What is Optical Isomerism?

Worksheet

Enantiomers are non-superimposable mirror images. The D-form rotates polarized light clockwise (+, dextro); the L-form rotates it counterclockwise (, levo). Same formula, different optical behavior.

Questions

1. If (R)-alanine rotates light by +8.5, (S)-alanine rotates by

A) +8.5
B) 8.5
C) 0
D) +17

2. A solution shows 45 rotation. Which enantiomer is present?

A) D-form
B) L-form
C) Racemic (both)
D) Can't tell without more info

3. What is the optical rotation of a 1:1 (D:L) enantiomer mixture?

A) +90
B) 90
C) 0
D) Can't predict

4. How do you distinguish D- and L- forms experimentally?

A) Melting point
B) Mass spectrometry
C) Polarimetry (rotation of light)
D) Atomic formula

5. A solution of D-glucose rotates polarized light by +52.7. What does the L-glucose solution do?

6. A 1.0 M solution of (S)-2-methylbutyric acid rotates light by 12.4. Why doesn't the (R) form rotate by +12.4?

7. A racemic mixture (50:50 D:L) of lactic acid shows zero rotation. Why?

8. Define: What is optical isomerism?

9. Define: What does 'dextrorotatory' mean?

10. Define: What is a racemic mixture?

Answer Key

1. B) 8.5 - R and S forms are enantiomers with opposite rotations. If R is +, S is .

2. B) L-form - Negative () rotation = levorotatory = L-form. D-form would give positive (+) rotation.

3. C) 0 - Equal D and L rotations cancel zero net rotation (racemic mixture).

4. C) Polarimetry (rotation of light) - Only a polarimeter detects opposite rotations. Other methods show identical properties.

5. D and L forms are enantiomers (optical isomers) with equal and opposite rotation. If D-glucose rotates by +52.7 (clockwise, dextro), L-glucose rotates by 52.7 (counterclockwise, levo).

6. Yes, it does! (R)-enantiomer rotates by +12.4 (opposite direction). The small difference you might see is due to solvent, concentration, or temperature-but magnitudes are equal.

7. D-lactic acid rotates plane by +; L-lactic acid rotates by . When mixed equally, effects cancel: (+) + () = 0 net rotation.

8. When two molecules have the same atoms but are non-superimposable mirror images (enantiomers) that rotate polarized light in opposite directions.

9. The molecule rotates the plane of polarized light clockwise-labeled D or (+).

10. An equal mixture of D and L enantiomers that has zero net optical rotation.