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From Lewis Structures to Point Groups

Carry out the following instructions on the molecules listed below. Enter your responses in the spaces provided.

#	Molecule
1	H_2O (example)
2	CO_2
3	HCl
4	NH_3
5	BF_3
6	CH_4
7	H_2O_2
8	CH_2ClF
9	SF_6
10	XeF_4

1. Enter the chemical formula for the compound.

2. Determine the total number of valence electrons.

3. Draw a Lewis structure for the compound.

4. Share your Lewis structure with a partner to confirm that it is correct. If you and your partner(s) disagree, discuss your structure and come to an agreement on the correct Lewis structure.

5. After you have a correct Lewis structure, apply the VSEPR theory to predict and draw a three-dimensional (3D) representation of the molecule.

6. Determine the molecular geometry (e.g., linear, trigonal planar, etc.) and record it in the same space as your 3D drawing.

7. Using a molecular model kit, build a model of the molecule.

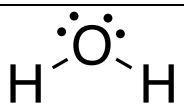
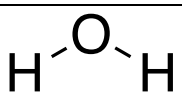
8. Using your 3D drawing and/or molecular model, identify as many symmetry elements as you can. You do not need to identify every instance of a particular type of symmetry element, but you should identify as many different types as you can. (e.g., E, C_n, σ, (σ_v, σ_h, σ_d), i, S_n)

9. Identify the principal rotation axis.

10. Using a symmetry flowchart, determine the point group of the molecule.

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1. Example

Formula	**Valence Electrons**	**Lewis Structure**	**3D Structure**
H_2O	8		 Bent or Angular
Types of Symmetry Elements Present		**Principal Axis**	**Point Group**
E – identity C_2 – proper rotation σ_v – reflection plane x 2		C_2	C_{2v}

2.

Formula	**Valence Electrons**	**Lewis Structure**	**3D Structure**
Types of Symmetry Elements Present		**Principal Axis**	**Point Group**

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3.

Formula	**Valence Electrons**	**Lewis Structure**	**3D Structure**
Types of Symmetry Elements Present		**Principal Axis**	**Point Group**

4.

Formula	**Valence Electrons**	**Lewis Structure**	**3D Structure**
Types of Symmetry Elements Present		**Principal Axis**	**Point Group**

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5.

Formula	**Valence Electrons**	**Lewis Structure**	**3D Structure**
Types of Symmetry Elements Present		**Principal Axis**	**Point Group**

6.

Formula	**Valence Electrons**	**Lewis Structure**	**3D Structure**
Types of Symmetry Elements Present		**Principal Axis**	**Point Group**

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7.

Formula	**Valence Electrons**	**Lewis Structure**	**3D Structure**
Types of Symmetry Elements Present		**Principal Axis**	**Point Group**

8.

Formula	**Valence Electrons**	**Lewis Structure**	**3D Structure**
Types of Symmetry Elements Present		**Principal Axis**	**Point Group**

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9.

Formula	**Valence Electrons**	**Lewis Structure**	**3D Structure**
Types of Symmetry Elements Present		**Principal Axis**	**Point Group**

10.

Formula	**Valence Electrons**	**Lewis Structure**	**3D Structure**
Types of Symmetry Elements Present		**Principal Axis**	**Point Group**