

Study Guide — BI Problem 7: Forensic Autopsy (End-of-Unit Test)

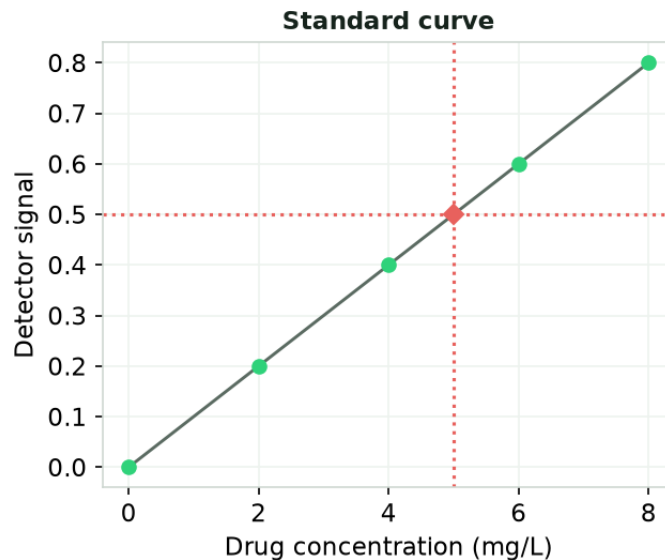
Biomedical Innovations · Problem 7 — Forensic Autopsy · Modeled on the PLTW Guided Review format

Vocabulary to know cold

Term	Definition
Chain of custody	Signed, unbroken record of every handoff; required at each transfer to keep evidence admissible.
Pre-analytical error	A handling, labeling, transport, or storage mistake occurring before analysis.
Sample integrity	A specimen staying unchanged and uncontaminated from collection to analysis.
Carryover / contamination	Outside material entering a sample or instrument, causing a false signal (e.g., a high blank).
Sharps container	Rigid, puncture-resistant container for needles, blades, and broken glass.
Hazardous chemical waste	Regulated chemicals such as formalin, disposed per SDS, never down the drain.
Standard curve	A plot of signal vs. known concentration used to quantify an unknown.
Negative (no-template) control	A reaction with no DNA added; detects contamination in PCR.
Vitreous potassium	Eye-fluid potassium that rises with time after death, used to estimate the postmortem interval.
Precision	How closely repeated measurements of the same sample agree (reproducibility).
Dose-response relationship	A toxicology pattern where biological effect increases with dose.
Standard precautions / PPE	Gloves, gown, and eye protection used to prevent bloodborne pathogen exposure.

Worked examples (follow the reasoning)

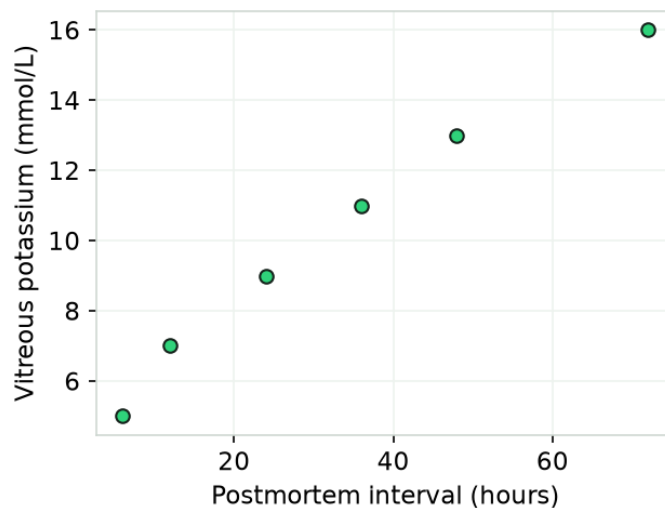
Example 1. A toxicology lab uses a standard curve (signal = 0.10 x concentration). An unknown postmortem sample gives a signal of 0.50. Find its concentration and state one handling rule that keeps the result valid.



- Read the relationship: signal = 0.10 x concentration.
- Set $0.50 = 0.10 \times \text{concentration}$.
- Solve: concentration = $0.50 / 0.10 = 5 \text{ mg/L}$.
- Locate signal 0.50 on the curve to confirm ~5 mg/L.
- Handling rule: store and prepare the unknown exactly like the standards so the comparison is valid.

Answer: About 5 mg/L; standards and the unknown must be handled and stored identically.

Example 2. A body is found and vitreous potassium is 11 mmol/L. Using the scatter trend, estimate the postmortem interval and explain why the sample was kept cold.



- Find 11 mmol/L on the y-axis.
- Trace to the trend line and down to the x-axis.
- It aligns with about 36 hours.
- Cold storage was used because warming accelerates cell breakdown that would raise potassium and bias the estimate.

Answer: About 36 hours; cold storage prevents artificial potassium rise that would corrupt the estimate.

Practice questions (with reasoning)

1. At each transfer of a specimen between labs, what is required?

- A. A brand-new label replacing the old
- B. A signed chain-of-custody entry
- C. Nothing if refrigerated
- D. A verbal note only

Answer: B. Every handoff needs a signed custody entry; the original label is never replaced.

2. A blank (no-drug) control shows a high signal. The most likely cause is:

- A. Perfect calibration
- B. Contamination or carryover
- C. A weak unknown
- D. Correct chain of custody

Answer: B. A high blank indicates contamination/carryover that must be fixed before reporting.

3. Which pairing of waste and container is correct?

- A. Needle -> sharps container
- B. Needle -> red biohazard bag
- C. Formalin -> sink drain
- D. Broken glass -> regular trash

Answer: A. Needles (and broken glass) go in the rigid sharps container; formalin is hazardous chemical waste.

4. Repeating a control 10 times gives tightly clustered results. This shows the method has high:

- A. Contamination
- B. Precision
- C. Pre-analytical error
- D. Bias

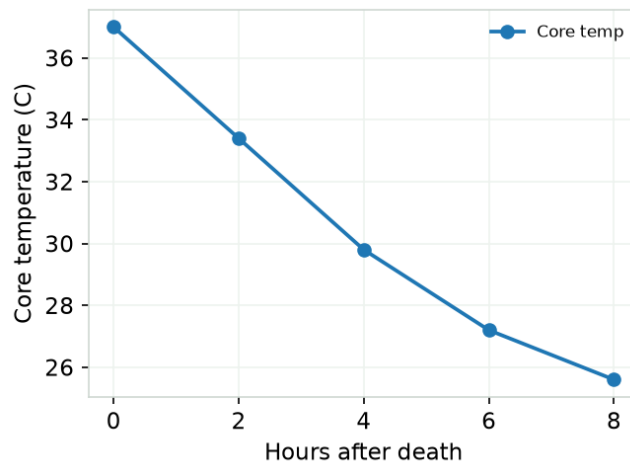
Answer: B. Close agreement of repeated measurements indicates precision.

5. SPIRAL: Trace DNA from a bloodstain must be copied before profiling. The technique is:

- A. Centrifugation
- B. PCR amplification
- C. Refrigeration
- D. Gram staining

Answer: B. PCR amplifies tiny amounts of DNA so a profile can be generated.

6. The graph shows body-core temperature measured at autopsy over the hours after death. What does the trend show, and what is it used to estimate?



- A. Temperature rises after death, indicating decomposition
- B. Core temperature falls steadily after death (algor mortis), which helps estimate time of death
- C. Temperature stays constant, so it gives no information
- D. The line shows random readings with no pattern

Answer: B. Postmortem cooling (algor mortis) shows a steady drop toward ambient temperature and is used to estimate the time of death.