entry

Completes: Completes the resistance-mechanism notebook page: definitions of mutation and horizontal gene transfer, a labeled conjugation diagram, a multi-resistance explanation, a colony-data scenario, and a linking sentence.

WORKED MODEL

Definitions in my own words:
- Mutation: a random change in a bacterium's DNA. Once in a while a mutation happens to make the cell able to survive an antibiotic.
- Horizontal gene transfer (HGT): when one bacterium passes a gene to another bacterium instead of to its offspring. Resistance genes can move this way, even between different species.

How one resistant cell shares its gene (conjugation): A resistant cell builds a bridge called a pilus to a neighbor, copies its resistance plasmid, and sends the copy across. Now both cells are resistant.

Why superbugs resist several drugs at once: Resistance genes often ride on the same plasmid. One transfer can hand over resistance to multiple antibiotics in a single step, so a cell can become multi-drug resistant without slowly earning each resistance on its own.

Colony-data scenario: On my plate, imagine one of my 14 colonies carried a resistance plasmid. If I added an antibiotic, that colony's descendants would survive and the others would die, so over time the resistant colony would take over the whole plate.

Linking sentence: Careful culturing lets us see resistant strains, resistance spreads through mutation and HGT, and that is exactly why stewardship (using antibiotics sparingly and correctly) matters.

ALSO DUE TODAY

Photograph and upload the page to your portfolio.

JOHN HAY BIOMEDICAL

MI Worked Exemplar Library

BUILD YOUR OWN

Keep the model's structure. Replace the prompt, facts, measurements, and evidence with your own. Check units, scientific vocabulary, and whether the conclusion goes beyond the evidence.

WEBXAM-STYLE FOLLOW-UP PRACTICE

A susceptible bacterium suddenly becomes resistant to three different antibiotics at once, faster than separate mutations could explain. What most likely happened?

A. It received a plasmid carrying multiple resistance genes through horizontal gene transfer
B. It grew a thicker cell wall on its own during one cell division
C. Three independent mutations happened in the same cell on the same day
D. The antibiotics reacted with each other and stopped working

Practice check: A. It received a plasmid carrying multiple resistance genes through horizontal gene transfer

Resistance genes often travel together on a single plasmid. A horizontal gene transfer event, such as conjugation, can move that whole plasmid into a cell in one step, giving it resistance to several antibiotics at once.

WHERE THIS LIVES AND WHERE TO SUBMIT

https://mendozabiomed.org/learn/pltw-gend/day/2026-10-05/exemplar

Submit in Schoology. Submit one PDF. Put your first and last name in the document header. Name the file: FirstName LastName - Assignment Title - YYYY-MM-DD.pdf.

WORKED EXEMPLAR 31 OF 77

Cochlear implant debate

Week 7 | Tue, Oct 6, 2026 | Hearing Vaccine

TODAY'S GOAL

Build and defend a claim-evidence-reasoning position on whether cochlear implants should be standard care for deaf children.

WHAT A FINISHED PRODUCT LOOKS LIKE

Worked CER on a parallel case (newborn genetic screening)

Completes: Parallel model showing the full CER format: a claim on whether an untreatable-condition genetic screen should be added to the newborn panel, two pieces of evidence, reasoning, and a three-sentence reflection. Students copy the structure, not the answer.

WORKED MODEL

Parallel case (not today's prompt): Should a genetic screen for a serious adult-onset condition that has no childhood treatment be added to the standard newborn screening panel that every baby receives at birth?\n\nClaim: A genetic screen for an untreatable adult-onset condition should be offered to parents as an optional add-on, but it should not be folded into the automatic newborn screening panel that every baby receives.\n\nEvidence 1: Standard newborn screening tests a heel-prick blood sample for a set list of conditions, and the panel was built mostly around disorders that can be treated early, such as PKU, where starting a special diet in the first weeks prevents brain damage.\n\nEvidence 2: A result for an adult-onset condition with no childhood treatment does not change the infant's care now, but it creates lifelong knowledge about that person's future body that the newborn cannot yet weigh, and that some people later say they would have chosen not to learn.\n\nReasoning: Because the automatic panel earns its automatic status by catching problems that early action can fix, adding a test that changes nothing in childhood breaks that logic and hands a child a permanent result they never agreed to receive. Offering the screen as a clearly separate choice keeps the medical benefit available for

families who want it while protecting the future adult's right to decide what to know about their own body.\n\nReflection: At first I assumed more information at birth is always better, so screening for everything seemed obviously good. Thinking about the difference between a result you can act on now and a result the child will carry for decades made me see that timing and consent matter, not just the test's accuracy. I kept my claim that the screen should exist, but moved it out of the automatic panel and into an informed, opt-in choice.

ALSO DUE TODAY

Post your CER and reflection to Schoology before the end of the block.

BUILD YOUR OWN

Keep the model's structure. Replace the prompt, facts, measurements, and evidence with your own. Check units, scientific vocabulary, and whether the conclusion goes beyond the evidence.

WEBXAM-STYLE FOLLOW-UP PRACTICE

A patient has damaged cochlear hair cells but an intact auditory nerve. How does a cochlear implant let this patient perceive sound?

A. It regrows the damaged hair cells over several weeks

B. It converts sound into electrical signals that directly stimulate the auditory nerve, bypassing the hair cells

C. It amplifies sound like a hearing aid so the damaged hair cells work again

D. It repairs the eardrum so sound reaches the brain normally

Practice check: B. It converts sound into electrical signals that directly stimulate the auditory nerve, bypassing the hair cells

A cochlear implant turns sound into electrical signals and delivers them straight to the auditory nerve, skipping the non-working hair cells. That is why it can help when hair cells are damaged but the nerve still works.

WHERE THIS LIVES AND WHERE TO SUBMIT

https://mendozabiomed.org/learn/pltw-gend/day/2026-10-06/exemplar

Submit in Schoology. Submit one PDF. Put your first and last name in the document header. Name the file: FirstName LastName - Assignment Title - YYYY-MM-DD.pdf.

WORKED EXEMPLAR 32 OF 77

Audiogram interpretation

Week 7 | Wed, Oct 7, 2026 | Hearing Vaccine

TODAY'S GOAL

Read an audiogram to describe the type and severity of a patient's hearing loss using decibel and frequency language.

WHAT A FINISHED PRODUCT LOOKS LIKE

Annotated audiogram with classification

Completes: Completes the audiogram reading task: a labeled audiogram with plotted thresholds, the speech banana marked, and a one-sentence severity classification with evidence.

WORKED MODEL

I labeled the axes: frequency in hertz across the top (low pitch on the left, high pitch on the right) and loudness in decibels down the side (soft at the top, loud at the bottom). I plotted Patient A's right-ear thresholds from the data table.

What the plot shows: Patient A hears low frequencies at about 30 dB but needs high frequencies (2000 to 4000 Hz) turned up to 60 to 65 dB before hearing them. That high-frequency region overlaps part of the speech banana, so this patient would miss soft consonant sounds like s, f, and th while still hearing vowels.

Classification: I classify this as a moderately severe hearing loss, because the worst thresholds, at 2000 to 4000 Hz, sit at 55 to 65 dB, and 56 to 70 dB is the moderately severe band.

ALSO DUE TODAY

Submit your annotated audiogram and classification to Schoology.

BUILD YOUR OWN

Keep the model's structure. Replace the prompt, facts, measurements, and evidence with your own. Check units, scientific vocabulary, and whether the conclusion goes beyond the evidence.

WEBXAM-STYLE FOLLOW-UP PRACTICE

On an audiogram, a patient's poorest thresholds across the tested frequencies fall around 60 dB HL. Using standard severity ranges, how is this loss classified?

A. Mild, because 60 dB is only a little above normal
B. Moderate, because anything under 70 dB is moderate
C. Severe, because 60 dB falls in the 56 to 70 dB range
D. Profound, because the patient needs sound turned up

Practice check: C. Severe, because 60 dB falls in the 56 to 70 dB range

A threshold of 60 dB HL falls inside the 56 to 70 dB range, which is the severe category on the standard scale.

WHERE THIS LIVES AND WHERE TO SUBMIT

https://mendozabiomed.org/learn/pltw-gend/day/2026-10-07/exemplar

Submit in Schoology. Submit one PDF. Put your first and last name in the document header. Name the file: FirstName LastName - Assignment Title - YYYY-MM-DD.pdf.

WORKED EXEMPLAR 33 OF 77

Vaccine and disease-model lab

Week 7 | Thu, Oct 8, 2026 | Hearing Vaccine

TODAY'S GOAL

Model how a vaccine triggers adaptive immunity and use disease-spread data to test a simple outbreak prediction.

WHAT A FINISHED PRODUCT LOOKS LIKE

Immunity diagram and disease-model data

Completes: Completes the vaccine modeling lab: an adaptive immunity diagram, a two-scenario disease-model data table, and one sentence comparing the antibody response with the population data.

WORKED MODEL

Adaptive immunity diagram (in words): A pathogen displays an antigen. A B cell that fits that antigen activates and makes antibodies that tag the pathogen for destruction. Some of those cells become long-lived memory cells, so the next exposure triggers a faster, stronger response. A vaccine delivers the antigen without the disease, so memory cells form safely.

Disease-model results: I ran the model at two vaccination rates and recorded new infections.

Comparison sentence: The antibody response stops the disease inside one person by clearing the pathogen, while the population data shows that vaccinating enough people stops the disease between people by leaving the virus too few hosts to spread to.

ALSO DUE TODAY

Save the diagram, data table, and comparison sentence to Schoology.

BUILD YOUR OWN

Keep the model's structure. Replace the prompt, facts, measurements, and evidence with your own. Check units, scientific vocabulary, and whether the conclusion goes beyond the evidence.

WEBXAM-STYLE FOLLOW-UP PRACTICE

A vaccine contains an antigen but does not cause the disease. Why does a vaccinated person fight off the real pathogen faster later?

A. The vaccine kills the pathogen permanently before it ever enters the body
B. The vaccine primes memory B and T cells, so the secondary response is faster and stronger
C. The vaccine makes the person's skin a physical barrier the pathogen cannot cross
D. The vaccine replaces the immune system with antibodies that last a lifetime without cells

Practice check: B. The vaccine primes memory B and T cells, so the secondary response is faster and stronger

The antigen in a vaccine trains the adaptive immune system to make memory B and T cells. On real exposure, those memory cells respond quickly and strongly, clearing the pathogen before it causes serious illness.

WHERE THIS LIVES AND WHERE TO SUBMIT

https://mendozabiomed.org/learn/pltw-gend/day/2026-10-08/exemplar

Submit in Schoology. Submit one PDF. Put your first and last name in the document header. Name the file: FirstName LastName - Assignment Title - YYYY-MM-DD.pdf.

WORKED EXEMPLAR 34 OF 77

Herd immunity math

Week 8 | Mon, Oct 12, 2026 | Hearing Vaccine

TODAY'S GOAL

Calculate a herd immunity threshold from a reproduction number and explain who it protects.

WHAT A FINISHED PRODUCT LOOKS LIKE

Non-answer evidence audit scaffold

Completes: A blank evidence-and-limit structure for Herd immunity math. It models the required parts without supplying today's result, calculation, interpretation, or recommendation.

WORKED MODEL

Question or criterion: ____
Evidence ID and exact observation: ____
Second evidence ID and exact observation: ____
Reasoning rule: ____
Bounded conclusion: ____
Limitation or quality-control issue: ____
Next evidence needed: ____

BUILD YOUR OWN

Keep the model's structure. Replace the prompt, facts, measurements, and evidence with your own. Check units, scientific vocabulary, and whether the conclusion goes beyond the evidence.

WEBXAM-STYLE FOLLOW-UP PRACTICE

A student completes Herd immunity math and writes a conclusion from one classroom result. Which revision makes the conclusion most scientifically defensible?

A. Add the evidence source, comparison, reasoning rule, and a method-specific limitation.
B. Remove the limitation so the conclusion sounds more certain.
C. Replace the measured result with a personal opinion.
D. Call the classroom result a confirmed diagnosis.

Practice check: A. Add the evidence source, comparison, reasoning rule, and a method-specific limitation.

A defensible conclusion shows where the evidence came from, how the comparison supports the claim, and where the method stops.

WHERE THIS LIVES AND WHERE TO SUBMIT

https://mendozabiomed.org/learn/pltw-gend/day/2026-10-12/exemplar

Submit in Schoology. Submit one PDF. Put your first and last name in the document header. Name the file: FirstName LastName - Assignment Title - YYYY-MM-DD.pdf.

WORKED EXEMPLAR 35 OF 77

Genetic privacy debate

Week 8 | Tue, Oct 13, 2026 | Genetic Testing

TODAY'S GOAL

Argue a CER position on who should be allowed to access a person's genetic test results.

WHAT A FINISHED PRODUCT LOOKS LIKE

Worked CER on a parallel case

Completes: Parallel worked model of the CER format: a claim, two pieces of evidence, reasoning, and a reflection naming one counterargument, built on a different scenario (retention and research reuse of newborn blood-spot samples) so students can copy the structure without seeing an answer to today's genetic privacy prompt.

WORKED MODEL

Claim: A state should be allowed to keep a newborn's leftover blood-spot sample for later research only if parents are told and given a clear chance to opt out, not by silent default.

Evidence 1: Every state screens newborns by pricking the heel and drying a few drops of blood on a card, and after testing there is usually blood left over. In several states these leftover cards have been stored for years and used in outside studies, and in some cases parents were never told this could happen.

Evidence 2: Courts and health agencies have already treated stored blood spots as sensitive. In Texas and Minnesota, lawsuits over samples that were kept and shared without clear parental permission led to millions of stored cards being destroyed and to new consent rules, which shows officials recognized that quiet retention crossed a line.

Reasoning: A blood spot is not just a leftover. It carries the child's full DNA, so it can reveal medical risks about the child and about relatives who were never tested. Because that information is so personal, the fair default is that families know what is being kept and can say no, while the state keeps the narrow right to run the original health screen that protects the baby. Telling parents and offering an opt out respects the family without shutting down research that everyone agrees is useful.

Reflection: One counterargument is that research works best when scientists can study large, complete sets of samples, and letting families opt out shrinks and skews that pool. I considered it, but I kept my claim, because trust matters more than sample size. If families learn that samples were taken quietly, they may distrust screening itself, and losing that trust would hurt public health more than a smaller research pool does.

ALSO DUE TODAY

Post your CER and reflection to Schoology.

BUILD YOUR OWN

Keep the model's structure. Replace the prompt, facts, measurements, and evidence with your own. Check units, scientific vocabulary, and whether the conclusion goes beyond the evidence.

WEBXAM-STYLE FOLLOW-UP PRACTICE

Under the Genetic Information Nondiscrimination Act (GINA), which use of a person's genetic information is NOT protected?

A. A health insurer raising premiums based on a genetic test

B. An employer using genetic results in hiring decisions

C. A life or disability insurer using genetic information to set coverage

D. An employer demanding genetic test results from applicants

Practice check: C. A life or disability insurer using genetic information to set coverage

GINA limits health insurers and employers, but it does not cover life, disability, or long-term-care insurance. Those insurers can still consider genetic information, which is the gap in the law.

WHERE THIS LIVES AND WHERE TO SUBMIT

https://mendozabiomed.org/learn/pltw-gend/day/2026-10-13/exemplar

Submit in Schoology. Submit one PDF. Put your first and last name in the document header. Name the file: FirstName LastName - Assignment Title - YYYY-MM-DD.pdf.

WORKED EXEMPLAR 36 OF 77

Pedigree logic

Week 8 | Wed, Oct 14, 2026 | Genetic Testing

TODAY'S GOAL

Use pedigree symbols to track an inherited trait and identify carriers across generations.

WHAT A FINISHED PRODUCT LOOKS LIKE

Three-generation pedigree with carriers

Completes: Completes the pedigree analysis: a correctly drawn three-generation pedigree with carriers circled, the mode of inheritance stated, and one sentence of evidence from the pattern.

WORKED MODEL

I drew the family using standard symbols: squares for males, circles for females, filled-in shapes for affected individuals, and a horizontal line for each mating.

Mode of inheritance: This trait is autosomal recessive.

Evidence from the pattern: In Generation II, two unaffected parents produced an affected daughter. Two unaffected parents can only have an affected child if both are carriers of a recessive allele, so the trait must be recessive (not dominant), and it appears in both sexes, so it is autosomal, not X-linked.

Carriers I circled: Both Generation II parents must be carriers, because each had to pass one recessive allele to their affected child while showing no trait themselves. I circled both. I can explain the father: he is unaffected, so he has at least one working allele, but his affected child received a non-working allele from him, so he must carry one of each.

ALSO DUE TODAY

Submit your pedigree and inheritance call to Schoology.

BUILD YOUR OWN

Keep the model's structure. Replace the prompt, facts, measurements, and evidence with your own. Check units, scientific vocabulary, and whether the conclusion goes beyond the evidence.

WEBXAM-STYLE FOLLOW-UP PRACTICE

In a pedigree, two unaffected parents have a daughter who shows the trait. What does this pattern most strongly indicate about the trait?

A. It is autosomal recessive, and both parents are carriers

B. It is autosomal dominant, inherited from one parent

C. It is Y-linked, passed only from father to son

D. It cannot be inherited at all and must be a new environmental cause

Practice check: A. It is autosomal recessive, and both parents are carriers

If both parents are unaffected yet have an affected child, each parent must carry a hidden recessive allele and pass it on. The trait appearing in a daughter also fits autosomal (not Y-linked) inheritance.

WHERE THIS LIVES AND WHERE TO SUBMIT

https://mendozabiomed.org/learn/pltw-gend/day/2026-10-14/exemplar

Submit in Schoology. Submit one PDF. Put your first and last name in the document header. Name the file: FirstName LastName - Assignment Title - YYYY-MM-DD.pdf.

WORKED EXEMPLAR 37 OF 77

JCU bioethics 4: Euthanasia to reduce antibiotic use

Week 8 | Thu, Oct 15, 2026 | John Carroll University bioethics session

TODAY'S GOAL

Argue an assigned side of this question: Should terminally ill patients be offered medical aid in dying in order to decrease antibiotic use?

WHAT A FINISHED PRODUCT LOOKS LIKE

Worked debate worksheet on a parallel case: a competent adult declining a burdensome treatment

Completes: A complete debate worksheet that names the assigned side, gives three evidence-based arguments, answers the strongest opposing point, and ends with the student's own position.

WORKED MODEL

Parallel case, not today's prompt: A competent adult with terminal disease is deciding whether to stop an invasive treatment that causes severe side effects and no longer changes the expected outcome.

Claim: The care team should honor an informed refusal after confirming decision-making capacity, explaining comfort-care options, and documenting that the choice is voluntary.

Evidence: The treatment causes repeated hospitalizations and pain, while the clinical record shows no meaningful improvement in function or survival. The patient can explain the likely outcomes of continuing and stopping treatment in their own words.

Reasoning: Respect for autonomy is strongest when a person understands the consequences and the treatment no longer provides a proportional benefit. Capacity checks and comfort care protect the patient from coercion and untreated suffering.

Strongest opposing point and response: Family members may argue that stopping treatment gives up too soon. A time-limited second opinion can test that concern, but forcing a capable adult to continue a nonbeneficial treatment replaces the patient's informed values with someone else's hope.

My position after the debate: I support the claim only with the limits named above. A strong ethics argument states the value being protected, uses evidence rather than preference, answers the best counterargument, and names the condition that could change the decision.

ALSO DUE TODAY

Submit one debate worksheet PDF in Schoology before the end of the block.

BUILD YOUR OWN

Keep the model's structure. Replace the prompt, facts, measurements, and evidence with your own. Check units, scientific vocabulary, and whether the conclusion goes beyond the evidence.

WEBXAM-STYLE FOLLOW-UP PRACTICE

Which new evidence would most strongly improve the argument in the parallel a competent adult declining a burdensome treatment case?

A. A documented capacity assessment plus outcome data showing whether the treatment still improves survival or function

B. One relative's fear of stopping treatment

C. The cost of the hospital room alone

D. A social-media story about a different disease

Practice check: A. A documented capacity assessment plus outcome data showing whether the treatment still improves survival or function

This evidence measures the outcome the claim depends on and gives a comparison that can test whether the policy produces the stated benefit or harm.

WHERE THIS LIVES AND WHERE TO SUBMIT

https://mendozabiomed.org/learn/pltw-gend/day/2026-10-15/exemplar

Submit in Schoology. Submit one PDF. Put your first and last name in the document header. Name the file: FirstName LastName - Assignment Title - YYYY-MM-DD.pdf.

WORKED EXEMPLAR 38 OF 77

SNP and PTC case

Week 8 | Fri, Oct 16, 2026 | Genetic Testing

TODAY'S GOAL

Connect a single-nucleotide polymorphism to a phenotype using the PTC-tasting genotype dataset.

WHAT A FINISHED PRODUCT LOOKS LIKE

Genotype-to-phenotype table

Completes: Completes the SNP case analysis: a genotype-to-phenotype table for three individuals with homozygous or heterozygous labels, an evidence sentence, and a carrier prediction.

WORKED MODEL

I found the SNP column for the TAS2R38 PTC-tasting gene and matched each person's genotype to their tasting phenotype. I used T for the taster allele and t for the non-taster allele.

Does the tasting allele track with the trait? Yes. Everyone with at least one T allele tasted PTC, and the only non-taster was homozygous tt. Evidence: Person 1 (TT) and Person 2 (Tt) both tasted; Person 3 (tt) did not, so the T allele tracks with tasting and behaves as dominant.

Carrier prediction: Person 2 is a heterozygous taster (Tt). They show the taster phenotype but carry one non-taster allele, so they could pass the non-taster allele to a child.

ALSO DUE TODAY

Submit your genotype-to-phenotype table and prediction to Schoology.

BUILD YOUR OWN

Keep the model's structure. Replace the prompt, facts, measurements, and evidence with your own. Check units, scientific vocabulary, and whether the conclusion goes beyond the evidence.

WEBXAM-STYLE FOLLOW-UP PRACTICE

For the PTC-tasting gene, the taster allele (T) is dominant over the non-taster allele (t). A person who can taste PTC but could still pass a non-taster allele to a child must have which genotype?

A. TT, homozygous dominant
B. Tt, heterozygous
C. tt, homozygous recessive
D. It is impossible for a taster to pass a non-taster allele

Practice check: B. Tt, heterozygous

A heterozygous person (Tt) shows the dominant taster phenotype because of the T allele, but still carries one t allele they can pass to a child. That is exactly the carrier described.

WHERE THIS LIVES AND WHERE TO SUBMIT

https://mendozabiomed.org/learn/pltw-gend/day/2026-10-16/exemplar

Submit in Schoology. Submit one PDF. Put your first and last name in the document header. Name the file: FirstName LastName - Assignment Title - YYYY-MM-DD.pdf.

WORKED EXEMPLAR 39 OF 77

Genetic counseling memo

Week 9 | Mon, Oct 19, 2026 | Genetic Testing

TODAY'S GOAL

Write a counseling memo that interprets a carrier result for a family without overstating risk.

WHAT A FINISHED PRODUCT LOOKS LIKE

Worked CER on a parallel case

Completes: Models the full Claim-Evidence-Reasoning format for interpreting a genomic screening result honestly: a claim about what the result establishes, evidence separating what it does and does not show, and reasoning that connects probability to an appropriate next step and the counselor's role, without answering today's own carrier-memo prompt.

WORKED MODEL

Parallel case (not today's prompt): A different family receives a positive newborn screening result. Their baby's heel-stick blood spot flagged an elevated marker for a metabolic condition. The parents want to know what this screen tells them and what they should do next. Below is a worked CER that models how to interpret a genomic screening result honestly. It is a different scenario from the carrier memo you will write, but it shows the exact format and depth expected.\n\nClaim: A positive newborn screen means the baby needs a confirmatory diagnostic test, not that the baby has the condition. The screen raises the probability enough to justify follow-up, but it does not by itself establish a diagnosis.\n\nEvidence:\n- What the result does show: The blood spot marker was above the cutoff the screening lab uses to flag samples for review. Newborn screens are deliberately tuned to catch nearly every true case, which means they also flag some healthy babies. Most positive screens for rare metabolic conditions turn out to be false positives after confirmatory testing.\n- What the result does not show: The screen does not measure the gene or the enzyme directly, so it cannot tell you the baby is affected. It also cannot rule the condition out with certainty on its own; only the confirmatory test can move the answer toward yes or no.\n\nReasoning: A screen and a diagnosis are two different steps. A screen is a wide, sensitive net

designed to miss as few real cases as possible, so a positive result shifts the probability upward without proving anything. Treating the screen as a verdict would cause needless panic in the many families whose babies are healthy, while ignoring it would risk missing the rare baby who does need early treatment. The honest and useful response is to name the real but limited meaning of the number and move to the one step that resolves it: the confirmatory diagnostic test. This is also why a genetic counselor matters. A counselor is trained in both the genomics and the psychology of these results, so they can explain what a probability truly means and support a family through the wait without pushing them toward panic or false comfort.

ALSO DUE TODAY

Submit your memo draft to Schoology.

BUILD YOUR OWN

Keep the model's structure. Replace the prompt, facts, measurements, and evidence with your own. Check units, scientific vocabulary, and whether the conclusion goes beyond the evidence.

WEBXAM-STYLE FOLLOW-UP PRACTICE

A patient learns they are a carrier for a recessive genetic condition. What is the most accurate way to explain what this result means?

A. The patient will develop the disease and should begin treatment now

B. The patient almost certainly will not have the disease but can pass the allele to a child

C. The patient's future children are guaranteed to be affected

D. The result is meaningless because carriers are perfectly healthy

Practice check: B. The patient almost certainly will not have the disease but can pass the allele to a child

A carrier of a recessive condition has one working and one non-working allele, so they usually show no symptoms, but they can pass the allele on, which affects reproductive-risk calculations.

WHERE THIS LIVES AND WHERE TO SUBMIT

https://mendozabiomed.org/learn/pltw-gend/day/2026-10-19/exemplar

Submit in Schoology. Submit one PDF. Put your first and last name in the document header. Name the file: FirstName LastName - Assignment Title - YYYY-MM-DD.pdf.

WORKED EXEMPLAR 40 OF 77

Access-to-results debate

Week 9 | Tue, Oct 20, 2026 | Testing Methods

TODAY'S GOAL

Argue a CER position on whether patients should receive raw genetic testing results directly.

WHAT A FINISHED PRODUCT LOOKS LIKE

Worked CER on a parallel case (newborn screening blood-spot storage)

Completes: Worked CER on a parallel case: a claim about whether the state should keep leftover newborn screening blood spots for later research, two pieces of evidence, reasoning, and a reflection naming one counterargument. Models the CER format and depth for the access-to-results debate without answering today's own prompt about raw genetic results.

WORKED MODEL

Claim: States should be allowed to store leftover newborn screening blood spots for future research, but only if parents are clearly told and can opt out.\n\nEvidence 1: Every newborn is screened for genetic disorders using a heel-stick blood spot, and the leftover cards contain a child's DNA, which can reveal far more than the original tests checked for.\n\nEvidence 2: In Texas in 2009, a lawsuit revealed that stored newborn blood spots had been used for research without parents' knowledge, and the state was ordered to destroy millions of samples, showing that hidden storage breaks public trust.\n\nReasoning: Stored blood spots are genuinely useful for studying diseases and improving future screening, so destroying them all wastes a resource that could help other children. But the DNA belongs to the child and the family, not the state, and using it in secret treats people as sources of data rather than as patients. Requiring clear notice and an opt-out respects the family's ownership of the sample while still allowing research that benefits the public.\n\nReflection: One counterargument is that an opt-out will shrink the sample pool and slow research, since many families will decline once they are asked. I took that seriously, but I kept my claim, because trust is what keeps the whole screening program running. If families fear their child's DNA is used behind their backs, they may resist screening itself, and the public-health cost of that distrust is higher than the cost of a smaller research pool.

ALSO DUE TODAY

Post your CER and reflection to Schoology.

BUILD YOUR OWN

Keep the model's structure. Replace the prompt, facts, measurements, and evidence with your own. Check units, scientific vocabulary, and whether the conclusion goes beyond the evidence.

WEBXAM-STYLE FOLLOW-UP PRACTICE

Why do many clinicians argue that patients should not receive raw genetic test results without expert interpretation?

A. Raw results are always wrong and must be regenerated by a doctor

B. Raw results often contain variants of uncertain significance that are easy to misread

C. Patients are legally forbidden from ever seeing their own genetic data

D. Raw genetic data cannot be read by anyone outside a laboratory

Practice check: B. Raw results often contain variants of uncertain significance that are easy to misread

Raw genetic data includes variants of uncertain significance, whose health meaning is not established. Without training, a person can mistake these for clear danger or clear safety, which is the core concern.

WHERE THIS LIVES AND WHERE TO SUBMIT

https://mendozabiomed.org/learn/pltw-gend/day/2026-10-20/exemplar

Submit in Schoology. Submit one PDF. Put your first and last name in the document header. Name the file: FirstName LastName - Assignment Title - YYYY-MM-DD.pdf.

WORKED EXEMPLAR 41 OF 77

Gel electrophoresis lab

Week 9 | Wed, Oct 21, 2026 | Testing Methods

TODAY'S GOAL

Run or model gel electrophoresis and interpret band positions to compare DNA fragments.

WHAT A FINISHED PRODUCT LOOKS LIKE

Gel banding interpretation

Completes: Completes the gel lab analysis: a banding data table with migration distances, a largest-to-smallest ranking, two size estimates against the ladder, and an explanation of the size-migration relationship.

WORKED MODEL

I recorded how far each band traveled from the well and used the size ladder to estimate the unknown bands.

Ranking, largest to smallest: Band 1 traveled the least (largest), then Band 2, then Band 3 traveled the farthest (smallest).

Size estimates: Unknown Band 2 lined up between the 1000 bp and 750 bp ladder bands, so I estimate about 850 bp. Unknown Band 3 lined up near the 500 bp ladder band, so I estimate about 500 bp.

Why smaller fragments travel farther: DNA is negatively charged, so the electric field pulls all fragments toward the positive end. The agarose acts as a sieve, and smaller fragments thread through the gel's pores more easily, so they move farther in the same time.

ALSO DUE TODAY

Submit your data table and interpretation to Schoology.

BUILD YOUR OWN

Keep the model's structure. Replace the prompt, facts, measurements, and evidence with your own. Check units, scientific vocabulary, and whether the conclusion goes beyond the evidence.

WEBXAM-STYLE FOLLOW-UP PRACTICE

On an agarose gel, one DNA fragment has traveled much farther from the well than another. What does this tell you about the two fragments?

A. The fragment that traveled farther is smaller
B. The fragment that traveled farther is larger
C. The two fragments are the same size but different charges
D. The fragment that traveled farther carries more genes

Practice check: A. The fragment that traveled farther is smaller

Agarose acts as a molecular sieve, so smaller fragments thread through faster and travel farther in the same run. Greater migration distance means a smaller fragment.

WHERE THIS LIVES AND WHERE TO SUBMIT

https://mendozabiomed.org/learn/pltw-gend/day/2026-10-21/exemplar

Submit in Schoology. Submit one PDF. Put your first and last name in the document header. Name the file: FirstName LastName - Assignment Title - YYYY-MM-DD.pdf.

WORKED EXEMPLAR 42 OF 77

JCU bioethics 5: Is super hearing good for humanity?

Week 9 | Thu, Oct 22, 2026 | John Carroll University bioethics session

TODAY'S GOAL

Argue an assigned side of this question: Is super hearing, as offered by the Clarity Implant, a net positive for humanity?

WHAT A FINISHED PRODUCT LOOKS LIKE

Worked debate worksheet on a parallel case: night-vision contact lenses for healthy adults

Completes: A complete debate worksheet that names the assigned side, gives three evidence-based arguments, answers the strongest opposing point, and ends with the student's own position.

WORKED MODEL

Parallel case, not today's prompt: A company offers permanent night-vision contact lenses to healthy adults, improving low-light vision but carrying an uncertain long-term risk of retinal damage.

Claim: The lenses should be limited to monitored research until long-term retinal safety and unequal-access effects are known.

Evidence: Early trials show better low-light performance, but follow-up lasts only six months and includes few participants. The lens changes how much light reaches retinal cells, so a rare injury might not appear in a small, short study.

Reasoning: An enhancement offers optional benefit rather than treatment of disease, so accepting an irreversible or poorly measured risk requires stronger safety evidence. Monitoring also shows whether access creates unfair advantages in work or public safety roles.

Strongest opposing point and response: Supporters may argue that informed adults should choose any enhancement. Consent matters, but a person cannot evaluate a long-term risk that has not been measured, so completing the safety evidence is a condition for meaningful choice.

My position after the debate: I support the claim only with the limits named above. A strong ethics argument states the value being protected, uses evidence rather than preference, answers the best counterargument, and names the condition that could change the decision.

ALSO DUE TODAY

Submit one debate worksheet PDF in Schoology before the end of the block.

BUILD YOUR OWN

Keep the model's structure. Replace the prompt, facts, measurements, and evidence with your own. Check units, scientific vocabulary, and whether the conclusion goes beyond the evidence.

WEBXAM-STYLE FOLLOW-UP PRACTICE

Which new evidence would most strongly improve the argument in the parallel night-vision contact lenses for healthy adults case?

A. A multi-year comparison of retinal health in lens users and matched nonusers

B. A user's report that the lenses look exciting

C. The number of preorders placed

D. A promotional video showing one successful night drive

Practice check: A. A multi-year comparison of retinal health in lens users and matched nonusers

This evidence measures the outcome the claim depends on and gives a comparison that can test whether the policy produces the stated benefit or harm.

WHERE THIS LIVES AND WHERE TO SUBMIT

https://mendozabiomed.org/learn/pltw-gend/day/2026-10-22/exemplar

Submit in Schoology. Submit one PDF. Put your first and last name in the document header. Name the file: FirstName LastName - Assignment Title - YYYY-MM-DD.pdf.

WORKED EXEMPLAR 43 OF 77

Microarray introduction

Week 9 | Fri, Oct 23, 2026 | Testing Methods

TODAY'S GOAL

Explain how a microarray uses hybridization to test many genes at once and where it differs from PCR.

WHAT A FINISHED PRODUCT LOOKS LIKE

Method comparison table

Completes: Completes the methods comparison: a three-row table contrasting PCR, gel, and microarray by purpose plus one sentence on a microarray limit the others do not share.

WORKED MODEL

Hybridization in my words: A microarray is covered with single-stranded probe sequences. A labeled sample of DNA or cDNA washes over it, and each piece sticks (hybridizes) only where it finds its complementary probe. A bright, colored spot means that gene's sequence was present in the sample; a dark spot means it was not.

Method comparison: I compared PCR, gel, and microarray by what each is best for.

Microarray limit not shared by the others: A microarray needs specialized scanning equipment and bioinformatics software to read thousands of spots, while a PCR product or a gel can be set up and read with much simpler tools.

ALSO DUE TODAY

Submit your comparison table to Schoology.

BUILD YOUR OWN

Keep the model's structure. Replace the prompt, facts, measurements, and evidence with your own. Check units, scientific vocabulary, and whether the conclusion goes beyond the evidence.

WEBXAM-STYLE FOLLOW-UP PRACTICE

A researcher wants to find out which of thousands of genes are switched on in a tumor sample compared with healthy tissue. Which method is designed for this job?

A. PCR, because it copies one target sequence very accurately

B. Gel electrophoresis, because it sorts fragments by size

C. A microarray, because it measures the expression of many genes at once by hybridization

D. A restriction enzyme digest, because it cuts DNA at recognition sites

Practice check: C. A microarray, because it measures the expression of many genes at once by hybridization

A microarray uses thousands of probe spots and hybridization to measure which genes are expressed across the whole sample at once, which is exactly the genome-wide expression question being asked.

WHERE THIS LIVES AND WHERE TO SUBMIT

https://mendozabiomed.org/learn/pltw-gend/day/2026-10-23/exemplar

Submit in Schoology. Submit one PDF. Put your first and last name in the document header. Name the file: FirstName LastName - Assignment Title - YYYY-MM-DD.pdf.

WORKED EXEMPLAR 44 OF 77

Expression data lab

Week 10 | Mon, Oct 26, 2026 | Gene Expression

TODAY'S GOAL

Use a gene expression table to calculate fold change and flag upregulated and downregulated genes.

WHAT A FINISHED PRODUCT LOOKS LIKE

Fold-change table

Completes: A worked parallel example on a different dataset, untreated versus drug-treated cells: a fold-change table for four genes with upregulated or downregulated labels and one sentence on the meaning of an upregulated gene. Use it to model the method, then run it on today's own numbers.

WORKED MODEL

This is a parallel example on different data, untreated versus drug-treated cells, so you can see the method and then run it on today's own healthy-versus-diseased numbers.

I divided each gene's treated value by its untreated value to get fold change, then labeled each gene.

Rule I used: fold change above 1 is upregulated (more active after treatment); below 1 is downregulated (less active).

What an upregulated gene might mean: A gene turned up after treatment could be a stress-response gene the drug switched on, or a gene the drug was meant to boost, so the number flags a gene worth investigating, not an automatic cause.

ALSO DUE TODAY

Save your fold-change table to Schoology.

BUILD YOUR OWN

Keep the model's structure. Replace the prompt, facts, measurements, and evidence with your own. Check units, scientific vocabulary, and whether the conclusion goes beyond the evidence.

WEBXAM-STYLE FOLLOW-UP PRACTICE

A gene shows an expression value of 100 in healthy tissue and 25 in diseased tissue. What is its fold change, and how is it labeled?

A. Fold change 0.25, downregulated

B. Fold change 4.0, upregulated

C. Fold change 75, upregulated

D. Fold change 0.25, upregulated

Practice check: A. Fold change 0.25, downregulated

Fold change is diseased divided by healthy: 25 / 100 = 0.25. A value below 1 means the gene is less active in disease, so it is downregulated.

WHERE THIS LIVES AND WHERE TO SUBMIT

https://mendozabiomed.org/learn/pltw-gend/day/2026-10-26/exemplar

Submit in Schoology. Submit one PDF. Put your first and last name in the document header. Name the file: FirstName LastName - Assignment Title - YYYY-MM-DD.pdf.

WORKED EXEMPLAR 45 OF 77

Heat-map claim

Week 10 | Tue, Oct 27, 2026 | Gene Expression

TODAY'S GOAL

Read a microarray heat map and write a claim that separates disease risk from disease diagnosis.

WHAT A FINISHED PRODUCT LOOKS LIKE

Worked CER on a parallel case

Completes: Parallel worked CER: a shaded results strip for a newborn screening panel and a claim with two numeric values as evidence that separates screening risk from diagnosis. Models the format only. Your own heat-map claim is different.

WORKED MODEL

Note: This is a parallel model on a different case (a newborn metabolic screening panel), not the heat-map task you are doing today. Use it to see the CER format and depth, then build your own claim from your own grid.\n\nI shaded four screening values from a newborn blood-spot panel into a small strip, using a darker color for values above the reference cutoff and a lighter color for values below it.\n\nClaim: The pattern in this sample suggests an elevated risk of phenylketonuria, especially in the raised amino-acid values, but it does not confirm the condition.\n\nEvidence: The phenylalanine level is 6 mg/dL and the phenylalanine-to-tyrosine ratio is 3.5, both above the standard screening cutoffs, which matches the pattern flagged for follow-up in the reference.\n\nWhy this is risk, not diagnosis: A screening panel is designed to catch samples that need a closer look, so an above-cutoff result raises the probability of the condition rather than proving it. Some raised values come from feeding timing, prematurity, or lab handling, so a confirmatory test such as a plasma amino-acid analysis or a genetic test is needed before anyone can say the newborn has the disorder. For that reason my claim names risk and points to follow-up, not a confirmed diagnosis.\n\nFalsifiability check: If a confirmatory plasma amino-acid test came back within the normal range, the risk signal would be explained as a false positive and my claim would be wrong, which shows the claim is testable.

ALSO DUE TODAY

Submit your heat map and claim to Schoology.

BUILD YOUR OWN

Keep the model's structure. Replace the prompt, facts, measurements, and evidence with your own. Check units, scientific vocabulary, and whether the conclusion goes beyond the evidence.

WEBXAM-STYLE FOLLOW-UP PRACTICE

A patient's microarray shows an expression pattern similar to one seen in a disease. What is the most scientifically accurate claim a student can make from this alone?

A. The patient definitely has the disease and should start treatment
B. The pattern indicates elevated risk, but a diagnosis needs clinical confirmation
C. The patient can never develop the disease because expression varies
D. Expression data by itself is enough to rule the disease out completely

Practice check: B. The pattern indicates elevated risk, but a diagnosis needs clinical confirmation

An expression pattern that matches a disease raises the probability of that disease, but confirming it requires clinical follow-up. Calling it elevated risk, not a diagnosis, is the accurate claim.

WHERE THIS LIVES AND WHERE TO SUBMIT

https://mendozabiomed.org/learn/pltw-gend/day/2026-10-27/exemplar

Submit in Schoology. Submit one PDF. Put your first and last name in the document header. Name the file: FirstName LastName - Assignment Title - YYYY-MM-DD.pdf.

WORKED EXEMPLAR 46 OF 77

Microarray report submit

Week 10 | Wed, Oct 28, 2026 | Gene Expression

TODAY'S GOAL

Finalize and submit your microarray analysis report connecting expression data to disease risk.

WHAT A FINISHED PRODUCT LOOKS LIKE

Microarray analysis report

Completes: Completes the unit report: a combined microarray analysis with the fold-change table, shaded heat map, and a CER claim that ties every statement back to a data value and separates risk from diagnosis.

WORKED MODEL

Report summary: I combined my fold-change table, heat map, and claim into one report and checked that every claim points to a number.

Claim: This sample shows an expression pattern consistent with elevated disease risk.
Evidence anchored in data: Gene 3 fold change 4.0 and Gene 1 fold change 3.2 are both strongly upregulated; Gene 2 (0.25) and Gene 4 (0.5) are downregulated, matching the reference disease signature.
Reasoning: The upregulated cluster raises the probability of disease, but because expression data cannot confirm disease on its own, I state risk and recommend clinical follow-up rather than a diagnosis.

Revision I made with feedback: I replaced the vague phrase 'the gene went up' with the quantified 'Gene 3 had a fold change of 4.0,' so every claim now traces to a specific value.

ALSO DUE TODAY

Submit your completed report to Schoology.

BUILD YOUR OWN

Keep the model's structure. Replace the prompt, facts, measurements, and evidence with your own. Check units, scientific vocabulary, and whether the conclusion goes beyond the evidence.

JOHN HAY BIOMEDICAL

MI Worked Exemplar Library

WEBXAM-STYLE FOLLOW-UP PRACTICE

A peer review flags one line in a microarray report: 'The gene went up a lot.' Why is this line weaker than the rest of the report?

A. It uses vague language instead of citing the specific fold-change value

B. It is too long and should be deleted entirely

C. It mentions a gene, which reports should avoid

D. It states a diagnosis, which is exactly what a report should do

Practice check: A. It uses vague language instead of citing the specific fold-change value

Strong scientific writing ties each claim to a specific value, like a fold change of 3.2. 'Went up a lot' is vague and unverifiable, which weakens the report's credibility.

WHERE THIS LIVES AND WHERE TO SUBMIT

https://mendozabiomed.org/learn/pltw-gend/day/2026-10-28/exemplar

Submit in Schoology. Submit one PDF. Put your first and last name in the document header. Name the file: FirstName LastName - Assignment Title - YYYY-MM-DD.pdf.

WORKED EXEMPLAR 47 OF 77

JCU bioethics 6: Cochlear implants before the age of consent

Week 10 | Thu, Oct 29, 2026 | John Carroll University bioethics session

TODAY'S GOAL

Argue an assigned side of this question: Should children reach the age of consent before cochlear implants or other medical interventions are allowed?

WHAT A FINISHED PRODUCT LOOKS LIKE

Worked debate worksheet on a parallel case: an irreversible athletic enhancement for children

Completes: A complete debate worksheet that names the assigned side, gives three evidence-based arguments, answers the strongest opposing point, and ends with the student's own position.

WORKED MODEL

Parallel case, not today's prompt: A permanent implant could improve a child's sprint performance but offers no medical benefit and cannot be removed without another major procedure.

Claim: The enhancement should wait until the young person can give meaningful consent because the procedure is irreversible, nonmedical, and changes future choices.

Evidence: The implant provides a performance advantage but requires surgery and carries infection and revision risks. Less invasive training options remain available and do not close off a later decision.

Reasoning: Parents routinely authorize treatment that prevents immediate harm, but a permanent elective enhancement has a different benefit-risk balance. Waiting preserves the child's future autonomy without withholding necessary care.

Strongest opposing point and response: Parents may argue that early implantation creates the greatest competitive benefit. Competitive timing is not a medical emergency, and a possible advantage does not outweigh the child's later right to decide about an irreversible body change.

My position after the debate: I support the claim only with the limits named above. A strong ethics argument states the value being protected, uses evidence rather than preference, answers the best counterargument, and names the condition that could change the decision.

ALSO DUE TODAY

Submit one debate worksheet PDF in Schoology before the end of the block.

BUILD YOUR OWN

Keep the model's structure. Replace the prompt, facts, measurements, and evidence with your own. Check units, scientific vocabulary, and whether the conclusion goes beyond the evidence.

WEBXAM-STYLE FOLLOW-UP PRACTICE

Which new evidence would most strongly improve the argument in the parallel an irreversible athletic enhancement for children case?

A. Long-term complication and satisfaction rates separated by the age at which recipients personally consented
B. A coach's preference for faster athletes
C. The price of elite running shoes
D. A parent's prediction that the child will enjoy competition

Practice check: A. Long-term complication and satisfaction rates separated by the age at which recipients personally consented

This evidence measures the outcome the claim depends on and gives a comparison that can test whether the policy produces the stated benefit or harm.

WHERE THIS LIVES AND WHERE TO SUBMIT

https://mendozabiomed.org/learn/pltw-gend/day/2026-10-29/exemplar

Submit in Schoology. Submit one PDF. Put your first and last name in the document header. Name the file: FirstName LastName - Assignment Title - YYYY-MM-DD.pdf.

WORKED EXEMPLAR 48 OF 77

Viral vector chart

Week 10 | Fri, Oct 30, 2026 | Gene Therapy

TODAY'S GOAL

Chart how viral vectors deliver a therapeutic gene and distinguish somatic from germline targets.

WHAT A FINISHED PRODUCT LOOKS LIKE

Viral vector delivery chart

Completes: Completes the vector notebook page: a labeled viral-vector delivery diagram, a somatic-versus-germline distinction, a two-vector comparison row, and a sentence on vector-cell targeting.

WORKED MODEL

Diagram in words: A viral vector is a virus that has had its disease-causing genes removed and a therapeutic gene loaded in their place. It keeps its ability to enter a cell, so it delivers the healthy gene like a courier delivering a package.

Somatic vs. germline: In this case the vector targets liver cells, which are somatic (non-reproductive), so the edit is not heritable. A germline target (egg, sperm, embryo) would be heritable, which is why somatic delivery is the safer, standard

choice.

Why vector choice affects which cells are treated: Different vectors prefer different tissues and have different payload sizes, so the vector you pick determines which cells receive the gene and how safely.

ALSO DUE TODAY

Submit your vector chart to Schoology.

BUILD YOUR OWN

Keep the model's structure. Replace the prompt, facts, measurements, and evidence with your own. Check units, scientific vocabulary, and whether the conclusion goes beyond the evidence.

WEBXAM-STYLE FOLLOW-UP PRACTICE

A gene therapy team wants a vector with low immune response that does not insert itself into the patient's genome, to reduce insertion-mutation risk. Which vector best fits?

A. A retrovirus, because integrating into the genome is always safer
B. Adeno-associated virus (AAV), because it is non-integrating with a low immune response
C. Any vector, because vectors never affect insertion risk
D. A germline vector, because heritable edits are the goal

Practice check: B. Adeno-associated virus (AAV), because it is non-integrating with a low immune response

AAV is non-integrating and provokes a low immune response, so it avoids the insertion-mutation risk that comes with vectors that splice into the genome. That matches the team's requirement.

WHERE THIS LIVES AND WHERE TO SUBMIT

https://mendozabiomed.org/learn/pltw-gend/day/2026-10-30/exemplar

Submit in Schoology. Submit one PDF. Put your first and last name in the document header. Name the file: FirstName LastName - Assignment Title - YYYY-MM-DD.pdf.

WORKED EXEMPLAR 49 OF 77

CRISPR and reproductive screening

Week 11 | Wed, Nov 4, 2026 | Gene Therapy

TODAY'S GOAL

Explain how CRISPR-Cas9 edits DNA, including off-target risk, and apply it to a reproductive screening case.

WHAT A FINISHED PRODUCT LOOKS LIKE

Worked CER on a parallel case (somatic gene therapy for sickle cell disease)

Completes: Models the CER format on a parallel gene-editing case: a claim, two pieces of evidence, and reasoning about whether to use CRISPR-based somatic therapy in a consenting teenage patient with sickle cell disease. This mirrors the structure and depth students must produce today without answering the embryo screening prompt.

WORKED MODEL

Parallel case: A 16-year-old with severe sickle cell disease is offered a CRISPR-based therapy. Doctors would remove some of the patient's own bone-marrow stem cells, use a guide RNA to steer Cas9 to a single gene (BCL11A) that switches off fetal hemoglobin, cut that gene, and let the cells' repair machinery disable it. The edited cells are grown and returned to the patient so their body makes protective fetal hemoglobin again. The patient and their guardians consent after counseling.\n\nClaim: In this case CRISPR-based somatic therapy is an appropriate treatment to offer, because the edit is

limited to the patient's own body cells, is not passed to future generations, and is chosen with informed consent to treat serious ongoing harm.\n\nEvidence 1: The edit is somatic, not germline. It changes blood-forming cells in one person and is not inherited by that person's future children, so any mistake affects only the consenting patient and does not spread to descendants.\n\nEvidence 2: Off-target risk is real but is being managed and consented to. The guide RNA is about 20 letters long against a genome of roughly 3 billion letters, so Cas9 can cut a wrong site that partially matches, and a bad off-target cut could disrupt a tumor suppressor or another important gene. However, the edited cells can be screened before they are returned, and the patient is weighing that known risk against the daily harm of untreated sickle cell disease.\n\nReasoning: Because the change stays in one consenting person and is not heritable, the ethical stakes are lower than a change that every future generation would carry. The off-target danger does not disappear, but it can be reduced by checking the cells and is being accepted knowingly to relieve a serious, present illness. When a competent patient consents, the harm is severe, and the risk is bounded to that individual, offering the somatic edit is justified.

ALSO DUE TODAY

Submit your annotation and reproductive screening CER to Schoology.

BUILD YOUR OWN

Keep the model's structure. Replace the prompt, facts, measurements, and evidence with your own. Check units, scientific vocabulary, and whether the conclusion goes beyond the evidence.

WEBXAM-STYLE FOLLOW-UP PRACTICE

In CRISPR-Cas9 editing, what causes an off-target edit?

A. Cas9 runs out of energy and cuts randomly

B. The guide RNA matches a non-target sequence well enough that Cas9 cuts the wrong location

C. The cell refuses to repair the intended cut

D. The guide RNA is too short to bind any DNA at all

Practice check: B. The guide RNA matches a non-target sequence well enough that Cas9 cuts the wrong location

The guide RNA directs Cas9 by base-pairing. If a non-target site is similar enough to the guide, Cas9 can be steered there and cut the wrong location, which is an off-target edit.

WHERE THIS LIVES AND WHERE TO SUBMIT

https://mendozabiomed.org/learn/pltw-gend/day/2026-11-04/exemplar

Submit in Schoology. Submit one PDF. Put your first and last name in the document header. Name the file: FirstName LastName - Assignment Title - YYYY-MM-DD.pdf.

WORKED EXEMPLAR 50 OF 77

JCU bioethics 7: Two videos: controlling genetics, and what gives life meaning

Week 11 | Thu, Nov 5, 2026 | John Carroll University bioethics session

TODAY'S GOAL

Argue an assigned side of this question: Can humans be trusted with control over genetics? And: extinction, or life without culture?

WHAT A FINISHED PRODUCT LOOKS LIKE

Worked debate worksheet on a parallel case: editing crop seeds for drought tolerance

Completes: A complete debate worksheet that names the assigned side, gives three evidence-based arguments, answers the strongest opposing point, and ends with the student's own position.

WORKED MODEL

Parallel case, not today's prompt: A public seed bank can edit a drought-tolerance gene into a staple crop, but the change may reduce genetic diversity if one engineered line replaces many local varieties.

Claim: The seed bank should run limited field trials while preserving local varieties and requiring ecological monitoring before broad release.

Evidence: The edited plants survive low-water conditions in greenhouse trials, but the test covers only one growing season. Local varieties carry different traits that may protect against pests, heat, or future diseases.

Reasoning: The potential food-security benefit is real, but a single successful trait does not justify replacing the wider genetic resource. Limited trials produce evidence while seed preservation keeps the decision reversible.

Strongest opposing point and response: Supporters may argue that drought is urgent and delay costs harvests. Urgency supports a faster monitored trial, not an irreversible replacement of diverse seeds before ecosystem and yield effects are measured.

My position after the debate: I support the claim only with the limits named above. A strong ethics argument states the value being protected, uses evidence rather than preference, answers the best counterargument, and names the condition that could change the decision.

ALSO DUE TODAY

Submit one debate worksheet PDF in Schoology before the end of the block.

BUILD YOUR OWN

Keep the model's structure. Replace the prompt, facts, measurements, and evidence with your own. Check units, scientific vocabulary, and whether the conclusion goes beyond the evidence.

WEBXAM-STYLE FOLLOW-UP PRACTICE

Which new evidence would most strongly improve the argument in the parallel editing crop seeds for drought tolerance case?

A. Multi-site field data comparing yield, water use, pest damage, and gene flow for edited and local varieties

B. A photograph of one healthy edited plant

C. The researcher's confidence in the gene

D. A list of countries experiencing drought

Practice check: A. Multi-site field data comparing yield, water use, pest damage, and gene flow for edited and local varieties

This evidence measures the outcome the claim depends on and gives a comparison that can test whether the policy produces the stated benefit or harm.

WHERE THIS LIVES AND WHERE TO SUBMIT

https://mendozabiomed.org/learn/pltw-gend/day/2026-11-05/exemplar

Submit in Schoology. Submit one PDF. Put your first and last name in the document header. Name the file: FirstName LastName - Assignment Title - YYYY-MM-DD.pdf.

WORKED EXEMPLAR 51 OF 77

Screening equity debate

Week 11 | Fri, Nov 6, 2026 | Unit2 Synthesis

TODAY'S GOAL

Argue a CER position on whether genetic screening is offered fairly across communities.

WHAT A FINISHED PRODUCT LOOKS LIKE

Worked CER on a parallel case (AED placement equity)

Completes: Parallel model of the Unit 2 synthesis argument: a claim-evidence-reasoning paragraph taking a position on whether a life-saving health resource reaches communities fairly, plus a reflection that names one cost or access counterargument. Modeled on the placement of automated external defibrillators, NOT on the genetic screening question students must argue today.

WORKED MODEL

Note: This is a parallel model on a different case. It shows you the CER format and depth so you can see how a strong argument is built. It does NOT answer today's screening equity prompt. Build your own claim from your own evidence.\n\nClaim: Automated external defibrillators, or AEDs, are not currently placed equitably, because the neighborhoods where cardiac arrests are most likely to be survivable often have the fewest devices nearby.\n\nEvidence 1: An AED can restart a heart during sudden cardiac arrest, but it only helps if one is within reach in the first few minutes. Studies of public AED placement show that wealthier and commercial areas, like downtown office buildings and shopping centers, tend to have far more registered devices than lower-income residential neighborhoods.\n\nEvidence 2: Survival from cardiac arrest drops by roughly 10 percent for every minute that passes before a shock is delivered. In neighborhoods where the nearest AED is blocks away, locked inside a building, or simply absent, bystanders cannot reach a device in time even when they are willing to help.\n\nReasoning: Fast defibrillation is one of the strongest predictors of surviving cardiac arrest, so when device placement follows property value and foot traffic instead of where arrests actually happen, the survival gap widens along the same lines as income and geography. The technology itself works, but a device only saves a life if it is close enough to be used before the brain is starved of oxygen. That turns an uneven placement pattern into a health equity problem, not just a logistics detail.\n\nReflection (counterargument): A fair counterpoint is cost. AEDs are expensive to buy, register, and maintain, and some argue that limited funds should go where crowds are largest so each device covers the most people. My response is that placing devices where crowds gather is reasonable, but coverage should be measured against where cardiac arrests occur and how fast help can arrive, not only against headcount, so that residential neighborhoods with real medical need are not left uncovered.

ALSO DUE TODAY

Post your two prepared questions about who gets access and who is left out, then post your CER and reflection in

Schoology before end of block.

BUILD YOUR OWN

Keep the model's structure. Replace the prompt, facts, measurements, and evidence with your own. Check units, scientific vocabulary, and whether the conclusion goes beyond the evidence.

WEBXAM-STYLE FOLLOW-UP PRACTICE

A genetic screening test for an inherited cancer risk is accurate and could save lives. A public health analyst finds that wealthy, insured, city patients are screened far more often than low-income, uninsured, or rural patients. Why is this an example of a health equity problem rather than just a scheduling issue?

A. Because access to the test depends on income, insurance, and location instead of medical need, and early detection lowers death rates

B. Because the test is inaccurate for low-income patients

C. Because rural patients do not carry the cancer risk gene

D. Because screening has no effect on mortality, so access does not matter

Practice check: A. Because access to the test depends on income, insurance, and location instead of medical need, and early detection lowers death rates

It is an equity problem because a life-saving benefit (early detection lowering mortality and cost) is distributed by who can pay and where they live, not by who is medically at risk. When a real health advantage tracks income, insurance, and geography, that is the definition of a health equity gap.

WHERE THIS LIVES AND WHERE TO SUBMIT

https://mendozabiomed.org/learn/pltw-gend/day/2026-11-06/exemplar

Submit in Schoology. Submit one PDF. Put your first and last name in the document header. Name the file: FirstName LastName - Assignment Title - YYYY-MM-DD.pdf.

WORKED EXEMPLAR 52 OF 77

Evidence sort and false results

Week 12 | Mon, Nov 9, 2026 | Unit2 Synthesis

TODAY'S GOAL

Sort case evidence by strength and explain how false positives and false negatives change a decision.

WHAT A FINISHED PRODUCT LOOKS LIKE

Non-answer evidence audit scaffold

Completes: A blank evidence-and-limit structure for Evidence sort and false results. It models the required parts without supplying today's result, calculation, interpretation, or recommendation.

WORKED MODEL

Question or criterion: ____
Evidence ID and exact observation: ____
Second evidence ID and exact observation: ____
Reasoning rule: ____
Bounded conclusion: ____
Limitation or quality-control issue: ____
Next evidence needed: ____

BUILD YOUR OWN

Keep the model's structure. Replace the prompt, facts, measurements, and evidence with your own. Check units, scientific vocabulary, and whether the conclusion goes beyond the evidence.

WEBXAM-STYLE FOLLOW-UP PRACTICE

A student completes Evidence sort and false results and writes a conclusion from one classroom result. Which revision makes the conclusion most scientifically defensible?

A. Add the evidence source, comparison, reasoning rule, and a method-specific limitation.
B. Remove the limitation so the conclusion sounds more certain.
C. Replace the measured result with a personal opinion.
D. Call the classroom result a confirmed diagnosis.

Practice check: A. Add the evidence source, comparison, reasoning rule, and a method-specific limitation.

A defensible conclusion shows where the evidence came from, how the comparison supports the claim, and where the method stops.

WHERE THIS LIVES AND WHERE TO SUBMIT

https://mendozabiomed.org/learn/pltw-gend/day/2026-11-09/exemplar

Submit in Schoology. Submit one PDF. Put your first and last name in the document header. Name the file: FirstName LastName - Assignment Title - YYYY-MM-DD.pdf.

WORKED EXEMPLAR 53 OF 77

Treatment recommendation draft

Week 12 | Tue, Nov 10, 2026 | Unit2 Synthesis

TODAY'S GOAL

Draft a treatment plan recommendation that follows from the sorted evidence and named risks.

WHAT A FINISHED PRODUCT LOOKS LIKE

Non-answer evidence audit scaffold

Completes: A blank evidence-and-limit structure for Treatment recommendation draft. It models the required parts without supplying today's result, calculation, interpretation, or recommendation.

WORKED MODEL

Question or criterion: ____
Evidence ID and exact observation: ____
Second evidence ID and exact observation: ____
Reasoning rule: ____
Bounded conclusion: ____
Limitation or quality-control issue: ____
Next evidence needed: ____

BUILD YOUR OWN

Keep the model's structure. Replace the prompt, facts, measurements, and evidence with your own. Check units, scientific vocabulary, and whether the conclusion goes beyond the evidence.

WEBXAM-STYLE FOLLOW-UP PRACTICE

A student completes Treatment recommendation draft and writes a conclusion from one classroom result. Which revision makes the conclusion most scientifically defensible?

A. Add the evidence source, comparison, reasoning rule, and a method-specific limitation.
B. Remove the limitation so the conclusion sounds more certain.
C. Replace the measured result with a personal opinion.
D. Call the classroom result a confirmed diagnosis.

Practice check: A. Add the evidence source, comparison, reasoning rule, and a method-specific limitation.

A defensible conclusion shows where the evidence came from, how the comparison supports the claim, and where the method stops.

WHERE THIS LIVES AND WHERE TO SUBMIT

https://mendozabiomed.org/learn/pltw-gend/day/2026-11-10/exemplar

Submit in Schoology. Submit one PDF. Put your first and last name in the document header. Name the file: FirstName LastName - Assignment Title - YYYY-MM-DD.pdf.

WORKED EXEMPLAR 54 OF 77

JCU bioethics 8: Should vaccination be mandatory?

Week 12 | Thu, Nov 12, 2026 | John Carroll University bioethics session

TODAY'S GOAL

Argue an assigned side of this question: Should vaccination be mandatory?

WHAT A FINISHED PRODUCT LOOKS LIKE

Worked debate worksheet on a parallel case: required seatbelts on school buses

Completes: A complete debate worksheet that names the assigned side, gives three evidence-based arguments, answers the strongest opposing point, and ends with the student's own position.

WORKED MODEL

Parallel case, not today's prompt: A district is deciding whether every rider must wear a seatbelt on buses equipped with belts, even though enforcing the rule may slow loading.

Claim: The district should require seatbelt use while teaching and practicing a fast loading routine so the safety rule does not create avoidable delays.

Evidence: A belt keeps a rider from continuing forward during a sudden stop and spreads stopping force across stronger parts of the body. Unbelted riders can also strike and injure other passengers.

Reasoning: The rule prevents a serious, predictable harm with a low burden. A practiced routine answers the implementation problem without removing the protection.

Strongest opposing point and response: Opponents may argue that bus design already protects riders and enforcement wastes time. Compartmentalized seats reduce some injury, but they do not restrain a rider in every crash direction, so the belt adds protection that the seat alone cannot provide.

My position after the debate: I support the claim only with the limits named above. A strong ethics argument states the value being protected, uses evidence rather than preference, answers the best counterargument, and names the condition that could change the decision.

JOHN HAY BIOMEDICAL

MI Worked Exemplar Library

ALSO DUE TODAY

Submit one debate worksheet PDF in Schoology before the end of the block.

BUILD YOUR OWN

Keep the model's structure. Replace the prompt, facts, measurements, and evidence with your own. Check units, scientific vocabulary, and whether the conclusion goes beyond the evidence.

WEBXAM-STYLE FOLLOW-UP PRACTICE

Which new evidence would most strongly improve the argument in the parallel required seatbelts on school buses case?

A. Injury rates in comparable bus crashes with documented belt use and without belt use
B. A student's opinion that belts are uncomfortable
C. The color of the bus seats
D. A driver's estimate of how many riders like the rule

Practice check: A. Injury rates in comparable bus crashes with documented belt use and without belt use

This evidence measures the outcome the claim depends on and gives a comparison that can test whether the policy produces the stated benefit or harm.

WHERE THIS LIVES AND WHERE TO SUBMIT

https://mendozabiomed.org/learn/pltw-gend/day/2026-11-12/exemplar

Submit in Schoology. Submit one PDF. Put your first and last name in the document header. Name the file: FirstName LastName - Assignment Title - YYYY-MM-DD.pdf.

WORKED EXEMPLAR 55 OF 77

Microscopy image baseline

Week 12 | Fri, Nov 13, 2026 | Cancer Launch

TODAY'S GOAL

Use cell and tissue images to establish a baseline for normal versus abnormal morphology and a diagnostic workflow.

WHAT A FINISHED PRODUCT LOOKS LIKE

Morphology comparison and diagnostic workflow

Completes: Completes the cancer-launch baseline task: a two-column comparison of benign versus malignant tissue morphology, a one-line metastasis explanation, and a three-step diagnostic workflow sketch.

WORKED MODEL

Morphology comparison (benign vs. malignant):
- Cell size and shape: benign cells are uniform and look alike; malignant cells are pleomorphic, meaning they vary in size and shape.
- Tissue arrangement: benign tissue keeps an orderly, organized structure; malignant tissue is disorganized and loses normal architecture.
- Boundaries: a benign tumor stays in one place with a clear edge; a malignant tumor pushes into and invades the surrounding tissue.

Metastasis (one line): The metastasis image differs from a local tumor because cancer cells have left the original site and

traveled through blood or lymph to a distant organ, instead of staying put.

Diagnostic workflow (three steps):
1. Take a tissue sample (biopsy) and prepare it on a slide.
2. Examine the cells under the microscope for size, shape, and arrangement.
3. Classify the tumor as normal, benign, or malignant, and note any sign of invasion or spread.

ALSO DUE TODAY

Submit your morphology comparison and workflow sketch to Schoology before end of block.

BUILD YOUR OWN

Keep the model's structure. Replace the prompt, facts, measurements, and evidence with your own. Check units, scientific vocabulary, and whether the conclusion goes beyond the evidence.

WEBXAM-STYLE FOLLOW-UP PRACTICE

Under the microscope, a pathologist sees a sample with cells that vary widely in size and shape, are arranged in a disorganized way, and are pushing into the surrounding healthy tissue. How should this sample be classified?

A. Malignant, because the cells are pleomorphic, disorganized, and invading nearby tissue
B. Benign, because tumors that grow are always harmless
C. Normal tissue, because all tissue contains some variation in cell size
D. Metastatic, because any abnormal sample has already spread to distant organs

Practice check: A. Malignant, because the cells are pleomorphic, disorganized, and invading nearby tissue

Malignant tissue is defined by pleomorphic (variable size and shape) cells, disorganized arrangement, and invasion into surrounding tissue. All three of those features are present here, which is the classic microscopic picture of a malignant tumor.

WHERE THIS LIVES AND WHERE TO SUBMIT

https://mendozabiomed.org/learn/pltw-gend/day/2026-11-13/exemplar

Submit in Schoology. Submit one PDF. Put your first and last name in the document header. Name the file: FirstName LastName - Assignment Title - YYYY-MM-DD.pdf.

WORKED EXEMPLAR 56 OF 77

Trial-access debate

Week 13 | Mon, Nov 16, 2026 | Cancer Treatment

TODAY'S GOAL

Argue a position on who should get access to experimental cancer drugs through clinical trials and right-to-try laws.

WHAT A FINISHED PRODUCT LOOKS LIKE

Worked CER on a parallel case

Completes: Models the exact CER deliverable (Claim, Evidence, Reasoning) on a parallel bioethics access case so students can copy the structure and depth, not the answer: a single-sentence claim naming who should decide, evidence drawn from how the medical system actually handles the case, and reasoning that ties the evidence back to the claim.

WORKED MODEL

Parallel case (not today's prompt): A 12-year-old is the only close tissue match to donate a kidney to a sibling in kidney failure. The child says yes, but a minor cannot legally give full informed consent. Should the parents, the transplant surgeon, a hospital ethics committee, or the child have the final say on whether the donation happens?\n\nClaim: A hospital ethics committee, not the parents or the surgeon alone, should have the final say on whether a minor donates a kidney to a sibling, with the child given a real chance to refuse.\n\nEvidence: Living kidney donation is a surgery a healthy person does not medically need, and it carries real risks such as bleeding, infection, and the loss of one of two working kidneys for life. A 12-year-old cannot legally give informed consent, so someone else must decide for them. Parents have a clear interest in saving the sick child, which can pull them toward saying yes even when it is not in the donor child's best interest. For this reason, most transplant centers require a separate donor advocate and review by an independent ethics committee before a minor is allowed to donate, and courts have stepped in when a family and a hospital disagreed.\n\nReasoning: The person facing the risk of surgery is the donor child, but that child cannot legally weigh those risks alone, so the decision has to be shared. Handing the final say to the parents alone creates a conflict of interest, because they are also trying to save their other child, and handing it to the surgeon alone puts one person in charge of a life-altering choice for a healthy patient. An independent ethics committee is built to check exactly this kind of pressure: it can confirm the medical facts, protect the donor child's right to say no, and make sure the decision serves the donor and not only the sibling in need. That is why the committee, with the child's voice included, should hold the final say.

ALSO DUE TODAY

Record the class vote and your final stance, and submit the exit ticket to Schoology before leaving class.

BUILD YOUR OWN

Keep the model's structure. Replace the prompt, facts, measurements, and evidence with your own. Check units, scientific vocabulary, and whether the conclusion goes beyond the evidence.

WEBXAM-STYLE FOLLOW-UP PRACTICE

A new cancer drug has not finished clinical trials. A terminally ill patient wants to try it now. Which statement correctly describes why clinical trials normally gate access and what right-to-try laws change?

A. Clinical trials test safety and efficacy before market release, and right-to-try laws let terminal patients access a drug outside that normal pathway

B. Clinical trials only check the drug's price, and right-to-try laws lower that price

C. Clinical trials are skipped for cancer drugs, and right-to-try laws add them back

D. Clinical trials guarantee a drug works, and right-to-try laws remove that guarantee for everyone

Practice check: A. Clinical trials test safety and efficacy before market release, and right-to-try laws let terminal

patients access a drug outside that normal pathway

Clinical trials exist to test whether a drug is safe and effective before it reaches the general market. Right-to-try laws create an exception that lets terminally ill patients access an investigational drug outside the standard trial pathway, which is the exact tradeoff in the debate.

WHERE THIS LIVES AND WHERE TO SUBMIT

https://mendozabiomed.org/learn/pltw-gend/day/2026-11-16/exemplar

Submit in Schoology. Submit one PDF. Put your first and last name in the document header. Name the file: FirstName LastName - Assignment Title - YYYY-MM-DD.pdf.

WORKED EXEMPLAR 57 OF 77

Biopsy and staging

Week 13 | Tue, Nov 17, 2026 | Cancer Treatment

TODAY'S GOAL

Explain how a biopsy and staging move a suspicious finding toward a treatment decision.

WHAT A FINISHED PRODUCT LOOKS LIKE

Non-answer evidence and reasoning scaffold

Completes: A blank structure for organizing the assigned response. It contains no claim, ranking, calculation, data interpretation, or recommendation from today's task.

WORKED MODEL

1. Decision or claim I am testing: ____
2. Evidence ID and exact observation: ____
3. Second evidence ID and exact observation: ____
4. Rule that connects the evidence to my claim: ____
5. Strongest alternative or tradeoff: ____
6. Limitation or missing evidence that controls my confidence: ____
7. Revision I would make if the missing evidence changed: ____

ALSO DUE TODAY

Submit your diagnostic-workflow ticket to Schoology before the end of block.

BUILD YOUR OWN

Keep the model's structure. Replace the prompt, facts, measurements, and evidence with your own. Check units, scientific vocabulary, and whether the conclusion goes beyond the evidence.

WEBXAM-STYLE FOLLOW-UP PRACTICE

A pathology report shows a 4 cm tumor with cancer found in nearby lymph nodes but no distant organs affected. Compared with a 1 cm tumor with no lymph-node involvement, why would the staging push toward more aggressive treatment?

A. Because larger size plus lymph-node involvement means a higher stage, and higher stage usually calls for more aggressive or systemic treatment

B. Because tumor size has no effect on stage, only the patient's age does

C. Because lymph-node involvement always means the cancer is benign

D. Because a biopsy alone, without staging, determines the full treatment plan

Practice check: A. Because larger size plus lymph-node involvement means a higher stage, and higher stage usually calls for more aggressive or systemic treatment

Staging combines tumor size, lymph-node involvement, and metastasis. A larger tumor with positive nodes is a higher stage than a small node-negative tumor, and a higher stage generally requires more aggressive or systemic treatment because the cancer has progressed further.

WHERE THIS LIVES AND WHERE TO SUBMIT

https://mendozabiomed.org/learn/pltw-gend/day/2026-11-17/exemplar

Submit in Schoology. Submit one PDF. Put your first and last name in the document header. Name the file: FirstName LastName - Assignment Title - YYYY-MM-DD.pdf.

WORKED EXEMPLAR 58 OF 77

Chemo and radiation

Week 13 | Wed, Nov 18, 2026 | Cancer Treatment

TODAY'S GOAL

Compare how chemotherapy and radiation kill cancer cells and why each causes side effects.

WHAT A FINISHED PRODUCT LOOKS LIKE

Worked CER on a parallel case (targeted therapy vs broad chemotherapy for a widespread blood cancer)

Completes: Models the CER format for a treatment-mechanism argument on a parallel scenario: whether a targeted therapy or broad chemotherapy better fits a cancer that has spread throughout the bloodstream, using cell-killing mechanism and side-effect evidence. It does not argue the localized-tumor chemo-versus-radiation prompt students must complete.

WORKED MODEL

Claim: For a leukemia that has already spread throughout the bloodstream, a targeted therapy that flags one specific molecule on the cancer cells is usually a better fit than broad chemotherapy.\nEvidence 1: A targeted therapy is built to recognize a protein that appears mainly on the cancer cells, so it binds those cells and triggers apoptosis (programmed cell death) while mostly leaving normal cells alone, which concentrates the killing on the diseased cells even though they are scattered everywhere.\nEvidence 2: Broad chemotherapy travels through the whole body and kills any fast-dividing cell, so it does reach cancer cells no matter where they are, but it also damages healthy fast-dividing tissue and causes side effects like hair loss, mouth sores, nausea, and low blood counts, because hair follicles, the gut lining, and bone marrow all divide quickly.\nReasoning: When the cancer is spread out in the blood, the treatment has to reach the whole body, so a local option would miss most of the disease. Both a targeted therapy and broad chemotherapy can reach cells everywhere, but the targeted drug aims at a marker that is far more common on the cancer cells, so it spares more healthy tissue and tends to cause milder side effects than chemotherapy, which hits every fast-dividing cell it passes. Because the reach of each treatment has to match how spread out the disease is, and because that reach is what decides which healthy tissues get harmed, the targeted therapy fits this widespread situation better.

ALSO DUE TODAY

Submit your CER paragraph to Schoology by end of block.

BUILD YOUR OWN

Keep the model's structure. Replace the prompt, facts, measurements, and evidence with your own. Check units, scientific vocabulary, and whether the conclusion goes beyond the evidence.

WEBXAM-STYLE FOLLOW-UP PRACTICE

A patient on chemotherapy experiences hair loss, mouth sores, and a drop in white blood cells. Why do these specific side effects occur?

A. Chemotherapy targets fast-dividing cells throughout the body, so healthy fast-dividing tissues like hair follicles, the gut lining, and bone marrow are damaged too

B. Chemotherapy only damages DNA in a single targeted area, so the side effects are local

C. Chemotherapy avoids all healthy cells, so these side effects must come from the cancer itself

D. Chemotherapy works by raising body temperature, which causes hair and blood cell loss

Practice check: A. Chemotherapy targets fast-dividing cells throughout the body, so healthy fast-dividing tissues like hair follicles, the gut lining, and bone marrow are damaged too

Chemotherapy circulates systemically and kills any rapidly dividing cell. Hair follicles, the lining of the mouth and gut, and bone marrow (which makes white blood cells) all divide quickly, so they get caught alongside the cancer, which is why these particular side effects appear.

WHERE THIS LIVES AND WHERE TO SUBMIT

https://mendozabiomed.org/learn/pltw-gend/day/2026-11-18/exemplar

Submit in Schoology. Submit one PDF. Put your first and last name in the document header. Name the file: FirstName LastName - Assignment Title - YYYY-MM-DD.pdf.

WORKED EXEMPLAR 59 OF 77

JCU bioethics 9: Prosecuting health misinformation

Week 13 | Thu, Nov 19, 2026 | John Carroll University bioethics session

TODAY'S GOAL

Argue an assigned side of this question: Should the government prosecute people for lying about vaccines or other health matters?

WHAT A FINISHED PRODUCT LOOKS LIKE

Worked debate worksheet on a parallel case: knowingly false emergency evacuation alerts

Completes: A complete debate worksheet that names the assigned side, gives three evidence-based arguments, answers the strongest opposing point, and ends with the student's own position.

WORKED MODEL

Parallel case, not today's prompt: A person posts a fabricated wildfire evacuation order that looks official, causing residents to flee and blocking roads needed by emergency vehicles.

Claim: The government should penalize knowingly fabricated emergency alerts that create a specific, foreseeable public danger, while protecting mistaken opinions and good-faith warnings.

Evidence: The post copied the official alert design, named streets that were not under threat, and was published after the author had been told no order existed. Traffic records show the false evacuation blocked an active emergency route.

Reasoning: The narrow rule targets deliberate deception tied to measurable harm, not disagreement or uncertainty. Requiring proof of knowledge and a specific danger protects ordinary speech while addressing conduct that disrupts emergency response.

Strongest opposing point and response: Critics may argue that penalties chill people from sharing urgent information. A knowledge requirement protects good-faith sharing because punishment applies only when evidence shows the person knew the alert was false.

My position after the debate: I support the claim only with the limits named above. A strong ethics argument states the value being protected, uses evidence rather than preference, answers the best counterargument, and names the condition that could change the decision.

ALSO DUE TODAY

Submit one debate worksheet PDF in Schoology before the end of the block.

BUILD YOUR OWN

Keep the model's structure. Replace the prompt, facts, measurements, and evidence with your own. Check units, scientific vocabulary, and whether the conclusion goes beyond the evidence.

WEBXAM-STYLE FOLLOW-UP PRACTICE

Which new evidence would most strongly improve the argument in the parallel knowingly false emergency evacuation alerts case?

A. Timestamped messages showing the author knew the alert was false plus traffic data documenting the emergency-route blockage

B. The number of angry replies to the post

C. A resident's dislike of social media

D. The author's claim that the post was popular

Practice check: A. Timestamped messages showing the author knew the alert was false plus traffic data documenting the emergency-route blockage

This evidence measures the outcome the claim depends on and gives a comparison that can test whether the policy produces the stated benefit or harm.

WHERE THIS LIVES AND WHERE TO SUBMIT

https://mendozabiomed.org/learn/pltw-gend/day/2026-11-19/exemplar

Submit in Schoology. Submit one PDF. Put your first and last name in the document header. Name the file: FirstName LastName - Assignment Title - YYYY-MM-DD.pdf.

WORKED EXEMPLAR 60 OF 77

Targeted therapy

Week 13 | Fri, Nov 20, 2026 | Cancer Treatment

TODAY'S GOAL

Explain how targeted therapy attacks specific molecules so it spares more healthy cells.

WHAT A FINISHED PRODUCT LOOKS LIKE

Non-answer evidence audit scaffold

Completes: A blank evidence-and-limit structure for Targeted therapy. It models the required parts without supplying today's result, calculation, interpretation, or recommendation.

WORKED MODEL

Question or criterion: ____
Evidence ID and exact observation: ____
Second evidence ID and exact observation: ____
Reasoning rule: ____
Bounded conclusion: ____
Limitation or quality-control issue: ____
Next evidence needed: ____

BUILD YOUR OWN

Keep the model's structure. Replace the prompt, facts, measurements, and evidence with your own. Check units, scientific vocabulary, and whether the conclusion goes beyond the evidence.

WEBXAM-STYLE FOLLOW-UP PRACTICE

A student completes Targeted therapy and writes a conclusion from one classroom result. Which revision makes the conclusion most scientifically defensible?

A. Add the evidence source, comparison, reasoning rule, and a method-specific limitation.
B. Remove the limitation so the conclusion sounds more certain.
C. Replace the measured result with a personal opinion.
D. Call the classroom result a confirmed diagnosis.

Practice check: A. Add the evidence source, comparison, reasoning rule, and a method-specific limitation.

A defensible conclusion shows where the evidence came from, how the comparison supports the claim, and where the method stops.

WHERE THIS LIVES AND WHERE TO SUBMIT

https://mendozabiomed.org/learn/pltw-gend/day/2026-11-20/exemplar

Submit in Schoology. Submit one PDF. Put your first and last name in the document header. Name the file: FirstName LastName - Assignment Title - YYYY-MM-DD.pdf.

WORKED EXEMPLAR 61 OF 77

Skin cancer risk and the DNA repair plate lab

Week 14 | Mon, Nov 23, 2026 | Cancer Treatment

TODAY'S GOAL

Score your own skin cancer risk against the ABCDE exam, then design and run a simulated plate experiment comparing wild-type yeast with a DNA repair mutant after the same UV exposure.

WHAT A FINISHED PRODUCT LOOKS LIKE

Non-answer evidence audit scaffold

Completes: A blank evidence-and-limit structure for Skin cancer risk and the DNA repair plate lab. It models the required parts without supplying today's result, calculation, interpretation, or recommendation.

WORKED MODEL

Question or criterion: ____
Evidence ID and exact observation: ____
Second evidence ID and exact observation: ____
Reasoning rule: ____
Bounded conclusion: ____
Limitation or quality-control issue: ____
Next evidence needed: ____

BUILD YOUR OWN

Keep the model's structure. Replace the prompt, facts, measurements, and evidence with your own. Check units, scientific vocabulary, and whether the conclusion goes beyond the evidence.

WEBXAM-STYLE FOLLOW-UP PRACTICE

A student completes Skin cancer risk and the DNA repair plate lab and writes a conclusion from one classroom result. Which revision makes the conclusion most scientifically defensible?

A. Add the evidence source, comparison, reasoning rule, and a method-specific limitation.
B. Remove the limitation so the conclusion sounds more certain.
C. Replace the measured result with a personal opinion.
D. Call the classroom result a confirmed diagnosis.

Practice check: A. Add the evidence source, comparison, reasoning rule, and a method-specific limitation.

A defensible conclusion shows where the evidence came from, how the comparison supports the claim, and where the method stops.

WHERE THIS LIVES AND WHERE TO SUBMIT

https://mendozabiomed.org/learn/pltw-gend/day/2026-11-23/exemplar

Submit in Schoology. Submit one PDF. Put your first and last name in the document header. Name the file: FirstName LastName - Assignment Title - YYYY-MM-DD.pdf.

WORKED EXEMPLAR 62 OF 77

Organ-allocation debate

Week 14 | Tue, Nov 24, 2026 | Unit4 Overview

TODAY'S GOAL

Argue how a limited supply of donor organs should be allocated among waiting patients.

WHAT A FINISHED PRODUCT LOOKS LIKE

Non-answer evidence and reasoning scaffold

Completes: A blank structure for organizing the assigned response. It contains no claim, ranking, calculation, data interpretation, or recommendation from today's task.

WORKED MODEL

1. Decision or claim I am testing: ____
2. Evidence ID and exact observation: ____
3. Second evidence ID and exact observation: ____
4. Rule that connects the evidence to my claim: ____
5. Strongest alternative or tradeoff: ____
6. Limitation or missing evidence that controls my confidence: ____
7. Revision I would make if the missing evidence changed: ____

ALSO DUE TODAY

Hand in your exit-ticket card, or turn it in on Schoology under the Unit 4 Organ-Allocation Debate exit-ticket assignment.

BUILD YOUR OWN

Keep the model's structure. Replace the prompt, facts, measurements, and evidence with your own. Check units, scientific vocabulary, and whether the conclusion goes beyond the evidence.

WEBXAM-STYLE FOLLOW-UP PRACTICE

A transplant board must allocate one donor liver among four waiting patients. Which allocation factor most directly aims to prevent a waiting patient from dying before an organ becomes available?

A. Match quality measured by HLA typing
B. Medical urgency measured by a mortality-risk score
C. Total time already spent on the waiting list
D. The distance between the donor hospital and the recipient

Practice check: B. Medical urgency measured by a mortality-risk score

Medical urgency scores estimate how likely a patient is to die soon without a transplant, so ranking by urgency directly targets preventing death on the waiting list.

WHERE THIS LIVES AND WHERE TO SUBMIT

https://mendozabiomed.org/learn/pltw-gend/day/2026-11-24/exemplar

Submit in Schoology. Submit one PDF. Put your first and last name in the document header. Name the file: FirstName LastName - Assignment Title - YYYY-MM-DD.pdf.

WORKED EXEMPLAR 63 OF 77

Recombinant DNA flow

Week 15 | Mon, Nov 30, 2026 | Unit4 Overview

TODAY'S GOAL

Trace how recombinant DNA lets cells manufacture a useful human protein.

WHAT A FINISHED PRODUCT LOOKS LIKE

Recombinant DNA flow diagram

Completes: Completes the recombinant-DNA flow diagram: a labeled sequence showing a plasmid cut open, a human gene inserted, a host cell transformed, and the named human protein produced.

WORKED MODEL

Labeled recombinant-DNA flow (insulin example):

- Step 1, Isolate the gene: Cut the human insulin gene out of human DNA using a restriction enzyme such as EcoRI, which leaves sticky ends.
- Step 2, Cut the plasmid: Use the SAME restriction enzyme to open the bacterial plasmid, so its sticky ends match the gene's sticky ends.
- Step 3, Insert the gene: DNA ligase seals the human insulin gene into the plasmid. The result is recombinant DNA, meaning DNA combined from two sources.
- Step 4, Transform the host: Take up the recombinant plasmid into a host cell such as E. coli. The transformed bacterium now carries the human gene.
- Step 5, Manufacture the protein: The bacterium reads the inserted gene using the same genetic code all cells share, transcribes it to mRNA, and translates it into human insulin protein. Grow the culture and the bacteria make insulin in bulk.

Named product: human insulin (used to treat diabetes).
Why a bacterium can read a human gene: the genetic code is nearly universal, so the codons in the human gene mean the same amino acids inside the bacterial cell.

(Tip: label the restriction enzyme as the same tool in Step 1 and Step 2, since matching sticky ends is the part graders look for.)

ALSO DUE TODAY

Attach the diagram to your PLTW tracker, and turn it in on Schoology under the Unit 4 Recombinant DNA Flow assignment.

BUILD YOUR OWN

Keep the model's structure. Replace the prompt, facts, measurements, and evidence with your own. Check units, scientific vocabulary, and whether the conclusion goes beyond the evidence.

WEBXAM-STYLE FOLLOW-UP PRACTICE

In a recombinant DNA procedure to make human insulin in bacteria, why is the SAME restriction enzyme used to cut both the human DNA and the bacterial plasmid?

A. It kills any bacteria that lack the insulin gene
B. It produces matching sticky ends so the human gene can join the plasmid
C. It translates the human gene into insulin protein
D. It copies the plasmid so there are more of them

Practice check: B. It produces matching sticky ends so the human gene can join the plasmid

Using one enzyme on both molecules leaves complementary sticky ends, so the cut human gene and the cut plasmid base-pair and can be sealed together by ligase.

WHERE THIS LIVES AND WHERE TO SUBMIT

https://mendozabiomed.org/learn/pltw-gend/day/2026-11-30/exemplar

Submit in Schoology. Submit one PDF. Put your first and last name in the document header. Name the file: FirstName LastName - Assignment Title - YYYY-MM-DD.pdf.

WORKED EXEMPLAR 64 OF 77

Protocol and data stations

Week 15 | Tue, Dec 1, 2026 | Unit4 Overview

TODAY'S GOAL

Rotate through hands-on stations modeling protein purification, HLA matching, and tissue-engineering data.

WHAT A FINISHED PRODUCT LOOKS LIKE

Three-station data table

Completes: Completes the three-station data table: recorded results from the protein-purification station, the HLA-matching station, and the tissue-scaffold station.

WORKED MODEL

Three-station data table (my recorded results):

- Purification station (chromatography column): Collected 6 fractions. Protein assay was strongest in Fraction 4 (dark blue, high signal) and Fraction 5 (medium), with Fractions 1-3 and 6 near zero. Conclusion: the target protein eluted in Fractions 4 and 5.
- HLA-matching station: Compared donor and recipient cards across 6 HLA loci. Matches at 5 of 6 loci; one mismatch at HLA-DR. Crossmatch score recorded as 5/6, flagged as a strong but not perfect match.
- Tissue station (scaffold comparison): Scaffold A (dense mesh) showed cell coverage about 45 percent after the modeled growth period; Scaffold B (porous mesh) showed about 78 percent. Note: the porous Scaffold B supported more cell growth, likely because pores let nutrients and cells move deeper.

One-line reading of each: high-protein fractions = 4 and 5; crossmatch = 5/6 (usable); better scaffold = B.

(Tip: write the actual number in every cell, even an estimate like 78 percent, because a data table with words but no values loses the most points.)

ALSO DUE TODAY

turns in the completed data table on Schoology under the Unit 4 Protocol and Data Stations assignment.

BUILD YOUR OWN

Keep the model's structure. Replace the prompt, facts, measurements, and evidence with your own. Check units, scientific vocabulary, and whether the conclusion goes beyond the evidence.

WEBXAM-STYLE FOLLOW-UP PRACTICE

At the purification station you run a protein sample through a chromatography column and collect six fractions. A protein assay is strongly positive in Fraction 4 and moderately positive in Fraction 5, and negative in the rest. What is the best conclusion to record?

A. The protein is spread evenly across all six fractions
B. The target protein is concentrated in Fractions 4 and 5
C. The column failed because only some fractions have protein
D. Fractions 1 through 3 contain the purest protein

Practice check: B. The target protein is concentrated in Fractions 4 and 5

A positive assay signal in Fractions 4 and 5 and no signal elsewhere means the target protein eluted into and is concentrated in those two fractions.

WHERE THIS LIVES AND WHERE TO SUBMIT

https://mendozabiomed.org/learn/pltw-gend/day/2026-12-01/exemplar

Submit in Schoology. Submit one PDF. Put your first and last name in the document header. Name the file: FirstName LastName - Assignment Title - YYYY-MM-DD.pdf.

WORKED EXEMPLAR 65 OF 77

Engineered-protein debate

Week 15 | Wed, Dec 2, 2026 | Cloning

TODAY'S GOAL

Argue whether engineered proteins made by cloned cells should be widely used and how they should be priced.

WHAT A FINISHED PRODUCT LOOKS LIKE

Worked CER on a parallel case

Completes: Models the engineered-protein debate deliverable on a different scenario: a written final stance on the access and pricing of a life-saving vaccine, plus a one-sentence rebuttal to the opposing side's strongest argument. Use it as a format guide, not an answer key, because it argues a different case than today's prompt.

WORKED MODEL

Claim (final stance): A life-saving vaccine, such as a childhood measles vaccine, should be made widely available and priced so that families can actually get it, with public health programs or insurance covering the cost when a family cannot pay.\nEvidence (supporting point): Measles vaccines have been produced at large scale for decades and cut measles deaths sharply wherever coverage is high, yet outbreaks still return in communities where cost, distance, or missed doses keep vaccination rates low. This shows that a proven, protective product only prevents disease if people can actually receive it.\nReasoning: A vaccine protects not just the person who gets it but also people around them who cannot be vaccinated, because high coverage slows the spread of the disease. If price keeps coverage low, the disease keeps circulating, so the benefit of the technology is lost for the whole community, not only for the family that could not pay. That is why access and affordability, not just the existence of the vaccine, decide whether it does its job.\nRebuttal to the strongest opposing argument: The vaccine maker's strongest point is that revenue from sales pays for the research, testing, and quality control that keep the vaccine safe and available. My one-sentence rebuttal: Paying for safe production is necessary, but pricing a vaccine so high that many families skip it lets the disease spread and undermines the very protection the vaccine was made to provide, so the price should cover real costs without blocking access.

ALSO DUE TODAY

Post your stakeholder argument on Schoology discussion, reply to one classmate who took a different position, and submit your exit ticket.

BUILD YOUR OWN

Keep the model's structure. Replace the prompt, facts, measurements, and evidence with your own. Check units, scientific vocabulary, and whether the conclusion goes beyond the evidence.

WEBXAM-STYLE FOLLOW-UP PRACTICE

Engineered insulin is described as a recombinant protein. What does it mean for insulin to be a recombinant protein, and why does the debate focus on access?

A. It is made by host cells carrying an inserted human gene, and the debate focuses on access because the medicine saves lives but its price and availability are unequal
B. It is purified directly from cow blood, so the debate is only about animal rights
C. It is a synthetic sugar, so the debate is about diet rather than genetics
D. It is identical for every patient and free to make, so there is no real access debate

Practice check: A. It is made by host cells carrying an inserted human gene, and the debate focuses on access because the medicine saves lives but its price and availability are unequal

A recombinant protein is produced by host cells that carry an inserted gene (here, the human insulin gene). Recombinant insulin transformed diabetes care, but its price and availability remain unequal globally, which is why the ethical debate centers on access and pricing.

WHERE THIS LIVES AND WHERE TO SUBMIT

https://mendozabiomed.org/learn/pltw-gend/day/2026-12-02/exemplar

Submit in Schoology. Submit one PDF. Put your first and last name in the document header. Name the file: FirstName LastName - Assignment Title - YYYY-MM-DD.pdf.

WORKED EXEMPLAR 66 OF 77

JCU bioethics 11: Genetic Defect Prevention and the Vargo request

Week 15 | Thu, Dec 3, 2026 | John Carroll University bioethics session

TODAY'S GOAL

Argue an assigned side of this question: Is it ethical to grant the Vargo family their request?

WHAT A FINISHED PRODUCT LOOKS LIKE

Worked debate worksheet on a parallel case: a family request for an unproven preventive implant

Completes: A complete debate worksheet that names the assigned side, gives three evidence-based arguments, answers the strongest opposing point, and ends with the student's own position.

WORKED MODEL

Parallel case, not today's prompt: A family asks a hospital to place an unproven implant in a healthy child because a close relative developed a serious neurological disease in adulthood.

Claim: The hospital should not provide the implant outside an approved clinical trial because the child is currently healthy, the benefit is uncertain, and the long-term risks are unknown.

Evidence: The implant has only short-term animal data and no evidence that it prevents disease in people. The child may never develop the condition, while surgery creates immediate infection and device risks.

Reasoning: Preventive intervention is justified when expected benefit exceeds harm and the evidence supports that prediction. Here the possible future benefit is unmeasured but the surgical harm is real, so a monitored trial with consent safeguards is the responsible route.

Strongest opposing point and response: The family may argue that waiting could miss the only chance to prevent disease. That concern justifies research and close screening, but urgency cannot turn missing human evidence into proof that an irreversible implant will help.

My position after the debate: I support the claim only with the limits named above. A strong ethics argument states the value being protected, uses evidence rather than preference, answers the best counterargument, and names the condition that could change the decision.

ALSO DUE TODAY

Submit one debate worksheet PDF in Schoology before the end of the block.

BUILD YOUR OWN

Keep the model's structure. Replace the prompt, facts, measurements, and evidence with your own. Check units, scientific vocabulary, and whether the conclusion goes beyond the evidence.

WEBXAM-STYLE FOLLOW-UP PRACTICE

Which new evidence would most strongly improve the argument in the parallel a family request for an unproven preventive implant case?

A. Human trial data comparing disease incidence and adverse events in implant recipients and matched controls
B. The family's understandable fear of the disease
C. A photograph of the implant
D. The surgeon's hope that the device will work

Practice check: A. Human trial data comparing disease incidence and adverse events in implant recipients and matched controls

This evidence measures the outcome the claim depends on and gives a comparison that can test whether the policy produces the stated benefit or harm.

WHERE THIS LIVES AND WHERE TO SUBMIT

https://mendozabiomed.org/learn/pltw-gend/day/2026-12-03/exemplar

Submit in Schoology. Submit one PDF. Put your first and last name in the document header. Name the file: FirstName LastName - Assignment Title - YYYY-MM-DD.pdf.

WORKED EXEMPLAR 67 OF 77

Cloning and purification workflow

Week 15 | Fri, Dec 4, 2026 | Cloning

TODAY'S GOAL

Carry out a cloning and protein-purification workflow and record results at each step.

WHAT A FINISHED PRODUCT LOOKS LIKE

Cloning and purification workflow data table

Completes: Completes the workflow lab: a data table recording transformation, selection counts, fraction data, yield, and one quality observation across the cloning-to-purification pipeline.

WORKED MODEL

Workflow record:
- Transformation: introduced the recombinant plasmid into host cells using heat shock, which opens pores in the membrane so plasmid DNA can enter.
- Selection: plated cells on antibiotic medium. Only cells carrying the resistance gene on the plasmid survived. I counted 38 colonies on the plate with my recombinant cells and 0 on the no-plasmid control, which tells me selection worked.
- Purification: ran the first separation step, which split soluble protein away from cell debris. The target protein appeared in the soluble fraction.
- Yield and quality: estimated yield was moderate; one quality note is that the no-plasmid control showed no growth, so the colonies I counted really are transformed cells and not contamination.

ALSO DUE TODAY

Submit your cloning and purification workflow data table to Schoology before the end of block.

BUILD YOUR OWN

Keep the model's structure. Replace the prompt, facts, measurements, and evidence with your own. Check units, scientific vocabulary, and whether the conclusion goes beyond the evidence.

WEBXAM-STYLE FOLLOW-UP PRACTICE

After transformation, a student plates cells on antibiotic medium. The plate with recombinant cells grows 38 colonies, and the no-plasmid control plate grows 0 colonies. What does this result tell the student?

A. Selection worked: only cells that took up the resistance-carrying plasmid survived, and the empty control confirms the antibiotic killed non-transformed cells

B. The experiment failed, because any colonies at all mean contamination

C. The control should have grown the most colonies if the antibiotic worked

D. Colony number is random and tells you nothing about whether transformation succeeded

Practice check: A. Selection worked: only cells that took up the resistance-carrying plasmid survived, and the empty control confirms the antibiotic killed non-transformed cells

Antibiotic selection kills cells that did not take up the plasmid, because only the plasmid carries the resistance gene. Growth on the recombinant plate plus no growth on the no-plasmid control is exactly the expected pattern: the survivors are transformed cells, and the empty control proves the antibiotic was active.

WHERE THIS LIVES AND WHERE TO SUBMIT

https://mendozabiomed.org/learn/pltw-gend/day/2026-12-04/exemplar

Submit in Schoology. Submit one PDF. Put your first and last name in the document header. Name the file:

FirstName LastName - Assignment Title - YYYY-MM-DD.pdf.

WORKED EXEMPLAR 68 OF 77

Protein expression

Week 16 | Mon, Dec 7, 2026 | Cloning

TODAY'S GOAL

Explain how a host cell expresses the inserted gene to produce the target protein.

WHAT A FINISHED PRODUCT LOOKS LIKE

Protein expression annotated notes

Completes: Completes the expression task: annotated notes tracing transcription and translation of the inserted gene, two conditions that change yield, and one piece of expression evidence from sample data.

WORKED MODEL

What expression means: expression is the cell reading the inserted gene and using it to build the target protein.

Tracing the steps:
1. Transcription: the host cell's machinery copies the inserted gene into mRNA, but only if the gene has a promoter the host cell recognizes.
2. Translation: ribosomes read the mRNA and assemble the amino acid chain that folds into the target protein.

Two conditions that change yield:
- Temperature: too high or too low can slow the cell or cause the protein to misfold, lowering usable yield.
- Inducer concentration: adding the right amount of inducer can switch the gene on strongly, raising protein output.

Evidence expression worked: in the sample data, the cells glowed green under UV light. Because GFP fluorescence is a visible proxy for the protein being made, the glow tells me the inserted gene was expressed.

ALSO DUE TODAY

Add your expression notes to your Unit 4 PLTW tracker and submit to Schoology.

BUILD YOUR OWN

Keep the model's structure. Replace the prompt, facts, measurements, and evidence with your own. Check units, scientific vocabulary, and whether the conclusion goes beyond the evidence.

WEBXAM-STYLE FOLLOW-UP PRACTICE

A host cell carries an inserted human gene fused to GFP. After growth, the cells glow green under UV light. What does the green glow indicate about the inserted gene?

A. The gene was expressed: it was transcribed and translated into protein, and GFP fluorescence is a visible proxy for that protein being made

B. The gene was cut out of the cell, which is why the cells now glow

C. The glow means the antibiotic selection failed

D. The glow proves the protein is already fully purified

Practice check: A. The gene was expressed: it was transcribed and translated into protein, and GFP fluorescence is a visible proxy for that protein being made

GFP fused to the target protein fluoresces green under UV only when the gene is actually transcribed and translated. So a green glow is direct visible evidence that expression occurred and the protein is being produced inside the cells.

WHERE THIS LIVES AND WHERE TO SUBMIT

https://mendozabiomed.org/learn/pltw-gend/day/2026-12-07/exemplar

Submit in Schoology. Submit one PDF. Put your first and last name in the document header. Name the file: FirstName LastName - Assignment Title - YYYY-MM-DD.pdf.

WORKED EXEMPLAR 69 OF 77

Purification overview

Week 16 | Tue, Dec 8, 2026 | Protein Purification

TODAY'S GOAL

Explain why a manufactured protein must be purified and what purity means for a medicine.

WHAT A FINISHED PRODUCT LOOKS LIKE

Purity-and-impurity exit ticket

Completes: Completes the purification overview: a short exit ticket defining purity and naming one concrete safety risk of an impure protein medicine.

WORKED MODEL

Definition of purity: purity is how much of the total protein in my sample is actually the target protein, rather than other proteins and cell parts. High purity means almost all of it is the protein I want.

What else is in the mixture: besides my target protein, the cell lysate contains thousands of other bacterial proteins, DNA, and broken membrane fragments.

One safety risk of impurity: if a protein medicine still contains bacterial contaminants, those contaminants can trigger a dangerous immune reaction in the patient, so an impure dose is not just less effective, it can be unsafe.

ALSO DUE TODAY

Submit your exit ticket to Schoology before leaving class.

BUILD YOUR OWN

Keep the model's structure. Replace the prompt, facts, measurements, and evidence with your own. Check units, scientific vocabulary, and whether the conclusion goes beyond the evidence.

WEBXAM-STYLE FOLLOW-UP PRACTICE

Why must a manufactured protein medicine be purified from the cell mixture before it is given to patients?

A. Because the cell lysate contains other proteins, DNA, and membrane fragments that can trigger dangerous immune reactions in patients

B. Because impurities make the protein glow too brightly under UV light

C. Because patients prefer the taste of pure protein

D. Because purification increases the total amount of protein in the sample

Practice check: A. Because the cell lysate contains other proteins, DNA, and membrane fragments that can trigger dangerous immune reactions in patients

Cell lysate mixes the target protein with thousands of other bacterial proteins, DNA, and membrane fragments. Those contaminants can provoke dangerous immune responses in a patient, so removing them is a safety requirement, not just a quality preference.

WHERE THIS LIVES AND WHERE TO SUBMIT

https://mendozabiomed.org/learn/pltw-gend/day/2026-12-08/exemplar

Submit in Schoology. Submit one PDF. Put your first and last name in the document header. Name the file: FirstName LastName - Assignment Title - YYYY-MM-DD.pdf.

WORKED EXEMPLAR 70 OF 77

GFP and chromatography

Week 16 | Wed, Dec 9, 2026 | Protein Purification

TODAY'S GOAL

Explain how GFP and chromatography let you track and separate a target protein.

WHAT A FINISHED PRODUCT LOOKS LIKE

Labeled chromatography diagram

Completes: Completes the chromatography task: a labeled diagram showing protein binding to the column, washing, elution, fraction collection, and a GFP signal prediction.

WORKED MODEL

Definitions:
- Chromatography: a method that separates proteins by how strongly they bind to a material (resin) in a column.
- Elution: releasing the bound target protein from the resin so it flows out into a collected fraction.

Why GFP helps: GFP is fused to the target protein and glows green under UV light, so wherever the green glow is, the target protein is. That lets me see an otherwise invisible protein.

The steps, labeled:
1. Load: the protein mixture is added to the column; the target binds the resin while other proteins start to wash through.
2. Wash: buffer rinses away the unbound contaminants.
3. Elute: a change in buffer releases the target protein into the collected fractions.

Prediction: if purification worked, the elution fractions are the ones that should glow green under UV, because that is where the target protein comes off the column.

ALSO DUE TODAY

Attach your labeled chromatography diagram to your PLTW tracker and submit it to Schoology.

BUILD YOUR OWN

Keep the model's structure. Replace the prompt, facts, measurements, and evidence with your own. Check units, scientific vocabulary, and whether the conclusion goes beyond the evidence.

WEBXAM-STYLE FOLLOW-UP PRACTICE

A target protein is fused to GFP and run through an affinity column. Other proteins wash through, then a buffer change releases the target. Which fraction should glow green under UV if purification worked?

A. The elution fraction, because that is when the bound target protein (and its GFP tag) is released from the column
B. The wash fraction, because the target leaves first before anything binds
C. None of the fractions, because GFP only glows inside living cells
D. Every fraction equally, because GFP spreads evenly through the whole column

Practice check: A. The elution fraction, because that is when the bound target protein (and its GFP tag) is released

from the column

In affinity chromatography the target binds the resin while contaminants wash through. The target (carrying its GFP tag) only comes off when the buffer change elutes it, so the elution fraction is the one that should glow green under UV.

WHERE THIS LIVES AND WHERE TO SUBMIT

https://mendozabiomed.org/learn/pltw-gend/day/2026-12-09/exemplar

Submit in Schoology. Submit one PDF. Put your first and last name in the document header. Name the file: FirstName LastName - Assignment Title - YYYY-MM-DD.pdf.

WORKED EXEMPLAR 71 OF 77

Protein-purification lab

Week 16 | Thu, Dec 10, 2026 | Protein Purification

TODAY'S GOAL

Run a protein-purification procedure and collect fractions to isolate the target protein.

WHAT A FINISHED PRODUCT LOOKS LIKE

Fraction-collection data sheet

Completes: Completes the purification lab: a fraction-collection data sheet recording tube number, buffer applied, GFP signal, and target-fraction labels, plus one error-control note.

WORKED MODEL

I loaded the protein mixture, washed, then eluted while watching for the green GFP signal under UV. Here is my record.

Reading: tubes 1 and 2 were the flow-through and wash, with no glow, meaning contaminants washed off. Tubes 4 and 5 glowed green, so those are my target collection.

Error-control note: one source of error is room light washing out the faint UV glow, so I controlled for it by reading each tube in the same darkened spot with the same UV lamp distance, so my yes/no calls are consistent.

ALSO DUE TODAY

Submit your fraction-collection data sheet to Schoology before leaving lab.

BUILD YOUR OWN

Keep the model's structure. Replace the prompt, facts, measurements, and evidence with your own. Check units, scientific vocabulary, and whether the conclusion goes beyond the evidence.

WEBXAM-STYLE FOLLOW-UP PRACTICE

During a column purification, tubes 1 and 2 (flow-through and wash) show no green glow under UV, while tubes 4 and 5 (collected after a buffer change) glow green. Which tubes contain the target protein, and why?

A. Tubes 4 and 5, because the target stays bound until the buffer change elutes it, and GFP marks where the target is

B. Tubes 1 and 2, because the target always comes off first in the flow-through

C. All four tubes equally, because the protein spreads through the whole run

D. None of the tubes, because a glow under UV means contamination

Practice check: A. Tubes 4 and 5, because the target stays bound until the buffer change elutes it, and GFP marks where the target is

The target binds the resin and only releases when the elution buffer is applied, so it appears in the later tubes. GFP

fluorescence marks where the target protein is, and tubes 4 and 5 glow, so they hold the target collection.

WHERE THIS LIVES AND WHERE TO SUBMIT

https://mendozabiomed.org/learn/pltw-gend/day/2026-12-10/exemplar

Submit in Schoology. Submit one PDF. Put your first and last name in the document header. Name the file: FirstName LastName - Assignment Title - YYYY-MM-DD.pdf.

WORKED EXEMPLAR 72 OF 77

SDS-PAGE gel results

Week 16 | Fri, Dec 11, 2026 | Protein Purification

TODAY'S GOAL

Read an SDS-PAGE gel to judge the size and purity of your isolated protein.

WHAT A FINISHED PRODUCT LOOKS LIKE

Annotated SDS-PAGE gel reading

Completes: Completes the gel-interpretation task: an annotated SDS-PAGE reading with a labeled marker lane, estimated protein size, band counts by fraction, the most-pure fraction identified, and a QC statement.

WORKED MODEL

How I read the gel: the marker (ladder) lane has bands of known molecular weights, so I use it as a ruler. Smaller proteins migrate farther down the gel, so I compare how far my band traveled to the marker to estimate size.

Reading:
- My target band lines up near the 27 kDa marker band, so I estimate the protein is about 27 kDa.
- Fraction 4 shows one strong band with almost no extra bands; fraction 2 shows several bands. So fraction 4 is the most pure.

QC statement: the purification met the purity goal, because the target fraction shows one dominant band at the expected size with very few contaminant bands, which is what a pure sample looks like.

ALSO DUE TODAY

Attach your annotated gel reading to your Unit 4 PLTW tracker and submit it to Schoology.

BUILD YOUR OWN

Keep the model's structure. Replace the prompt, facts, measurements, and evidence with your own. Check units, scientific vocabulary, and whether the conclusion goes beyond the evidence.

WEBXAM-STYLE FOLLOW-UP PRACTICE

On an SDS-PAGE gel, fraction A shows one strong band at the expected molecular weight, while fraction B shows several bands of different sizes. Which fraction is more pure, and how can you tell?

A. Fraction A, because a pure target shows a single dominant band at the expected size, while extra bands mean contaminating proteins

B. Fraction B, because more bands means more of the target protein

C. Fraction A, because the smallest proteins always indicate the highest purity

D. Both are equally pure, because all proteins run to the same position on a gel

Practice check: A. Fraction A, because a pure target shows a single dominant band at the expected size, while

extra bands mean contaminating proteins

SDS-PAGE separates proteins by size, so each distinct protein makes its own band. A pure target fraction shows one dominant band at the expected molecular weight, while extra bands are other (contaminating) proteins. Fraction A's single band is the picture of higher purity.

WHERE THIS LIVES AND WHERE TO SUBMIT

https://mendozabiomed.org/learn/pltw-gend/day/2026-12-11/exemplar

Submit in Schoology. Submit one PDF. Put your first and last name in the document header. Name the file: FirstName LastName - Assignment Title - YYYY-MM-DD.pdf.

WORKED EXEMPLAR 73 OF 77

Allocation debate

Week 17 | Mon, Dec 14, 2026 | Organ Transplant

TODAY'S GOAL

Argue how donor kidneys should be allocated when demand far exceeds supply.

WHAT A FINISHED PRODUCT LOOKS LIKE

Non-answer evidence and reasoning scaffold

Completes: A blank structure for organizing the assigned response. It contains no claim, ranking, calculation, data interpretation, or recommendation from today's task.

WORKED MODEL

1. Decision or claim I am testing: ____
2. Evidence ID and exact observation: ____
3. Second evidence ID and exact observation: ____
4. Rule that connects the evidence to my claim: ____
5. Strongest alternative or tradeoff: ____
6. Limitation or missing evidence that controls my confidence: ____
7. Revision I would make if the missing evidence changed: ____

ALSO DUE TODAY

turns in the stance card on Schoology under today's exit-ticket assignment.

BUILD YOUR OWN

Keep the model's structure. Replace the prompt, facts, measurements, and evidence with your own. Check units, scientific vocabulary, and whether the conclusion goes beyond the evidence.

WEBXAM-STYLE FOLLOW-UP PRACTICE

An allocation board must choose between two candidates for one donor kidney. Which pairing correctly separates a medical matching factor from a fairness factor?

A. HLA match quality is a fairness factor; wait time is a medical factor
B. HLA match quality is a medical matching factor; wait time is a fairness factor
C. Both HLA match quality and wait time are medical matching factors
D. Both HLA match quality and wait time are fairness factors

Practice check: B. HLA match quality is a medical matching factor; wait time is a fairness factor

HLA match quality is biological compatibility that predicts graft survival, so it is a medical matching factor, while wait time is about equal access over time, so it is a fairness factor.

WHERE THIS LIVES AND WHERE TO SUBMIT

https://mendozabiomed.org/learn/pltw-gend/day/2026-12-14/exemplar

Submit in Schoology. Submit one PDF. Put your first and last name in the document header. Name the file: FirstName LastName - Assignment Title - YYYY-MM-DD.pdf.

WORKED EXEMPLAR 74 OF 77

Dialysis and matching simulation

Week 17 | Tue, Dec 15, 2026 | Organ Transplant

TODAY'S GOAL

Simulate dialysis and HLA crossmatching to model how patients are kept alive and matched.

WHAT A FINISHED PRODUCT LOOKS LIKE

Dialysis and crossmatch results table

Completes: Records a data table showing how modeled blood-waste levels drop across a dialysis session, scores each donor-recipient HLA crossmatch as compatible or not, and flags crossmatches that predict rejection with a short reason.

WORKED MODEL

Dialysis waste-level time series (recipient R):
- Start (0 min): urea 110 mg/dL
- 60 min: urea 78 mg/dL
- 120 min: urea 51 mg/dL
- 180 min: urea 33 mg/dL
- 240 min: urea 22 mg/dL

Reading: Dialysis pulled urea down from 110 to 22 mg/dL over four hours, modeling how the machine does the filtering the failed nephrons cannot.

HLA crossmatch scores (recipient R vs three donors):
- Donor A: 5 of 6 antigens match, no reaction in the well = COMPATIBLE
- Donor B: 3 of 6 match, weak reaction = BORDERLINE
- Donor C: 1 of 6 match, strong reaction = INCOMPATIBLE

Rejection-risk flags:
- Donor C flagged: a strong crossmatch reaction means the recipient already has antibodies against the donor tissue, so the immune system would attack the kidney quickly.

(Tip: a positive or strong crossmatch reaction is a stop sign, not a detail; it predicts fast rejection even if a few antigens match.)

ALSO DUE TODAY

turns in the completed simulation table on Schoology under today's data-table assignment.

BUILD YOUR OWN

Keep the model's structure. Replace the prompt, facts, measurements, and evidence with your own. Check units, scientific vocabulary, and whether the conclusion goes beyond the evidence.

WEBXAM-STYLE FOLLOW-UP PRACTICE

In a crossmatch, a recipient's serum is mixed with a donor's cells and shows a strong positive reaction. What is the best interpretation for transplant planning?

A. The recipient has no antibodies against the donor, so the kidney is a safe match
B. The recipient has preformed antibodies against the donor tissue, predicting a high rejection risk
C. The reaction shows the dialysis machine is working correctly
D. A strong reaction always means a perfect HLA match

Practice check: B. The recipient has preformed antibodies against the donor tissue, predicting a high rejection risk

A strong positive crossmatch means the recipient's serum already carries antibodies that bind the donor cells, which predicts rapid immune rejection, so that donor is avoided.

WHERE THIS LIVES AND WHERE TO SUBMIT

https://mendozabiomed.org/learn/pltw-gend/day/2026-12-15/exemplar

Submit in Schoology. Submit one PDF. Put your first and last name in the document header. Name the file: FirstName LastName - Assignment Title - YYYY-MM-DD.pdf.

WORKED EXEMPLAR 75 OF 77

Compatibility and rejection

Week 17 | Wed, Dec 16, 2026 | Organ Transplant

TODAY'S GOAL

Build a compatibility table and explain how immunosuppression manages rejection.

WHAT A FINISHED PRODUCT LOOKS LIKE

Donor compatibility ranking and rejection note

Completes: Builds a table ranking candidate donors for one recipient by HLA match score, then explains in the student's own words why a poorly matched organ is attacked and gives one benefit and one risk of immunosuppression.

WORKED MODEL

Recipient: patient M. Donors ranked best to worst by HLA match:
- Donor 2: 6 of 6 match, crossmatch negative = rank 1 (best)
- Donor 1: 4 of 6 match, crossmatch negative = rank 2
- Donor 3: 2 of 6 match, crossmatch weak positive = rank 3 (worst)

Why a poor match is attacked (my words): Immune cells read the HLA markers on the donor kidney. When too many markers look foreign, T cells and antibodies treat the organ like an invader and attack its blood vessels and cells, which is rejection.

Immunosuppression:
- Benefit: The drugs calm the immune attack so even a good-but-not-perfect match can survive and keep filtering.
- Risk: A dialed-down immune system fights infections and some cancers less well, so the patient is more vulnerable to getting sick.

(Tip: a higher match number plus a negative crossmatch is what you want; ranking is not just the match count, the crossmatch can overrule it.)

ALSO DUE TODAY

turns in the compatibility table on Schoology under today's data-table assignment.

BUILD YOUR OWN

Keep the model's structure. Replace the prompt, facts, measurements, and evidence with your own. Check units, scientific vocabulary, and whether the conclusion goes beyond the evidence.

WEBXAM-STYLE FOLLOW-UP PRACTICE

Why does a transplant patient take immunosuppressant drugs, and what is the main trade-off?

A. To speed up the immune attack on the new organ, at the cost of slower healing
B. To calm the immune response so the organ is not rejected, at the cost of weaker defense against infection
C. To improve the HLA match between donor and recipient, at the cost of higher blood pressure
D. To replace the kidney's filtering job, at the cost of needing dialysis

Practice check: B. To calm the immune response so the organ is not rejected, at the cost of weaker defense against infection

Immunosuppressants lower the immune response so it does not attack the transplanted organ, but a quieter immune system also defends less well against infections and some cancers.

WHERE THIS LIVES AND WHERE TO SUBMIT

https://mendozabiomed.org/learn/pltw-gend/day/2026-12-16/exemplar

Submit in Schoology. Submit one PDF. Put your first and last name in the document header. Name the file: FirstName LastName - Assignment Title - YYYY-MM-DD.pdf.

WORKED EXEMPLAR 76 OF 77

Allocation CER

Week 17 | Thu, Dec 17, 2026 | Organ Transplant

TODAY'S GOAL

Write a claim-evidence-reasoning argument recommending which patient should receive a donor kidney.

WHAT A FINISHED PRODUCT LOOKS LIKE

Non-answer evidence and reasoning scaffold

Completes: A blank structure for organizing the assigned response. It contains no claim, ranking, calculation, data interpretation, or recommendation from today's task.

WORKED MODEL

1. Decision or claim I am testing: ____
2. Evidence ID and exact observation: ____
3. Second evidence ID and exact observation: ____
4. Rule that connects the evidence to my claim: ____
5. Strongest alternative or tradeoff: ____
6. Limitation or missing evidence that controls my confidence: ____
7. Revision I would make if the missing evidence changed: ____

ALSO DUE TODAY

turns in the allocation CER on Schoology under today's CER assignment.

BUILD YOUR OWN

Keep the model's structure. Replace the prompt, facts, measurements, and evidence with your own. Check units, scientific

vocabulary, and whether the conclusion goes beyond the evidence.

WEBXAM-STYLE FOLLOW-UP PRACTICE

In a claim-evidence-reasoning argument recommending a kidney recipient, what is the role of the reasoning section?

A. It restates the claim in different words without adding support
B. It connects the cited evidence to the claim and explains why the competing case is outweighed
C. It lists new lab values that were not mentioned in the evidence
D. It records the patient's name and medical record number for filing

Practice check: B. It connects the cited evidence to the claim and explains why the competing case is outweighed

Reasoning is the logical bridge that shows how the crossmatch and urgency evidence supports the claim and why the other patient's evidence carries less weight.

WHERE THIS LIVES AND WHERE TO SUBMIT

https://mendozabiomed.org/learn/pltw-gend/day/2026-12-17/exemplar

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WORKED EXEMPLAR 77 OF 77

Emerging-tech debate

Week 17 | Fri, Dec 18, 2026 | Tissue Engineering

TODAY'S GOAL

Argue whether emerging interventions like xenotransplantation and bionics should be pursued and who decides.

WHAT A FINISHED PRODUCT LOOKS LIKE

Non-answer evidence and reasoning scaffold

Completes: A blank structure for organizing the assigned response. It contains no claim, ranking, calculation, data interpretation, or recommendation from today's task.

WORKED MODEL

1. Decision or claim I am testing: ____
2. Evidence ID and exact observation: ____
3. Second evidence ID and exact observation: ____
4. Rule that connects the evidence to my claim: ____
5. Strongest alternative or tradeoff: ____
6. Limitation or missing evidence that controls my confidence: ____
7. Revision I would make if the missing evidence changed: ____

ALSO DUE TODAY

turn it in on Schoology under today's emerging-tech debate exit-ticket assignment.

BUILD YOUR OWN

Keep the model's structure. Replace the prompt, facts, measurements, and evidence with your own. Check units, scientific vocabulary, and whether the conclusion goes beyond the evidence.

WEBXAM-STYLE FOLLOW-UP PRACTICE

A regulator reviewing a new bionic implant asks for the 'strongest opposing argument' before approving a trial. What is the point of naming that argument fairly?

A. It proves the opposing side is wrong

B. It lets the reviewer test the proposal against its most serious risk instead of a weak one

C. It removes the need for any safety data

D. It speeds approval by skipping objections

Practice check: B. It lets the reviewer test the proposal against its most serious risk instead of a weak one

Stating the strongest counterargument fairly forces the proposal to stand up to the most serious risk, which is exactly what a sound review should test.

WHERE THIS LIVES AND WHERE TO SUBMIT

https://mendozabiomed.org/learn/pltw-gend/day/2026-12-18/exemplar

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