

Isomerism and Structure-Property Reasoning

Student Worksheet | g10_u07_w26

I can: distinguish molecular formula from connectivity and make bounded structure-property claims from supplied isomer data.

Scope card: A constitutional isomer pair has the same molecular formula but different atom connectivity. The boiling points and contact-index labels below are supplied comparison data for these cards only. They do not prove a universal rule, an exact molecular mechanism, a hazard, a health effect, a pharmaceutical role, or a consumer use. Use paper/data cards only—no chemical samples, odor tests, ingestion, or handling.

card	condensed structure / connectivity	molecular formula	supplied comparison data
A	CH ₃ CH ₂ CH ₂ CH ₃ (straight chain)	C ₄ H ₁₀	boiling point $-0.5\text{ }^{\circ}\text{C}$; contact index 4
B	CH ₃ CH(CH ₃)CH ₃ (branched)	C ₄ H ₁₀	boiling point $-11.7\text{ }^{\circ}\text{C}$; contact index 3
C	CH ₃ CH ₂ OH (alcohol pattern)	C ₂ H ₆ O	boiling point $78.4\text{ }^{\circ}\text{C}$
D	CH ₃ OCH ₃ (ether connectivity)	C ₂ H ₆ O	boiling point $-24.2\text{ }^{\circ}\text{C}$

1. Define molecular formula using the scope card.

2. Define a constitutional isomer pair using the scope card.

3. Which two cards share molecular formula C₄H₁₀?

4. How does the connectivity of card A differ from card B?

5. Why are A and B distinct constitutional isomers even though their formula matches?

6. Count the carbon atoms in each of A and B.

7. State the shared hydrogen count in the formula for A and B.

8. Calculate the boiling-point difference between A and B.

9. Which C4 card has the higher listed boiling point?

10. State one evidence-bounded pattern relating the listed contact index to the listed boiling points for A and B.

11. Does the A/B table prove an exact molecular mechanism or a rule for every branched molecule? Explain.

12. Which two cards share molecular formula C_2H_6O ?

13. How does the oxygen connectivity in card C differ from card D?

14. Why do C and D receive different structural labels in the supplied cards?

15. Calculate the listed boiling-point difference between C and D.

16. State one bounded inference from the C/D data and one reason it should not be generalized to every oxygen-containing compound.

17. A formula card says only C_4H_{10} . What additional information is needed to decide whether it matches A or B?

18. Critique: “Branching always lowers boiling point because cards A and B show that pattern.”

19. Critique: “A structure/property card proves a substance’s hazard, health effect, pharmaceutical role, or consumer use.”

20. Write a cautious CER statement using one shared formula, one connectivity difference, and one numerical data comparison. Include a scope limit.
