CH301 Worksheet 6: What can you find out about structure and bonding by creating 3 dimensional structures of molecules?

Explanation of columns:

A   Compound name or structure

B   Creating a 2D Lewis Structure: Create symmetrical layout of atoms and assign EN values to each atom

C   Creating a 2D Lewis Structure: Calculate $\Delta EN > 1.5$, bond is ionic. If $\Delta EN < 1.5$, bond is covalent.

D   Creating a 2D Lewis Structure: How many valence electrons?

E   Creating a 2D Lewis Structure: Does structure follow octet rule or is it hypovalent , hypervalent or radical?

F   Creating a 2D Lewis Structure: Do you need to add electron pairs to the center atom to make resonance, double or triple bonds?

G   Creating a 2D Lewis Structure: Draw Lewis dot structure

H   Creating a 3D Lewis Structure: Count number of regions of electron density around central atom

I-K   Creating a 3D Lewis Structure: Determine electronic geometry, hybridization bond angle from regions of electron density

L-N   Creating a 3D Lewis Structure: Distinguish bonding and nonbonding electron pairs around central atom to determine molecular geometry

O-P   Creating a 3D Lewis Structure: Draw VSEPR 3-D structure first with all valence electrons and then displaying the dipoles from ΔEN

Q,R   Creating a 3D Lewis Structure: Firs count number of σ and pi bonds in molecule, then use $\Sigma \Delta EN = 0$ or $\Sigma \Delta EN \neq 0$ to determine molecular polarity

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
Molecular formula	Initial layout EN values	Ionic or Covalent	# valence e-	Hypo, hyper or octet?	Multiple bonds or resonance	2-D Lewis dot Structure	#e- rich regions	Elec. geometry	Hybridization	Bond angle	Bonding pairs	Unbonded pairs	Molecular geom..	3-D VSEPR structure	VSEPR with dipoles	How many sigma and pi bonds?	Polar or non polar
H_2O																	
NH_3																	
I_3^-																	
SO_2																	

Your turn—print out several copies of this chart and take on as many compounds as you can:

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
Molecular formula	Initial layout EN values	Ionic or Covalent	# valence e-	Hypo, hyper or octet?	Multiple bonds or resonance	2-D Lewis dot Structure	#e- rich regions	Elec. geometry	Hybridization	Bond angle	Bonding pairs	Unbonded pairs	Molecular geom..	3-D VSEPR structure	VSEPR with dipoles	How many sigma and pi bonds?	Polar or non polar

For example: C_2H_2, C_2H_4, C_2H_6, SCl_4, CO_2, $CO_3^=$, XeF_2, XeF_4, CH_3CH_2OH, CH_2Br_2, SCN^-, and on and on and on