

Chemical Bonding 4.7

Molecular Shape
VSEPR Theory
Part II. Shapes Resulting from
5 and 6 Charge Clouds

VSEPR Theory

Valence Shell Electron Pair Repulsion Theory

- Charge clouds repel each other
- Terminal atoms move as far away from one another as possible
- Results in distinctive geometric shapes

VSEPR Theory

Step 1. Count the number of **charge clouds**, **bonds**, and **lone pairs** around **the central atom**.

(a) Each item in this list is a **single charge cloud**:

- One Single bond (consisting of 2 electrons)
- One Double bond (consisting of 4 electrons)
- One Triple bond (consisting of 6 electrons)
- One Lone pair (consisting of 2 electrons)
- One single unpaired electron (consisting of 1 lone electron)

VSEPR Theory

(b) Each item on this list is considered **one bond**:

- A Single bond (consisting of 2 electrons)
- A Double bond (consisting of 4 electrons)
- A Triple bond (consisting of 6 electrons)

(c) Each item on this list is considered a **lone pair**:

- One lone pair (consisting of 2 electrons)
- One single unpaired electron (consisting of 1 electron)

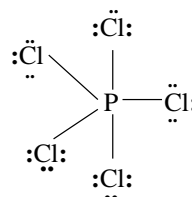
VSEPR Theory

Step 2. Predict the shape.

— There are 7 shapes that result from 5 or 6 charge clouds.

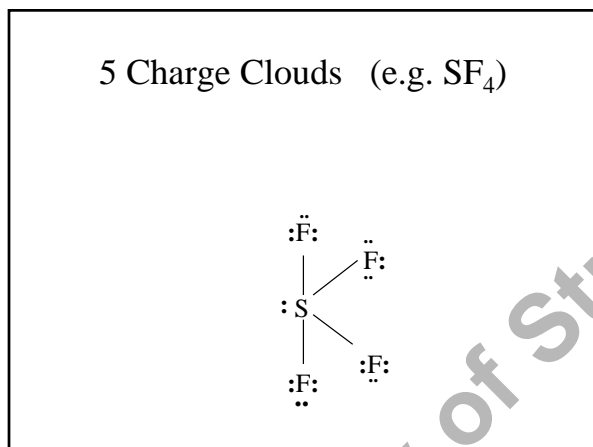
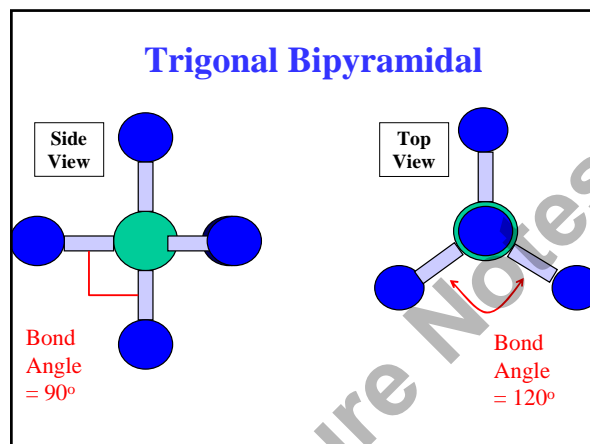
- You must know them all by name.
- You must know the bond angles for each.

5 Charge Clouds (e.g. PCl_5)



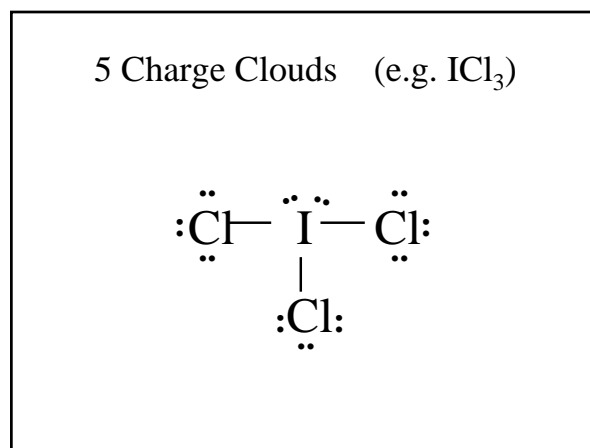
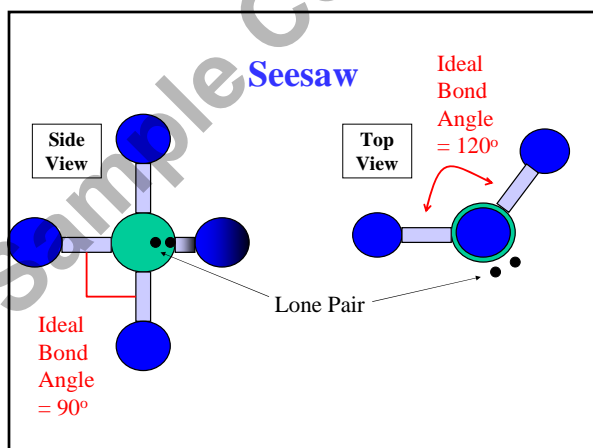
VSEPR Theory

Charge Clouds	Bonds	Lone Pairs	Shape
5	5	0	Trigonal Bipyramidal



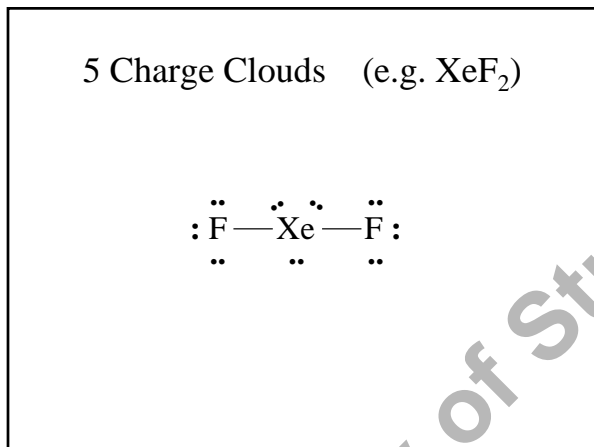
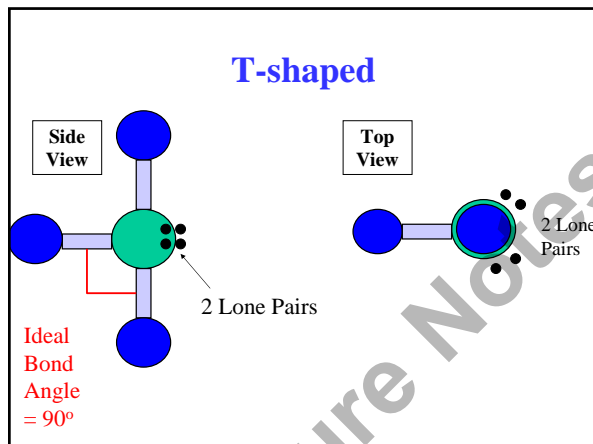
VSEPR Theory

Charge Clouds	Bonds	Lone Pairs	Shape
5	4	1	Seesaw



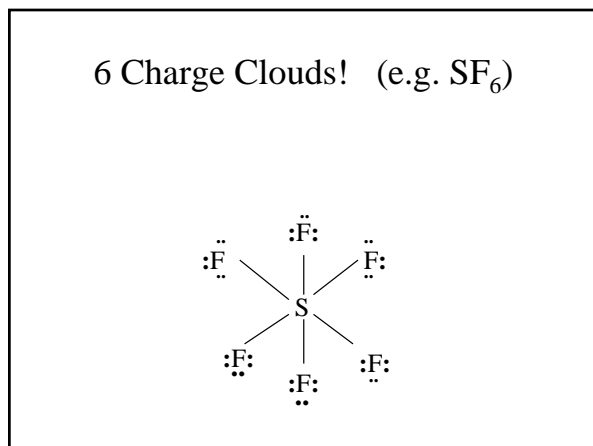
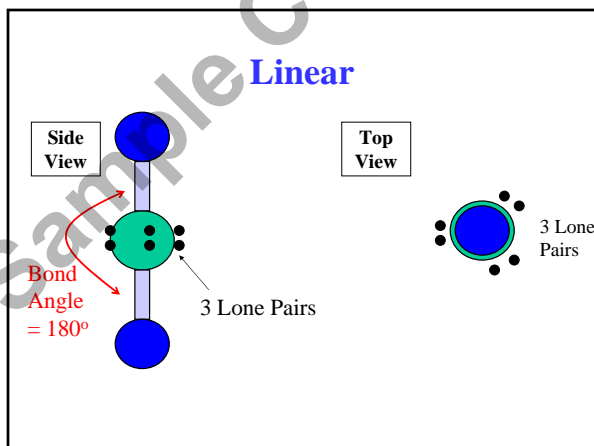
VSEPR Theory

Charge Clouds	Bonds	Lone Pairs	Shape
5	3	2	T - shaped



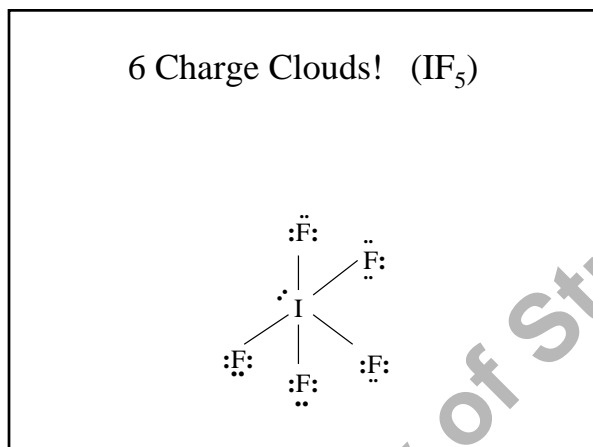
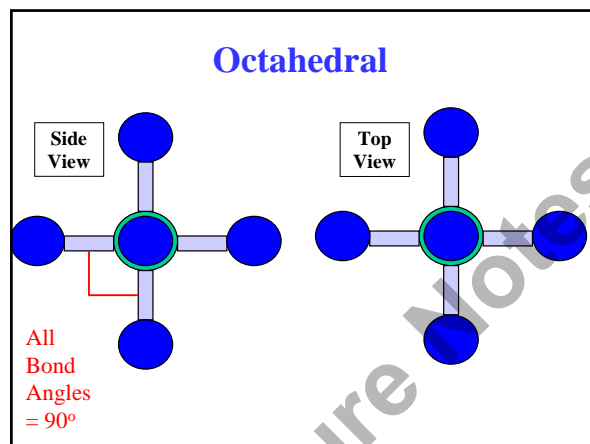
VSEPR Theory

Charge Clouds	Bonds	Lone Pairs	Shape
5	2	3	Linear



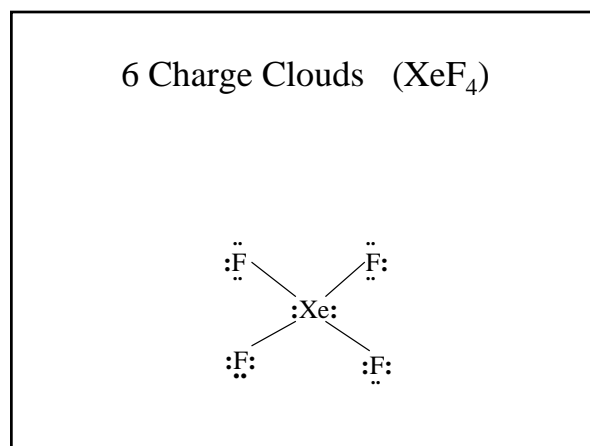
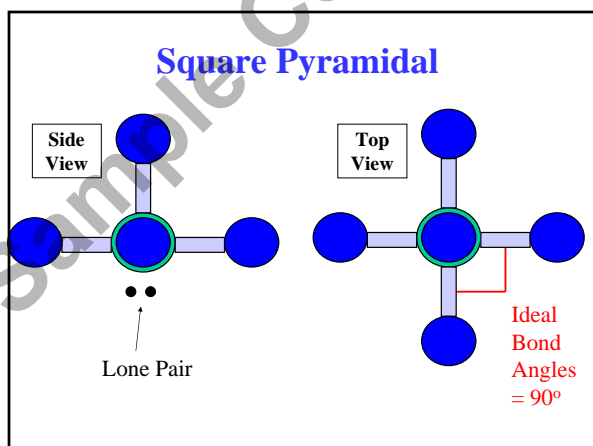
VSEPR Theory

Charge Clouds	Bonds	Lone Pairs	Shape
6	6	0	Octahedral

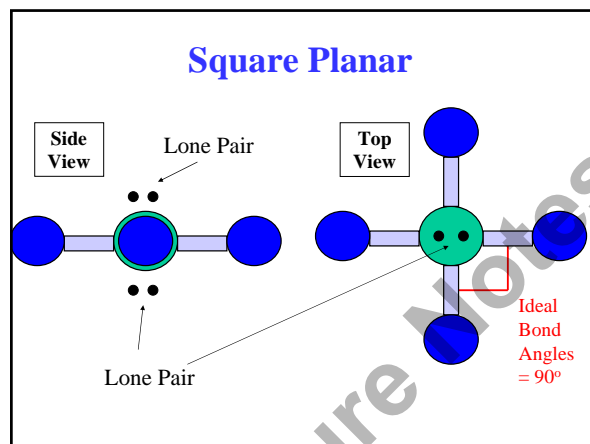


VSEPR Theory

Charge Clouds	Bonds	Lone Pairs	Shape
6	5	1	Square Pyramidal



VSEPR Theory			
Charge Clouds	Bonds	Lone Pairs	Shape
6	4	2	Square Planar



Sample Copy of Students' Lecture Notes