

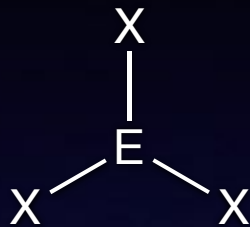
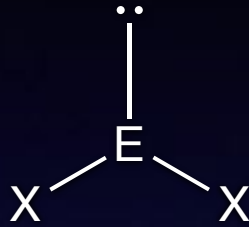
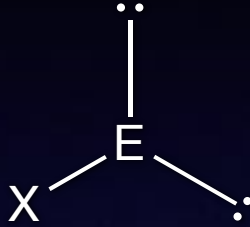

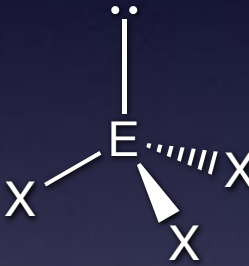
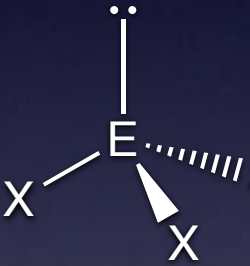
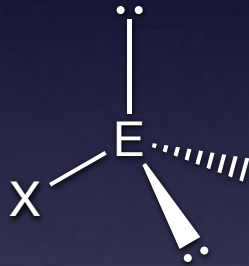
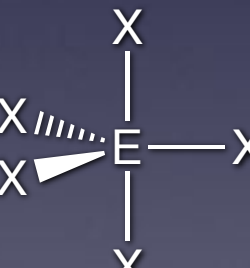
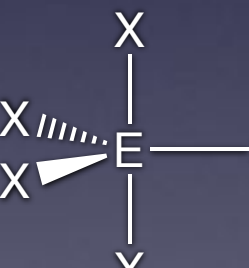
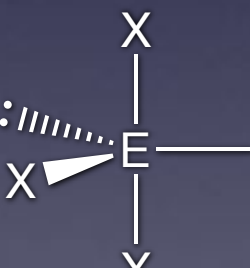
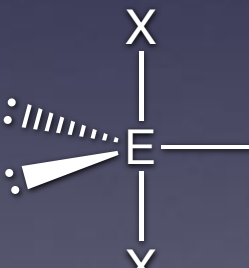



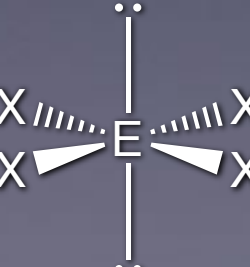
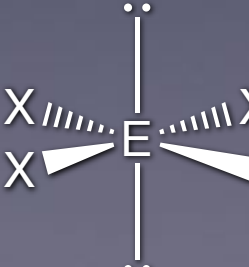

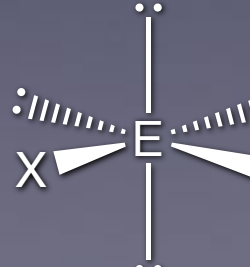


Previously in Molecularity...

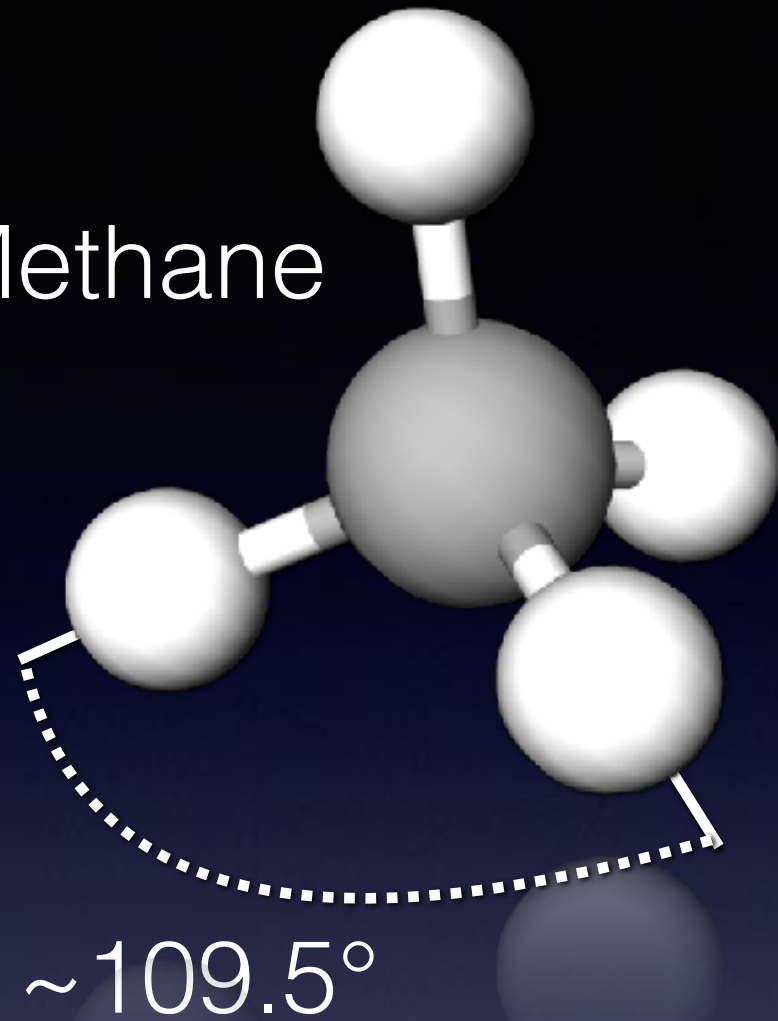
| SN | 0 LP | 1 LP | 2 LP | 3 LP | 4 LP | 5 LP |
|----|--|---|---|---|---|---|
| 2 |  <p>Linear</p> |  | | | | |
| 3 |  <p>Trigonal planar</p> |  <p>120° Bent</p> |  | | | |
| 4 |  <p>Tetrahedral</p> |  <p>Trig. pyramidal</p> |  <p>109.5° Bent</p> |  | | |
| 5 |  <p>Trig. bipyrimidal</p> |  <p>See-saw</p> |  <p>T-shaped</p> |  <p>Linear</p> |  | |
| 6 |  <p>Octahedral</p> |  <p>Sq. pyramidal</p> |  <p>Sq. planar</p> |  <p>T-shaped</p> |  <p>Linear</p> |  |

VSEPR Practice

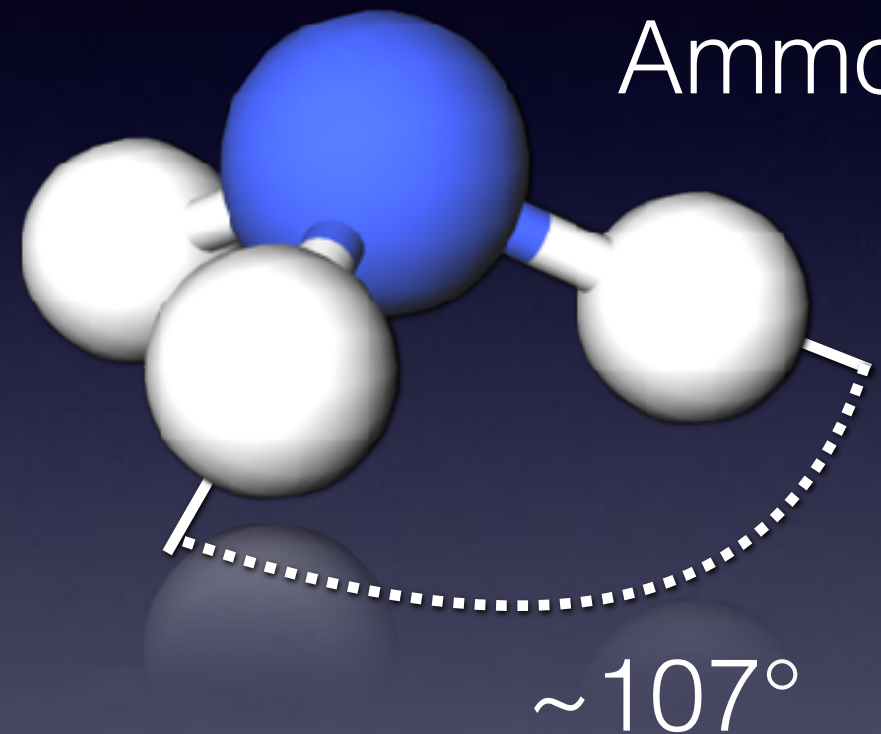
- Draw the Lewis dot structure, VSEPR structure and provide the VSEPR structure name for:
 - Formaldehyde, CH_2O
 - Phosphine, PH_3
 - Ethene (ethylene), CH_2CH_2
 - Bromine pentachloride
 - Bromine trichloride

Lone pairs are fat #3

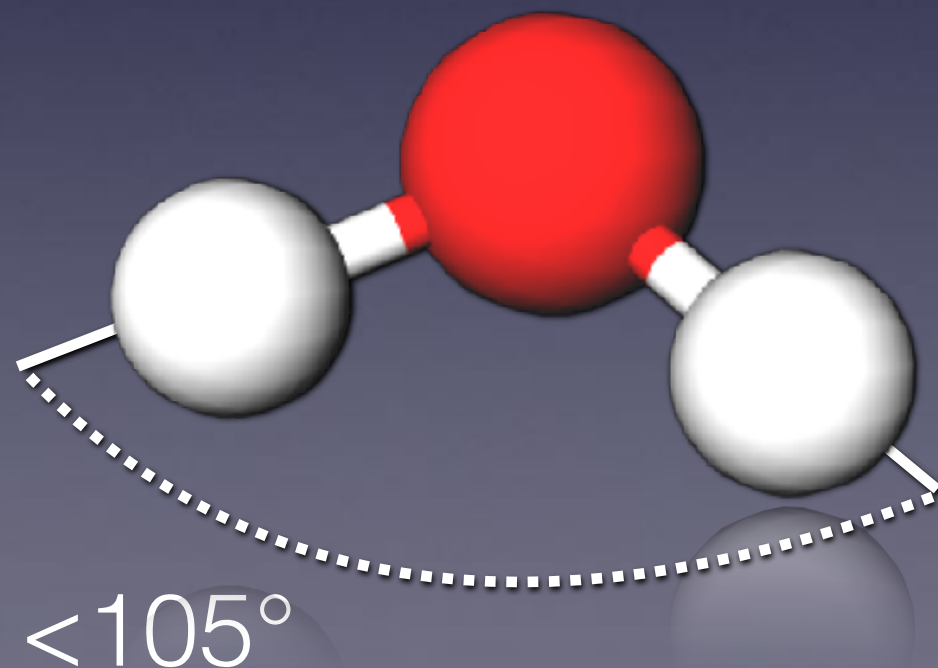
Methane



Ammonia



Water



Upcoming schedule

- Monday:
§5.6-9 VSEPR wrap-up
Good problems in Tro: 5.53–68
§5.2 and §5.10 Shapes, Dipoles, Polarity, oh my!
Good problems in Tro: 5.69–74
- Tuesday:
§6.2 Atomic overlap and §6.3 Hybridization of atomic orbitals
Good problems in Tro: 6.25–34
- Wednesday:
§6.3 Hybridization and the associated molecules

Upcoming schedule

- Thursday: recitation
- Friday: Exam 2
 - Same rooms
 - Same breakdown by last name.
 - Same coversheet.
 - Entire book through §6.3 (hybridization). Focus on Ch 4+

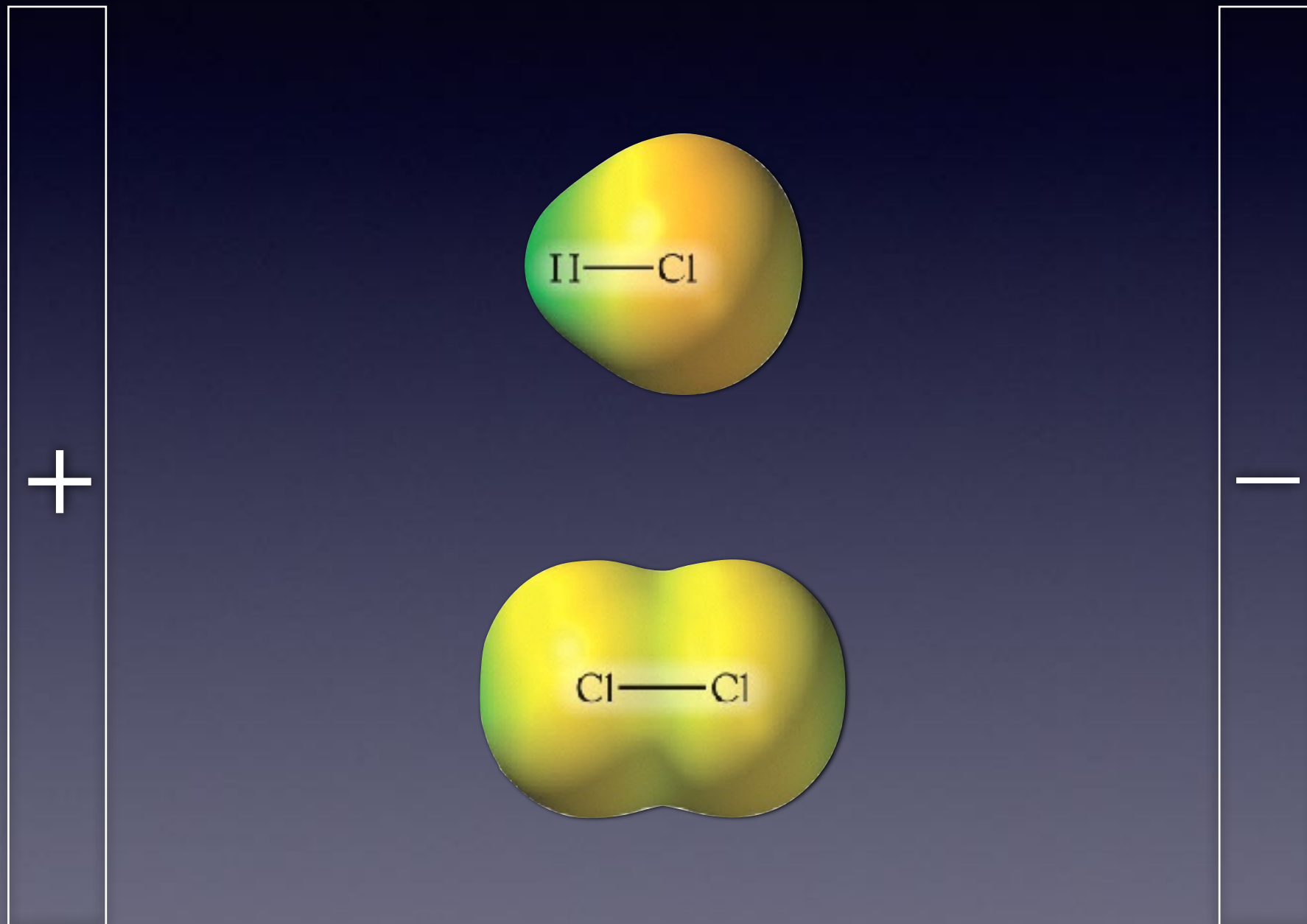


Where are we going today?

Ch1010-A17-A03 Lecture 17

- §5.2 and 5.10 Polarity and dipoles

What happens in an electric field?



What happens in an electric field?

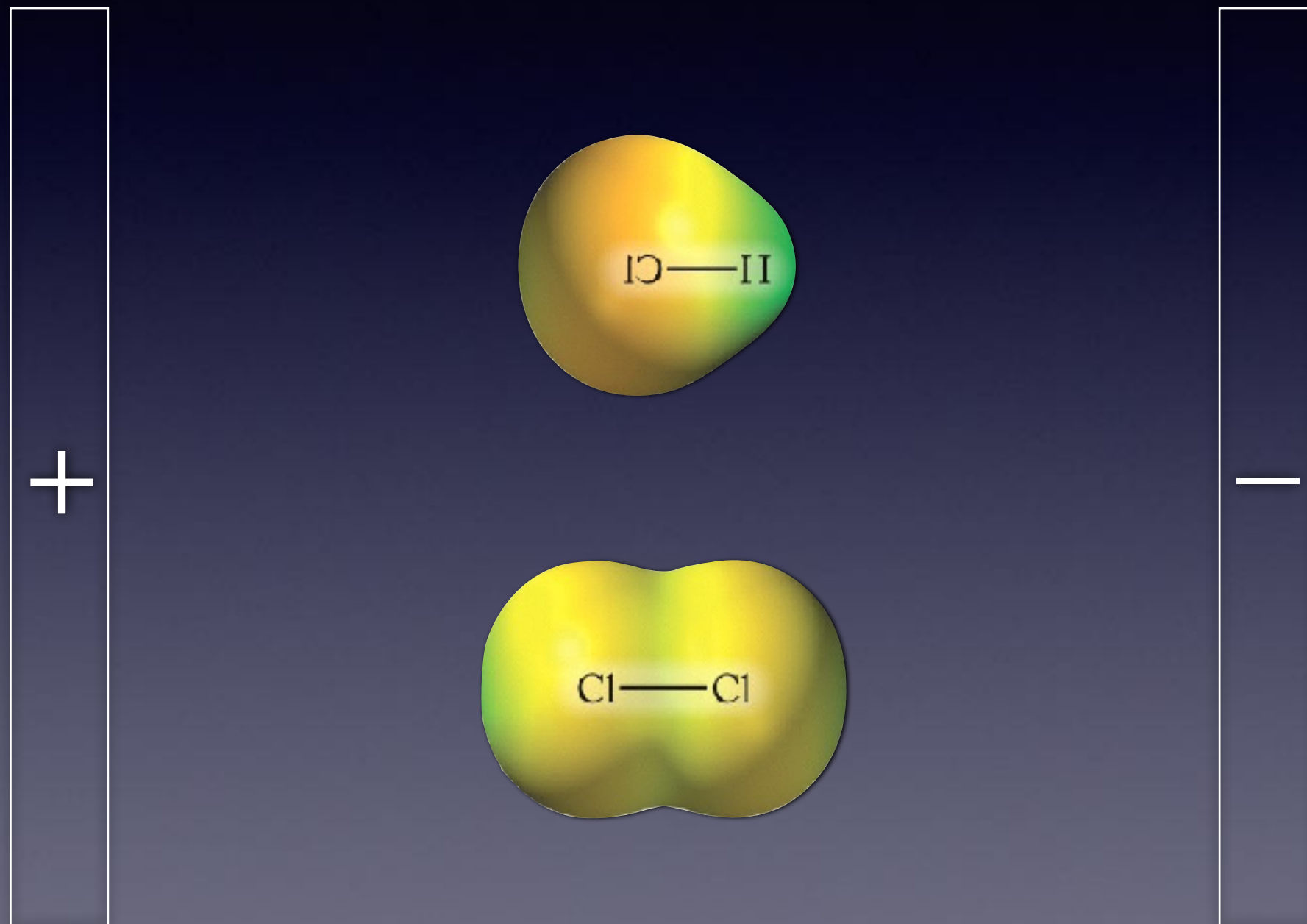
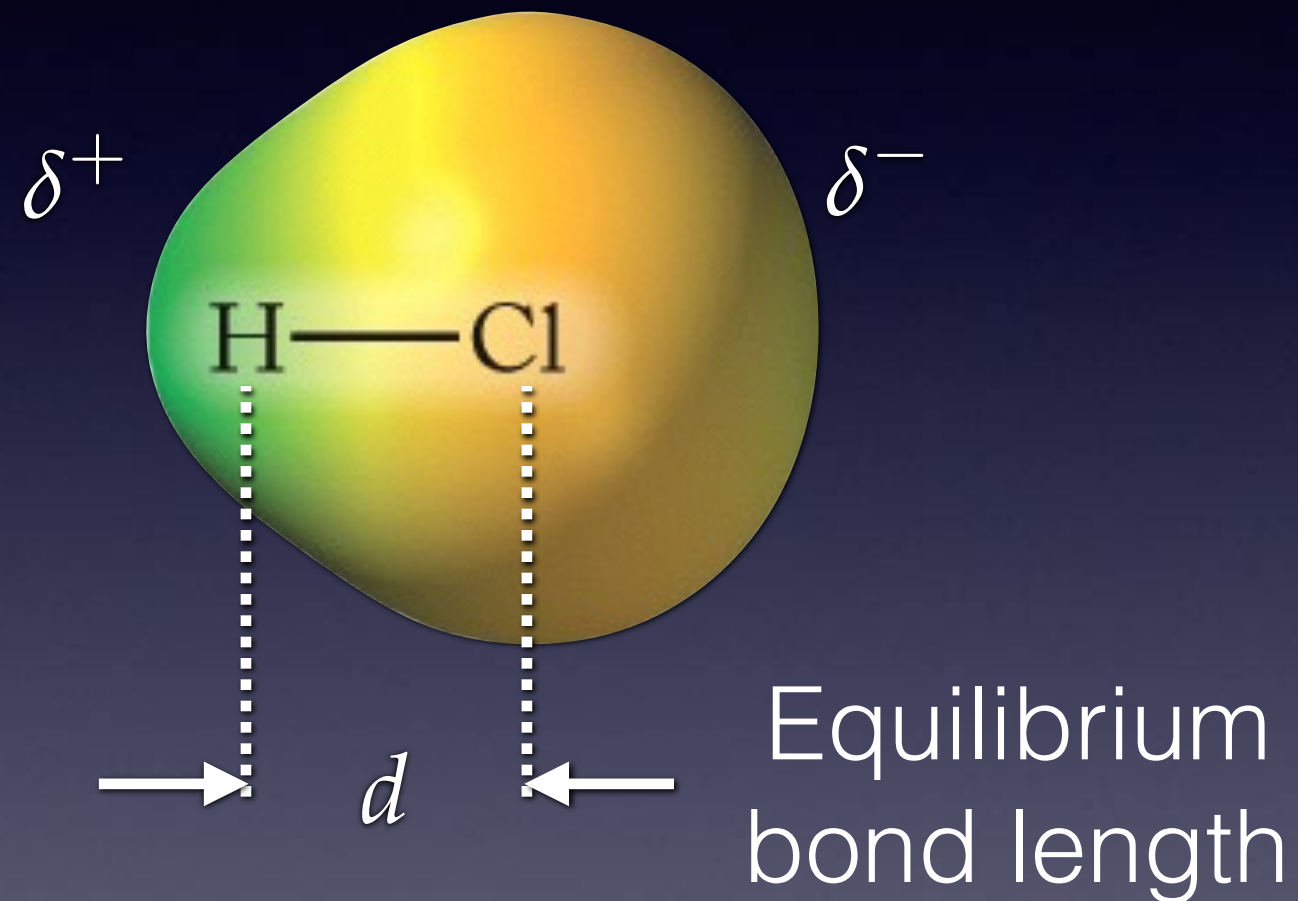


Fig. 4.7 GKF

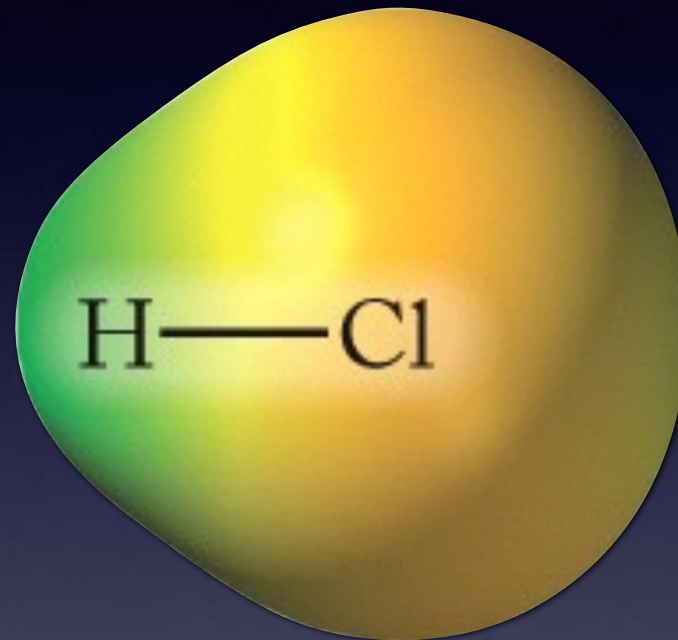
Dipole moment of a bond



$$\mu = \delta d$$

Dipole moment in C m
1 C m = 1 Debye

Dipole moment of a bond



Written pointing to the negative charge

$$\mu = \delta d$$

Dipole moment in C m
1 C m = 1 Debye

In your book...

$$\mu = \delta d$$

...is written...

$$\mu = qr$$

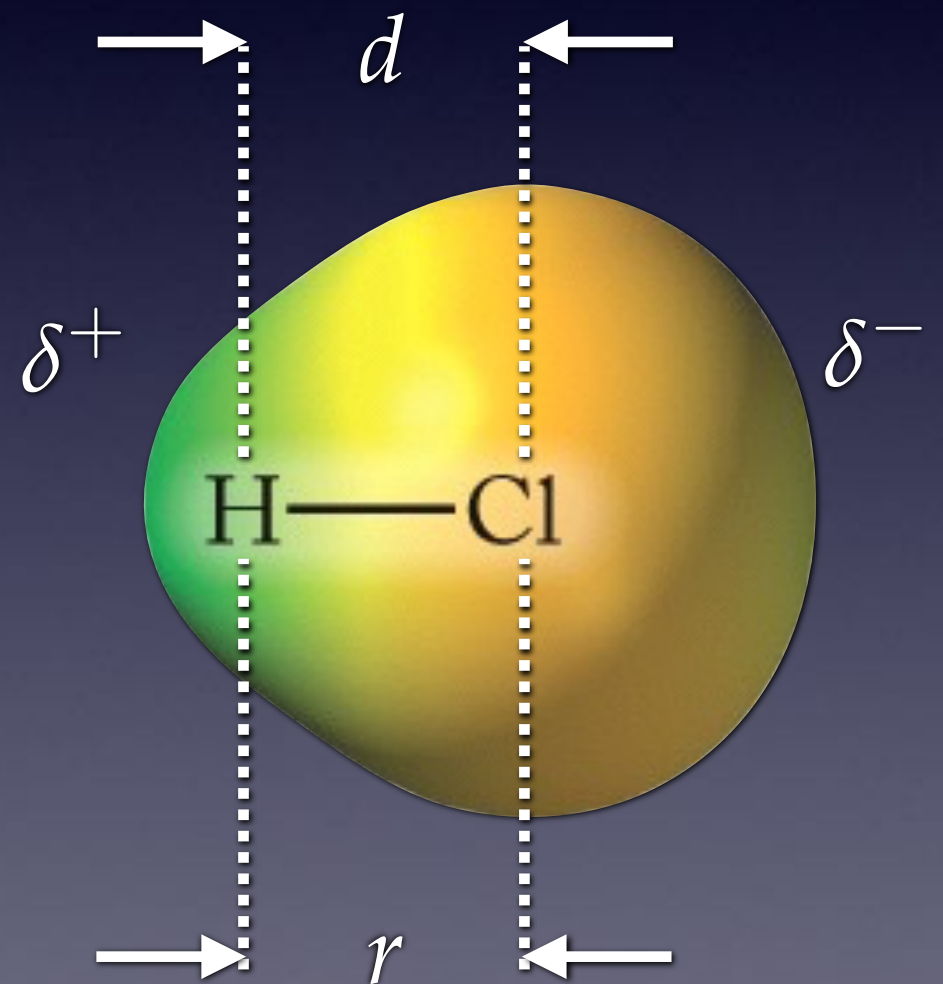


TABLE 5.2 Permanent Dipole Moments of Several Polar Molecules

| Formula | Structure with Bond Dipole(s) | Direction of Overall Dipole | Dipole Moment (debyes) |
|--------------------|---|-----------------------------|------------------------|
| HF |  | | |
| H ₂ O | | | |
| NH ₃ | | | |
| CHCl ₃ | | | |
| CCl ₃ F | | | |

TABLE 5.2 Permanent Dipole Moments of Several Polar Molecules

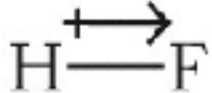
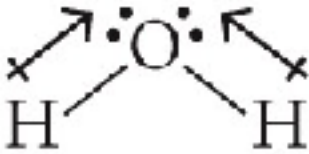
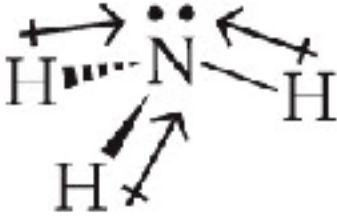
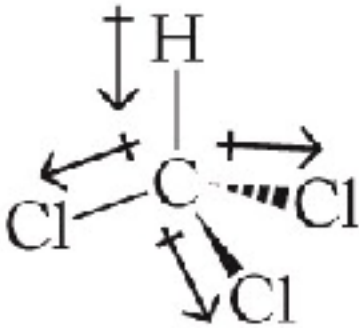
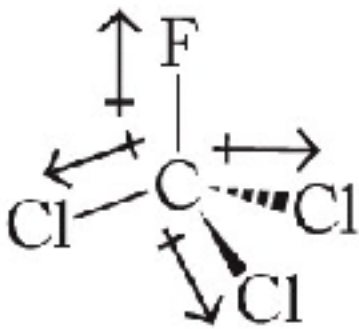
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|--------------------|--|-----------------------------|------------------------|
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TABLE 5.2 Permanent Dipole Moments of Several Polar Molecules

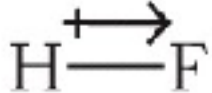
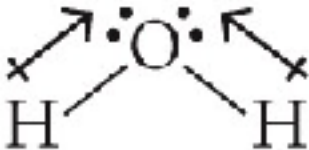
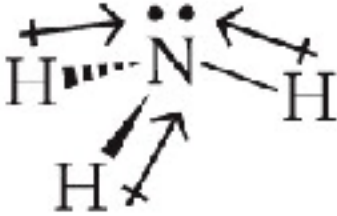
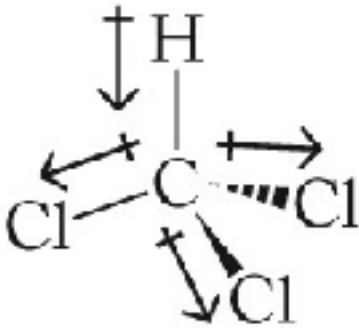
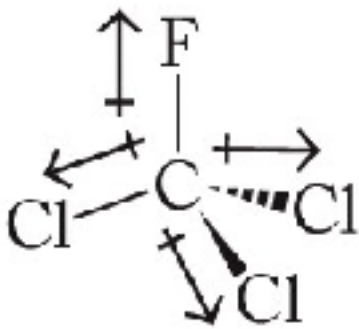
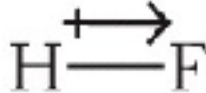
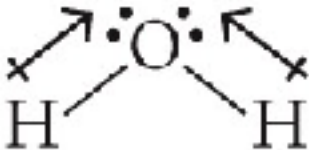
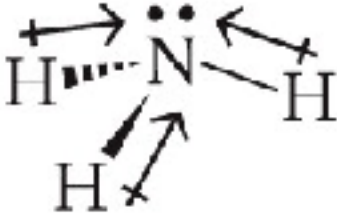
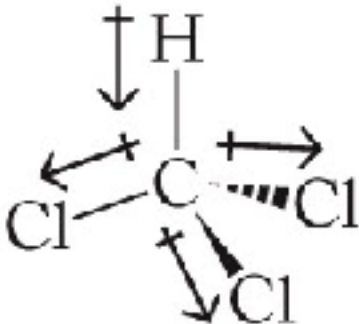
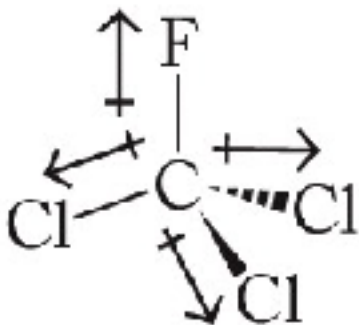
| Formula | Structure with Bond Dipole(s) | Direction of Overall Dipole | Dipole Moment (debyes) |
|--------------------|--|-----------------------------|------------------------|
| HF |  | \longleftrightarrow | |
| H ₂ O |  | \updownarrow | |
| NH ₃ |  | \updownarrow | |
| CHCl ₃ |  | \downarrow | |
| CCl ₃ F |  | \updownarrow | |

TABLE 5.2 Permanent Dipole Moments of Several Polar Molecules

| Formula | Structure with Bond Dipole(s) | Direction of Overall Dipole | Dipole Moment (debyes) |
|--------------------|--|-----------------------------|------------------------|
| HF |  | \longleftrightarrow | 1.91 |
| H ₂ O |  | \updownarrow | 1.85 |
| NH ₃ |  | \updownarrow | 1.47 |
| CHCl ₃ |  | \downarrow | 1.04 |
| CCl ₃ F |  | \updownarrow | 0.45 |

To think about on your own...

- Would the following molecules have permanent dipoles? If so, in what direction and what might the dipole moment be?
 - Phosgene, COCl_2 ; XeCl_2Br_2 ; Methanol CH_3OH
- Do resonance structures change dipoles? Why or why not?
- Additionally, think about what bond lengths angles might be...
- Similar problems from Recitation 4...

VSEPR Practice

- Draw the Lewis dot structure, VSEPR structure and provide the VSEPR structure name for:
 - Formaldehyde, CH_2O
 - Phosphine, PH_3
 - Ethene (ethylene), CH_2CH_2
 - Bromine pentachloride
 - Bromine trichloride

VSEPR Practice

- Draw the Lewis dot structure, VSEPR structure and provide the VSEPR structure name for:
 - Formaldehyde, CH_2O
 - Phosphine, PH_3
 - Ethene (ethylene), CH_2CH_2
 - Bromine pentachloride
 - Bromine trichloride

What are the polarities of these molecules?
How would they align in an electric field?



Where did we go today?

Ch1010-A17-A03 Lecture 17

- §5.2 and 5.10 Polarity and dipoles

Next time...

- § 6.2 Orbital overlap / chemical bonds
- § 6.3 Hybridization