Unit 6

Molecular Structure and Intermolecular Forces

SOURCE LOCK

Built from SCH3U video-distilled notes, video range P160–P168, 9 lessons. No outside textbook text added.

Big idea

- Molecular shape and polarity come from electron domains, bonding, and intermolecular forces.

Lesson map

- P160 Covalent Bond Formation, Sigma Bonds, and Pi Bonds (19m 59s)
- P161 Bond Parameters (15m 5s)
- P162 VSEPR and Molecular Shape: Core Concepts (21m 50s)
- P163 VSEPR and Molecular Shape: Visual Examples (11m 24s)
- P164 Hybrid Orbitals: sp, sp^2, and sp^3 (30m 30s)
- P165 Hybrid Orbitals and Delocalized Pi Bonds (29m 32s)
- P166 Bond Polarity and Molecular Polarity (31m 45s)
- P167 Hydrogen Bonding and van der Waals Forces (34m 14s)

Core Notes

What to know

- A single covalent bond is a sigma bond; double and triple bonds add pi bonds.
- Bond length, bond energy, and bond angle describe bond strength and geometry.
- VSEPR uses electron domains and lone pairs to predict molecular shape.
- Hybridization connects electron-domain geometry to orbitals: sp, sp^2, and sp^3.
- Molecular polarity depends on both bond polarity and the symmetry of the shape.
- Hydrogen bonding and van der Waals forces explain many boiling-point and solubility trends.

Problem-solving workflow

- Draw or read the Lewis structure.
- Count electron domains around the central atom.
- Use VSEPR to predict electron-domain geometry and molecular shape.
- Assign hybridization from the domain count.
- Decide whether bond dipoles cancel to determine polarity.

Common traps

- Do not confuse electron-domain geometry with molecular shape when lone pairs are present.
- A polar bond does not always make a polar molecule; symmetry can cancel dipoles.
- Pi bonds require unhybridized p orbitals, so track sigma and pi bonds separately.
- Hydrogen bonding requires H bonded to N, O, or F and a nearby lone pair.

Teacher Moves

WHY THESE MATTER

These are the teacher-style moves distilled from the video notes: how to decide, not just what to memorize.

Move 1

- Molecular polarity needs both bond polarity and molecular shape. | Source: P160 00:01:53, P166 00:10:58, P167 00:05:48.

Move 2

- Assign hybridization from electron-domain count: sp, sp^2, sp^3. | Source: P164 00:06:07, P165 00:23:49, P168 00:08:07.

Move 3

- Use VSEPR by counting electron domains before naming the shape. | Source: P162 00:11:35, P163 00:10:37.

Move 4

- Connect bonding type to electron transfer or sharing. | Source: P164 00:01:33, P167 00:03:18.

Move 5

- Convert through moles before jumping between particles, mass, volume, and concentration. | Source: P161 00:00:39.

Move 6

- Hydrogen bonding needs H attached to N, O, or F plus a lone-pair acceptor. | Source: P167 00:13:27.

Worked Example Cards

video-pattern example

VSEPR shape, hybridization, and polarity

Source: Unit 6 VSEPR and polarity workflow, P162–P166

1. Draw or read the Lewis structure first.
2. Count electron domains around the central atom.
3. Four domains with two lone pairs gives a bent molecular shape.
4. For H_2O, the O center is sp^3 and the bent shape makes the molecule polar.

Answer: H_2O: bent, sp^3, polar.

video-pattern example

σ and π bond count

Source: Unit 6 σ/π clips, P160–P165

1. Every single bond is one σ bond.
2. A double bond has one σ bond and one π bond.
3. A triple bond has one σ bond and two π bonds.
4. Count each multiple bond by this pattern.

Answer: Double bond = 1 σ + 1 π; triple bond = 1 σ + 2 π.

Practice prompts

- Predict shape and hybridization from a Lewis structure.
- Count sigma and pi bonds in a molecule.
- Decide whether a molecule is polar and justify the answer.