

## Molecular Polarity

*For each pair of molecules, draw the Lewis structures and determine which is most polar:*

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1) nitrogen triiodide or carbon disulfide

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2) silicon tetrafluoride or arsenic tribromide

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3) water or hydrogen sulfide

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4) oxygen or selenium dibromide

## Molecular Polarity Solutions

For each pair of molecules, draw the Lewis structures and determine which is most polar: **Note: Because of the difficulty of reproducing Lewis structures in this format, the Lewis structures of each molecule will not actually be presented in these solutions. However, each will be described in terms of commonly presented Lewis structures that all teachers are undoubtedly familiar with.**

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- 1) nitrogen triiodide or carbon disulfide

Nitrogen triiodide has a structure identical to ammonia, except that hydrogen is replaced with iodine. Carbon disulfide is identical to carbon dioxide except that oxygen is replaced with sulfur.

Nitrogen triiodide is most polar because the molecule is asymmetric, while carbon disulfide is symmetric, canceling out the dipoles of the bonds.

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- 2) silicon tetrafluoride or arsenic tribromide

Silicon tetrafluoride has a structure identical to methane, except that carbon is replaced with silicon and hydrogen replaced with fluorine. Arsenic tribromide is identical to ammonia, with arsenic replacing the nitrogen and bromine replacing hydrogen.

Arsenic tribromide is most polar because of the molecular asymmetry – SiF<sub>4</sub> is symmetric, causing the bond dipoles to cancel out.

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- 3) water or hydrogen sulfide

The structure of water is familiar, and the structure of hydrogen sulfide (H<sub>2</sub>S) is identical to water except that sulfur replaces oxygen.

Because the difference in Pauling electronegativities in water is 1.4 and the difference in hydrogen sulfide is 0.4, water is a more polar molecule than hydrogen sulfide.

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- 4) oxygen or selenium dibromide

Oxygen consists of two oxygen atoms double bonded to each other, and selenium dibromide is identical to water except that selenium replaces oxygen and bromine replaces hydrogen.

Oxygen is nonpolar because both atoms have identical electronegativities. Selenium dibromide is only slightly polar.