

Lewis structures, shapes and hybridization of molecules

AP Chemistry · Lab answers

Model answers use the sample table. Deflection depends on the stream and the rod, so expect your numbers to differ but the zero results for nonpolar liquids to be the same.

Level: AP Chemistry · **Curriculum:** AP Chem Unit 2

Question 1 Pattern

The liquids with a dipole moment of zero show no deflection, and **larger dipole moments tend to give larger deflections** (propanone is largest, ethanol smaller).

Question 2 Why a stream bends

The rod induces an arrangement of the molecules: the end of each polar molecule with opposite charge turns toward the rod. Either sign of charge attracts the oppositely charged end, so **the stream bends toward the rod**.

Question 3 Nonpolar liquids

Hexane is made of C-C and C-H bonds, which are nearly nonpolar, and its shape is symmetric overall. It has **no permanent dipole**, so the rod has nothing to align.

Question 4 Shape of water

H-O-H with two lone pairs on O. The two O-H bonds are polar (O is δ^-) and the shape is bent at about 104.5° , so the dipoles **do not cancel**.

Question 5 Propanone

The carbonyl carbon has three domains, so the shape is **trigonal planar** (sp^2). The C=O bond is strongly polar and the dipoles of the two CH_3 groups do not cancel it.

Question 6 Reliability

The stream wobbles, so the reading is uncertain: use a thin, steady stream and a video to read the deflection. Humidity changes the rod's charge: keep the same rubbing routine each time. **Repeat three times and average**.

Question 7 Limits of the test

Deflection depends on the stream's thickness, speed and density, and on how freely molecules rotate, which differ for each liquid. Hydrogen bonding in ethanol also affects it. **It is a rough indicator, not a measurement of dipole moment.**