

Study Guide — BI Problem 1: Emergency Room (Mid-Unit Test)

Biomedical Innovations · Problem 1 — Emergency Room · Modeled on the PLTW Guided Review format

Vocabulary to know cold

Term	Definition
Two-identifier rule	Confirming a patient with at least two independent identifiers (e.g., full name and date of birth) before collecting
Safety Data Sheet (SDS)	A document listing a chemical's hazards, safe handling, storage, disposal, and required PPE.
Refrigerated storage	Keeping specimens near 4 degrees C to slow degradation; distinct from frozen (-20 C) or incubated (37 C).
Frozen storage	Storing specimens at -20 degrees C or colder for long-term preservation.
Micropipette technique	Setting the correct volume, using a fresh tip per sample, and aspirating/dispensing slowly to ensure accurate
Centrifuge balance	Placing tubes of equal weight opposite each other so the rotor spins safely.
Pre-analytical error	An error before testing, such as wrong tube, mislabeling, or improper storage/transport.
Sensitivity	A test's ability to correctly identify true positives (few false negatives).
Specificity	A test's ability to correctly identify true negatives (few false positives).
Control group	The comparison group treated under standard/no-treatment conditions to isolate the effect being tested.
Pulse oximetry (SpO2)	A noninvasive measure of blood oxygen saturation; normal is about 95-100%.
Hypoxemia	Lower-than-normal oxygen level in the blood.

Worked examples (follow the reasoning)

Example 1. You must centrifuge a single blood tube. Describe how to load the centrifuge safely.

- Recognize that an unbalanced rotor can break and cause injury.
- Obtain a balance tube filled to the same weight as your sample.
- Place the balance tube in the slot directly opposite your sample.
- Close the lid and confirm balance before starting the spin.

Answer: Place an equal-weight balance tube directly opposite the sample so the rotor is balanced before spinning.

Example 2. A rapid test for a flu antigen has high sensitivity but only moderate specificity. A patient tests POSITIVE. What does each property tell you about trusting this result?

- Sensitivity (high) means few true cases are missed — a negative would be reassuring.
- Specificity (moderate) means some healthy people test positive (false positives).
- Because specificity is only moderate, a positive result may be a false positive.
- Confirm a positive with a more specific follow-up test.

Answer: A positive should be confirmed: high sensitivity makes a negative trustworthy, but only moderate specificity means positives can be false and need confirmation.

Practice questions (with reasoning)

1. A serum sample for next week's analysis should be stored at:

- A. 37 degrees C
- B. -20 degrees C
- C. Room temperature on the bench
- D. In direct sunlight

Answer: B. Long-term preservation requires frozen storage at -20 degrees C or colder.

2. Which action is the BEST control of a pre-analytical error?

- A. Re-checking the analyzer's reagents
- B. Confirming the correct tube type and label before collection
- C. Reprinting the final report
- D. Calling the result twice

Answer: B. Verifying tube type and labeling before collection prevents pre-analytical errors.

3. A pulse oximeter reads 92%. The reading is:

- A. Above normal
- B. Slightly below the normal 95-100% range
- C. Exactly normal
- D. A blood pressure value

Answer: B. 92% is just below the normal 95-100% SpO2 range and warrants attention.

4. Before using an unfamiliar disinfectant, a technician should first consult the:

- A. Patient chart
- B. Safety Data Sheet (SDS)
- C. Cafeteria sign
- D. Centrifuge timer

Answer: B. The SDS provides hazard, handling, and PPE information for the chemical.