

Caffeine Problem for Week 1:

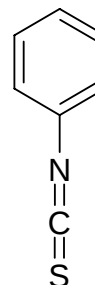
Chem 1C (Kahn)

1) A polar ($\mu > 0$) diatomic molecule with molar mass of about 28 reacts with a nonpolar ($\mu = 0$) diatomic molecule with molar mass of about 70. Draw the Lewis structures of the two reactants and the reaction product. Use the VSEPR model to predict the three-dimensional geometry of the product. (Hint: see chapter 6 in your text for the reaction).

Multiple choice answer version: pick correct

- A) One reactant has double bond; the product is tetrahedral
- B) One reactant has triple bond; the product is linear
- C) One reactant has single bond; the product is square planar
- D) One reactant has triple bond, the product is trigonal planar
- E) One reactant has double bond, the product is trigonal pyramidal

2) Phenylisothiocyanate (shown on the right) is an organic molecule that is used in biochemistry to determine the sequence of proteins and peptides via the Edman degradation method. You will learn about the Edman degradation in the organic chemistry course. For now, predict the three-dimensional structure of phenylisothiocyanate using concepts of hybridization and VSEPR.



Multiple choice answer version: pick correct

- A) The thiocyanate carbon has **linear** arrangement of adjacent N and S;
The thiocyanate nitrogen has **linear** arrangement of two adjacent carbons
The phenyl ring is **planar** with all angles about 120°
- B) The thiocyanate carbon has **V-shape** arrangement of adjacent N and S;
The thiocyanate nitrogen has **linear** arrangement for the two adjacent carbons
The phenyl ring is **planar** with all angles about 120°
- C) The thiocyanate carbon has **linear** arrangement of adjacent N and S;
The thiocyanate nitrogen has **bent** arrangement of the two adjacent carbons
The carbons in the phenyl ring have **tetrahedral** geometry.
- D) The thiocyanate carbon has **V-shape** arrangement for N and S;
The thiocyanate nitrogen has **bent** arrangement for N and S;
The carbons in the phenyl ring have alternating **trigonal pyramidal** geometries
- E) None of the above