Isomers: same formula, different connectivity

Student activity • observation and reasoning

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The question

Is a rotated drawing a different molecule?

Build alternative carbon skeletons and distinguish a structural isomer from a rotated copy. Use atom counts and connectivity to justify each decision.

Equipment

• Booklet, pencil, periodic table and optional molecular model kit

Desk activity only; keep small model pieces away from mouths.

Course coverage: Shared core: 4.2–4.5. Structural isomerism; no cis/trans or E/Z nomenclature.

Plan, model or apparatus sketch

Draw a labelled structure or model to explain your reasoning for this lesson.

Method and reasoning

Read the whole sequence before starting

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1. Build a straight-chain C_4H_{10} molecule and draw every bond. Check four bonds at each carbon.

2. Rearrange the four-carbon skeleton into a branched structure without changing atom counts. Complete its hydrogens.

3. Rotate one model and redraw it. Decide whether connectivity changed or only the viewpoint.

4. Find the three different carbon skeletons possible for C_5H_{12}; reject duplicated drawings and verify all hydrogen totals.

5. Compare $CH_2{=}CHCH_2CH_3$ with $CH_3CH{=}CHCH_3$. Identify what changes while retaining C_4H_8.

6. State a precise definition of structural isomers and test it on your models.

Cleanup

- Return shared equipment and retain corrected reasoning.

Record your evidence

Blank spaces are for your own work

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Reference and task data

Structural isomers have the same molecular formula but different atom connectivity. Rotating a drawing or turning a model does not change connectivity. C_5H_{12} examples: straight five-carbon chain; four-carbon chain with one methyl branch; three-carbon chain with two methyl branches on its central carbon. Use these as hints after attempting the task.

Task	My structure / working	Reason / correction
C_4H_{10} pair		
C_5H_{12} skeletons		
C_4H_8 positions		

Show your calculations, labelled model or correction here.

Explain and evaluate

Use evidence and show calculation steps where relevant

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1. Define structural isomers.

2. Draw the two C_4H_{10} structures.

3. Why is a reversed drawing of butane not a new isomer?

4. List the three C_5H_{12} structural isomers.

5. Why are ethane and propane not isomers?

6. Explain the difference between the two supplied C_4H_8 alkenes.