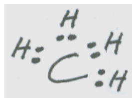
*<u>Do Now</u>: Draw the e- dot of **CH_4**. Predict its shape.*

Group 14:

<u>Shape</u>: Square

<u>Why not?</u>



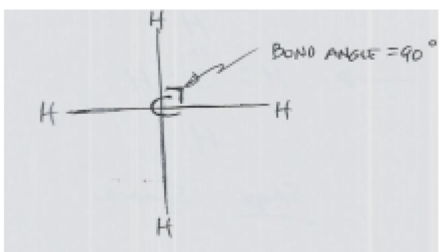
*This dot structure satisfies the OCTET RULE, but it shows the e- pairs too close to each other. <u>REMEMBER</u>: "Like charges repel each other." To predict the shape of a molecule you must consider the **repulsion** between e- pairs in adjacent bonds.*

<u>Aim</u>: How can we predict the 3-D shape of a molecule? (molecular geometry)

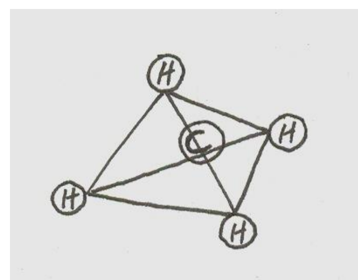
1. <u>V</u>alence <u>S</u>hell <u>E</u>lectron <u>P</u>air <u>R</u>epulsion Theory (**VSEPR**) says, since valence shell electron pairs **repel** each other, molecules take on shapes that keep them as far apart as possible.

Going back to **CH_4**,

A) **2D** VS. **3D**



Square shape

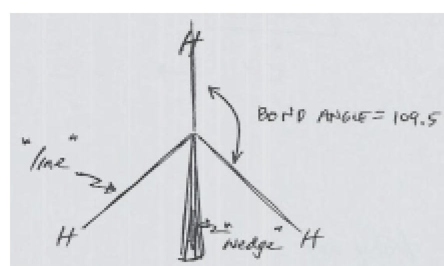


Picture the C atom in the center of a tetrahedron; the H atoms are in the corners.

To draw this shape more easily, we use 3 lines & a wedge.

line - points away from you

wedge - points towards you

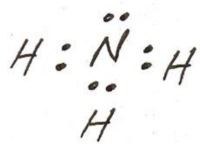


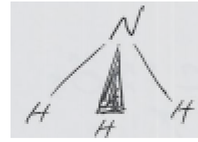
The **tetrahedral** shape is better b/c the e^- pairs in adjacent bonds are further apart.

B) Anytime there are **4** pairs of e^- involved in bonds ("**bonding pairs**") around a central atom, the shape of the molecule will be **tetrahedral**.

Don't be square. Be tetrahedral, man!

2. **NH_3**

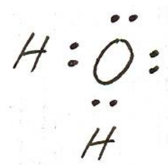


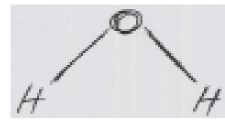


1 “lone pair” of e^- - not bonded
3 “bonding pairs”

Shape: **Pyramidal**

3. **H_2O**





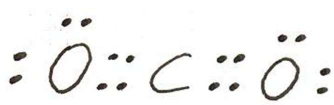
2 lone pairs
2 bonding pairs

Shape: **Angular (bent)**

4. **HCl** and **$H_2O_2N_2Cl_2Br_2I_2F_2$’s**
Any molecule consisting of only **2** atoms must have a **linear** shape.

H-Cl H-H O=O $N\equiv N$ Cl-Cl Br-Br I-I F-F

5. **CO_2** is a “special case” b/c you have to learn more chemistry to explain its shape. So, just remember when there’s 2 consecutive double bonds the shape is linear.



Shape: **Linear**