Sticky Note for students

VSEPR Theory: Electronic Geometry (ED) Vs Molecular Geometry

Here a set of molecules have been given with its electronic geometry (based on hybridization) and molecular geometry (based on VSEPR theory)

To understand both hybridization and VSEPR theory, initially read hybridization and VSEPR theory from chemical bonding.

	Molecules	Hybridization	ED	Molecular geometry	Bond angles distorted?
1.	CCl_4	sp^3	tetrahedral	Tetrahedral [No lone pair (LP)]	No (109.5°)
2.	NH_3	sp^3	tetrahedral	Trigonal pyramidal [one LP]	Yes Less than 109.5°
3.	H_2O	sp^3	tetrahedral	Bent [Two LP]	Yes Less than 109.5°
4.	PF_3	sp^3	tetrahedral	Trigonal pyramidal [one LP]	Yes Less than 109.5°
5.	PF_5	sp^3d	trigonal bipyramidal	trigonal bipyramidal [No LP]	No 90° (axial-equatorial) 120°(equatorial), 180° (axial)
6.	SF_4	sp^3d	trigonal bipyramidal	See-saw [one LP]	Yes Less than 90°, 120° and 180°

7.	SF_6	sp^3d^2	octahedral	Octahedral [No LP]	No 90°
8.	CH_3^+	Sp^2	Trigonal planar	Trigonal planar [No LP]	No 120°
9.	ClO_2^-	sp^3	tetrahedral	Bent [Two LP]	Yes Less than 109.5°
10.	ClO_3^-	sp^3	tetrahedral	Trigonal pyramidal [one LP]	Yes Less than 109.5°
11.	ClO_4^-	sp^3	tetrahedral	Tetrahedral [No LP]	No (109.5°)
12.	KrF_2	sp^3d	trigonal bipyramidal	Linear [three LP]	Yes 180°
13.	XeF_4	sp^3d^2	octahedral	Square planar [Two LP]	No 90°
14.	XeF_6	sp^3d^3	pentagonal bipyramidal	Distorted octahedral (One LP)	Yes 90°
15.	XeO_3	sp^3	tetrahedral	Trigonal pyramidal [one LP]	Yes Less than 109.5°
16.	N_3^-	sp	linear	Linear [No LP]	No 180°
17.	NO_3^-	sp^2	trigonal planar	trigonal planar [No LP]	No 120°
18.	BrF_3	sp^3d	trigonal bipyramidal	T-shaped [Two LP]	Yes Less than 90°, and 180° (axial)
19.	XeO_2F_2	sp^3d	trigonal bipyramidal	See-saw [one LP]	Yes

					Less than 90°, 120° and 180°
20.	CO_3^{2-}	sp^2	trigonal planar	trigonal planar [No LP]	No 120°
21.	$BHCl_2$	sp^2	trigonal planar	trigonal planar [No LP]	No 120°
22.	HCN	sp	linear	Linear [No LP]	No 180°
23.	$\mathbf{I_3^-}$	sp^3d	trigonal bipyramidal	Linear [Three LP]	No 180°
24.	$\mathbf{IF_5}$	sp^3d^2	octahedral	square planar (two LP)	Yes 90°
25.	$\mathbf{XeF_3^+}$	sp^3d	trigonal bipyramidal	T-shaped (Two LP)	Yes Less than 90°, 180°

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Practice makes perfect
Make molecular models using clays to understand electronic geometry vs molecular geometry