

Naming organic compounds and their isomers

Chemistry grades 11-12 (A Level · IB · Class 11-12) · Lab answers

These model answers use the sample data in the table. Your own angles will differ a little, but the rotation should rise in a straight line with concentration and the unknown should fall between the standards.

Level: Chemistry grades 11-12 (A Level · IB · Class 11-12) · **Curriculum:** IB S3.2

Question 1 Graph

The points lie on a **straight line through the origin**, so rotation is directly proportional to concentration.

Question 2 Specific rotation

Slope = $\Sigma(\alpha c) \div \Sigma c^2 = (0.7 + 2.6 + 5.7 + 10.8) \div 0.30 = 19.8 \div 0.30 = \mathbf{66^\circ \text{ dm}^{-1} \text{ cm}^3 \text{ g}^{-1}}$.

Question 3 Unknown concentration

$c = \alpha \div \text{slope} = 16 \div 66 = \mathbf{0.24 \text{ g cm}^{-3}}$.

Question 4 Longer tube

Rotation is proportional to length, so 2.0 dm gives $2 \times 19^\circ = \mathbf{38^\circ}$.

Question 5 Enantiomers

Each enantiomer rotates light by the same angle in opposite directions. In a racemic mixture the rotations **cancel exactly**, giving zero net rotation.

Question 6 Uncertainty

Percentage uncertainty = $(1 \div 7) \times 100 = \mathbf{14 \%}$, large because the angle is small.

Question 7 Improvement

Use a longer tube (for example 20 cm) to increase the angles, and read the angle with a finer scale or mean of several readings. **Keep the lamp and filters fixed** between tests.