

Detection, Uncertainty, and Evidence Claims

g11_u06_w24

Purpose and boundary

Use original fictional paper measurements only. No testing, sample collection, instrument operation, chemical handling, diagnosis, compliance, or environmental/health determination is requested.

Targets: I can compare a stated signal with a threshold, calculate simple uncertainty intervals, and write a bounded claim. **Vocabulary:** detection threshold, quantification, uncertainty, false positive, false negative, decision rule. **Prerequisites:** subtraction, percentage, intervals, calibration limits.

For items 4–11 use a fictional blank mean $B = 0.050$ signal units and a stated detection threshold $T = 0.080$ signal units. The threshold is an instructional decision rule, not a real-world standard.

1. Distinguish detecting a signal from identifying a substance.

2. Why is a detection threshold a decision-rule choice rather than a universal natural boundary?

3. What question does repeated blank data help ask?

4. A fictional unknown has $S = 0.074$. Compare it with T .

5. A fictional unknown has $S = 0.083$. Compare it with T .

6. What limited conclusion does item 5 support under the stated rule?

7. Why does item 5 not establish a chemical identity or a health/safety conclusion?

8. A blank mean is 0.050 and an unknown is 0.083. Find the signal difference.

9. A card has $S = 0.080$ exactly. Explain why its classification needs a stated convention.

10. Name one source of uncertainty not represented by a single threshold.

11. Explain how false-positive and false-negative possibilities can coexist in a measurement model.

12. Three fictional estimates are 1.16, 1.24, 1.20 mg L⁻¹. Find the mean.

13. Find the range and half-range for item 12.

14. Write the simple result as mean plus or minus half-range.

15. Why is that notation not a complete uncertainty budget?

16. A card gives 1.20 ± 0.05 mg L⁻¹; write its interval.

17. Another card gives 1.32 ± 0.04 mg L⁻¹; do the two intervals overlap?

18. State one cautious conclusion from item 17 and one conclusion it cannot support.

19. What sampling or calibration detail is needed before generalizing a paper result?

20. Write a two-sentence claim that uses a fictional threshold result and interval while naming a limitation.
