

Lewis structures, shapes and hybridization of molecules

AP Chemistry · Lab

Name: _____ Date: _____ Class: _____

A stream of a polar liquid bends toward a charged rod, while a nonpolar liquid does not. In this lab you test five liquids and connect the result to molecular shape and polarity.

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

Aim

To test whether liquids are polar by observing how a stream of each liquid responds to a charged rod, and to relate the result to molecular shape.

Equipment

- Burette (or a plastic pipette) on a stand
- Plastic rod and cloth
- Small beakers and a ruler
- Water, ethanol, propanone, hexane and cyclohexane (about 20 mL of each)

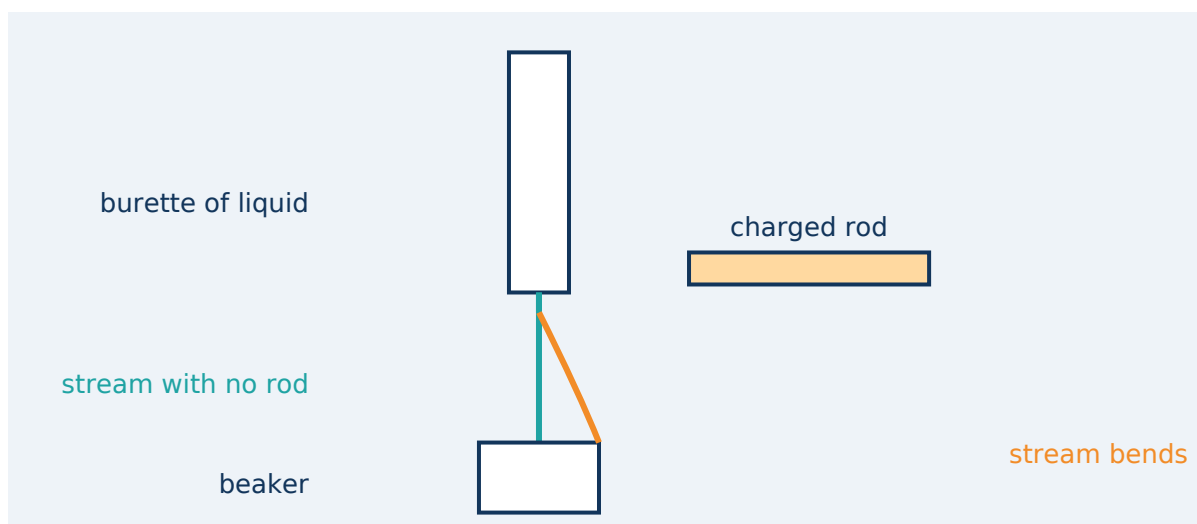
Safety

Safety

Ethanol, propanone, hexane and cyclohexane are flammable: no flames in the room. Wear goggles, work in a ventilated space and keep the quantities small. Dispose of waste liquids as instructed.

Method

1. Fill the burette with the first liquid and let it run in a thin continuous stream.
2. Rub the plastic rod with the cloth.
3. Hold the rod 2 cm from the stream, at the height 10 cm below the tap.
4. Measure the sideways deflection of the stream with the ruler.
5. Repeat three times, then test the other liquids.



Set-up: a charged rod attracts the stream of a polar liquid and leaves a nonpolar liquid unchanged.

Results

Liquid	Deflection (mm)	Dipole moment (D, reference)
Water	14	1.85
Propanone	16	2.88
Ethanol	11	1.69
Hexane	0	0
Cyclohexane	0	0

Analysis questions

Question 1 Pattern

Describe the pattern in the table between the deflection and the dipole moment.

Question 2 Why a stream bends

Explain why a charged rod attracts a stream of a polar liquid whatever the sign of the rod's charge.

Question 3 Nonpolar liquids

Explain why hexane shows no deflection, using its structure.

Question 4 Shape of water

Draw the Lewis structure of water and explain why the bent shape makes the molecule polar.

Question 5 Propanone

The structure of propanone is $(\text{CH}_3)_2\text{C}=\text{O}$. State the shape around the carbonyl carbon and explain why the molecule is polar.

Question 6 Reliability

Suggest two sources of error in measuring the deflection and one way to reduce each.

Question 7 Limits of the test

Ethanol gives a smaller deflection than water despite being polar. Suggest two reasons the deflection is not a perfect measure of the dipole moment.