



Cycle 6 Chemistry I Lesson 1

AGENDA – “Shape of Molecules” Unit

Lab day is WEDNESDAY be prepared

Warmup: Preassessment – sorry! I hope you guys at least remember Lewis Structures!

Vocab: “VSEPR”

Classwork:

Balloon Models

Take notes on basic shapes

HW: Type II writing

– borane (BH_3) vs ammonia (NH_3)





Why are the Shapes of Molecules Important?

Shapes of molecules determine how they react with each other.

Basic polarity – oil & water don't mix – depends on shapes of molecules. The biological 'cell' is built by membranes that assemble based on polarity.

Biology – LIFE – is built out of 'molecular machines'. Let's watch a video (thanks Harvard Biovisions).





LIFE as molecular machines

<https://www.youtube.com/watch?v=FJ4N0iSeR8U>

What determines the shape of a molecule?

VSEPR: Valence Shell Electron Pair Repulsion Theory.





Today's model is: **Balloons!**

- **Volunteers needed to: Inflate 2 balloons and tie them together as tightly and closely as you can.
This should give a “Linear” shape**
- **More volunteers needed to do same with 3 balloons.
This should give a propellor shape, we call it “Trigonal Planar”**
- **And somebody help to do 4 (tricky but I think we can do it).
We call this shape “Tetrahedral”.**




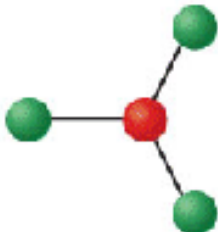
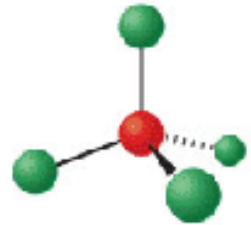


Take down Vocab (sketch shapes)

Linear (example: CO_2)

Trigonal Planar (example: BF_3)

Tetrahedral (example: CH_4)

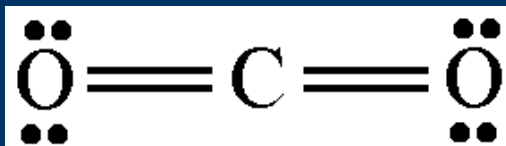
Bond angles	Spatial geometry
180°	 Linear
120°	 Trigonal planar
109.5°	 Tetrahedral



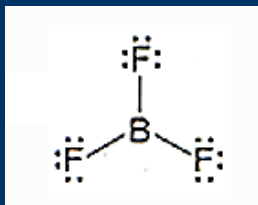
Valence-Shell Electron Pair Repulsion

Bonds made of electrons, which repel
Just like the balloons!

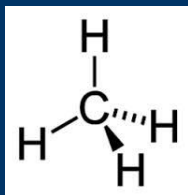
2 Bonds repel each other in CO_2



3 Bonds repel each other in BF_3



4 Bonds repel each other in CH_4



Bond angles	Spatial geometry
180°	<p>Linear</p>
120°	<p>Trigonal planar</p>
109.5°	<p>Tetrahedral</p>



Type I Writing: 3-5 sentences

- Borane (BF_3) molecules have a flat, trigonal planar geometry. However, ammonia (NH_3) molecules have a 'trigonal pyramid' shape instead. This is known to be true by X-Ray measurements.
- Can you explain why this happens? HINT: look at the Lewis Structure. How many electron pairs are around the Boron in BF_3 ? How many electron pairs surround Nitrogen in NH_3 ?

