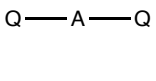
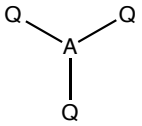
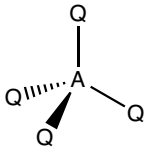
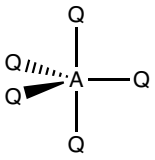
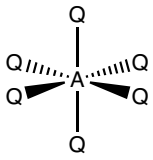
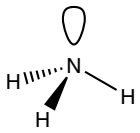
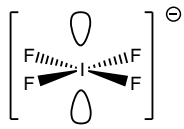
SHAPES OVERVIEW

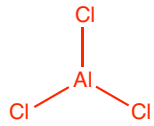
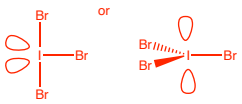
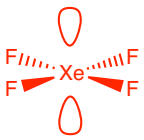
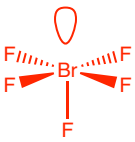
number of electron pairs*	2 pairs	3 pairs	4 pairs	5 pairs	6 pairs
shape					
name of shape	linear	trigonal planar	tetrahedral	trigonal bipyramidal	octahedral
bond angle	180º	120º	109.5º	120º, 90º	90º

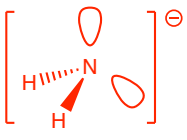
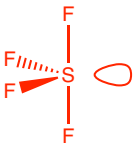
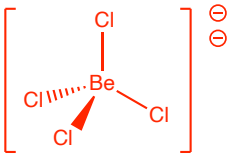
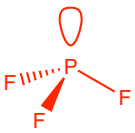
(* double bond counts as one pair for this)

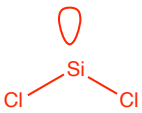
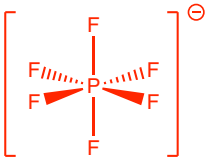
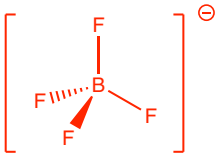
- The electron pairs repel as far as possible to produce these shapes.
- Some of these sites may be taken by lone pairs (non-bonding pairs) rather than bonding pairs. The lone pairs contribute to the shape of the molecule being what it is, but we do not include them when naming the shape – the name is focused on the shape of the atoms.
- Lone pairs repel more than bonding pairs and this can reduce bond angles.

The process to deduce a shape (assuming all bonds are single bonds):

	NH_3	**IF_4^-**
1) Count the number of electrons on the central atom. If the species is charged, add or remove electron(s) to account for the charge.	N is in group 5 so has 5 outer shell electrons	I is in group 7 so has 7 outer shell electrons; however the species is 1– and so there is one extra electron, so there are 8 outer shell electrons.
2) Each atom forms one bond to the central atom using one of the central atom's electrons. How many electrons are left and so how many lone pairs are there?	3 of the 5 electrons are used in the bonds to N this leaves 2 other electrons which make 1 lone pair	4 of the 8 electrons are used in the bonds to I this leaves 4 other electrons which make 2 lone pairs
3) How many electron pairs all together?	3 bonding pair + 1 lone pair = 4	4 bonding pair + 2 lone pair = 6
4) What is the shape based on?	4 electron pairs mean the shape is based on a tetrahedron	6 electron pairs mean the shape is based on a octahedron
5) Take into account the lone pairs	3 of the 4 pairs are bonds so the shape based on the bonds is trigonal pyramidal.  bond angle 107° (Bond angles will be slightly less than the normal tetrahedral bond angle due to the extra repulsion from the lone pair.)	4 of the 6 pairs are bonds so the shape based on the bonds is square planar (the lone pairs get as far apart as possible and go on opposite sides).  bond angle 90° (As the lone pairs are opposite each other, the extra repulsions cancel each other out)

Species	$AlCl_3$	IBr_3	XeF_4	BrF_5
Sketch				
Name of shape	trigonal planar	T-shape or trigonal planar	square planar	square pyramid
Expected bond angles	120º	about 89º or 120º	90º	about 88-89º

Species	NH_2^-	SF_4	$BeCl_4^{2-}$	PF_3
Sketch				
Name of shape	bent	see-saw	tetrahedral	trigonal pyramidal
Expected bond angles	about 104.5º	about 88-89º & 118-119º	109.5º	about 107º

Species	$SiCl_2$	BeF_2	PF_6^-	BF_4^-
Sketch				
Name of shape	bent	linear	octahedral	tetrahedral
Expected bond angles	about 118º	180º	90º	109.5º