

Corrosion, Batteries, and Electrochemical Data Claims

g11_u05_w20

Purpose and boundary

Use supplied original fictional paper data only. No batteries, cells, wires, metals, coatings, chemicals, device operation, repair, or disposal actions are requested.

Targets: I can calculate a rate or energy quantity from stated data, compare results with uncertainty, and write a claim that does not exceed its evidence. **Vocabulary:** corrosion rate, capacity, nominal voltage, watt-hour, uncertainty, system boundary. **Prerequisites:** proportions, area/rate models, electrical energy, evidence claims.

All values are fictional. A listed rate is a model result, not a safety, durability, purchasing, or design recommendation.

1. Define corrosion as an electrochemical change in material terms, without naming a procedure.

2. Why can two locations on one object be modeled as different electrochemical environments?

3. A fictional record lists a thickness-loss rate of 0.040 mm y^{-1} . Predict modeled loss in 3.00 y.

4. At the same stated rate, how long would a 0.120 mm modeled loss require?

5. A second fictional record lists 0.025 mm y^{-1} . Find its percentage reduction relative to 0.040 mm y^{-1} .

6. State one supported comparison from item 5 and one unsupported cause claim.

7. Records A and B are $0.040 \pm 0.005 \text{ mm y}^{-1}$ and $0.025 \pm 0.004 \text{ mm y}^{-1}$. Write each uncertainty interval.

8. Do the intervals in item 7 overlap? Write a cautious conclusion.

9. Name one missing contextual variable that could limit the comparison in item 8.

10. Explain why an average loss rate does not prove that loss is uniform at every location.

11. A fictional battery data card lists 2.00 A h and nominal 3.00 V. Find the nominal energy in W h.
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12. Convert item 11 into J, using $1 \text{ W h} = 3600 \text{ J}$.
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13. Distinguish capacity in A h from energy in W h.
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14. A second card lists 1.50 A h at 4.00 V. Compare its nominal W h with item 11.
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15. Why is a nominal-energy comparison not a lifetime or safety claim?
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16. A record begins at 6.00 W h and later lists 4.80 W h. Find the retained percentage.
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17. Give one bounded interpretation and one unbounded interpretation of item 16.
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18. A report lists voltage $3.00 \pm 0.05 \text{ V}$ and capacity $2.00 \pm 0.03 \text{ A h}$. Estimate the largest relative uncertainty in nominal energy by adding relative uncertainties.
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19. Identify one measurement or boundary statement needed before comparing two nominal-energy reports fairly.
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20. Write a two-sentence evidence claim that joins a corrosion-rate comparison and a nominal-energy comparison while naming their limits.
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