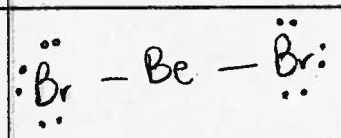
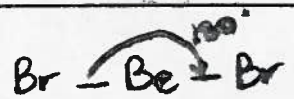
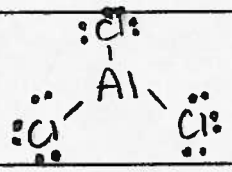
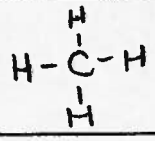
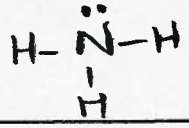
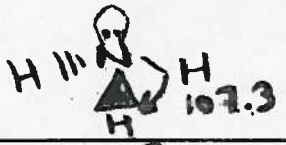
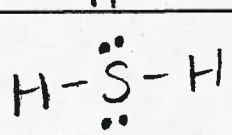
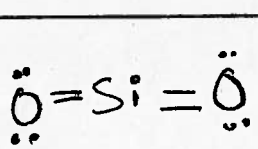
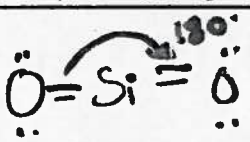
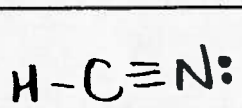
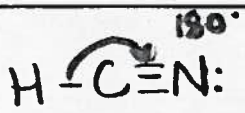
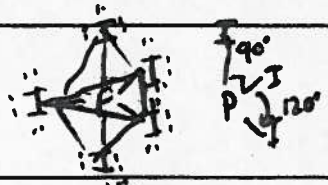
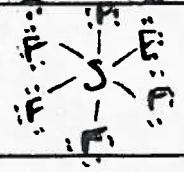
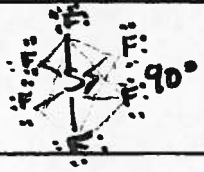
Name: _____ Date: _____

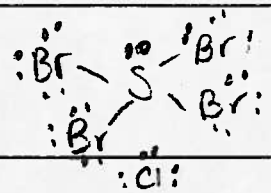
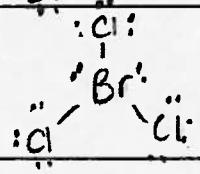
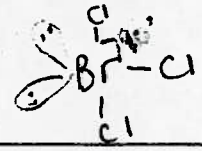
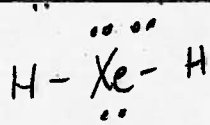
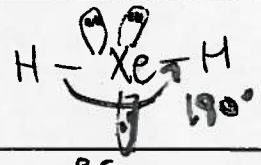
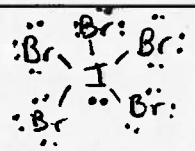
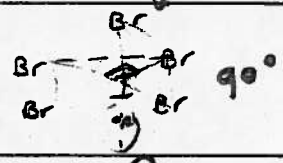
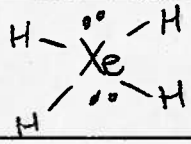
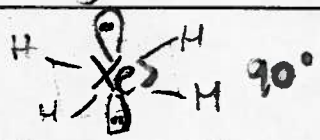
BCI SCIENCE
SCH 4U

Molecular Geometry: Predicting Molecular Shapes

Purpose: To determine the shapes of molecules using the molecular model kits and VSEPR theory. (Ref. pg's 178-186)

Observations:
Assemble the following molecules using the molecular model kits. Complete the chart and use the textbook to assist you in naming the shapes.

molecular formula	Lewis diagram	3-D diagram	Name of shape (general and specific)
$BeBr_2$			linear
$AlCl_3$			trigonal planar
CH_4			tetrahedral
NH_3			(g) tetrahedral (s) trigonal pyramidal
H_2S			(g) tetrahedral (s) angular
SiO_2			linear
HCN			linear
PI_5			trigonal bipyramidal
SF_6			octahedral

NG 40 V 34 B = 3 π LE **SBr_4** NG = 42 V = 34 B = 4 LE = 26			G: trigonal bipyramidal S: see saw
NG = 32 Ve = 28 B = 2 π **$BrCl_3$** NG = 34 V = 28 B = 3 LE = 22			G: trigonal bipyramidal S: ~~angular~~ T-shape
NG = 12 Ve = 10 B = 1 π **XeH_2** NG = 14 V = 10 B = 2 LE = 6			G: trigonal bipyramidal S: linear
NG 48 Ve 42 B 3 π **IBr_5** NG 52 Ve 42 B 5 LE 32			G: octahedral S: square pyramidal
NG 16 Ve 12 B 2 π **XeH_4** NG 20 V 12 B 4 LE 4			G: octahedral S: square planar

Summarizing Your Ideas:

Complete the following chart using the examples from your lab. Only use the examples with single bonds.

The Shapes of Molecules and Ions

Number of Electron Pairs Around Central Atom	Orientation of Electron Pairs	Number of Bonding and Lone Pairs (x BP, y LP)	Bond Angles	Specific Name of Shape	Example
2	linear	2BP, 0LP	180°	linear	$MgBr_2$
3	trigonal planar				
4					
5					
6					

The Shapes of Molecules and Ions: Answers

Number of Electron Pairs Around Central Atom	Orientation of Electron Pairs	Number of Bonding and Lone Pairs (x BP, y LP)	Bond Angles	Name of Shape	Example
2	linear	2 BP, 0 LP	180°	linear	$MgBr_2$
3	trigonal planar	2 BP, 1 LP 3 BP, 0 LP	120° 120°	bent trigonal planar	BF_2 $AlCl_3$
4	tetrahedral	4 BP, 0 LP	109.5°	tetrahedral	CH_4
	tetrahedral	3 BP, 1 LP	107.3° < 109.5°	trigonal pyramidal	NH_3
	tetrahedral	2 BP, 2 LP	104.5° < 109.5°	v-shaped, angular, or bent	H_2S
5	trigonal bipyramidal	5 BP, 0 LP	120° & 90°	trigonal bipyramidal	PI_5
	trigonal bipyramidal	4 BP, 1 LP	120° & 90°	seesaw	SBr_4
	trigonal bipyramidal	3 BP, 2 LP	90°	T-shaped	$BrCl_3$
	trigonal bipyramidal	2 BP, 3 LP	180°	linear	XeH_2
6	octahedral	6 BP, 0 LP	90°	octahedral	SF_6
	octahedral	5 BP, 1 LP	90°	square-based pyramid	IBr_5
	octahedral	4 BP, 2 LP	90°	square planar	XeH_4