***Chemistry***

**18: Representative Metals, Metalloids, and Nonmetals**

**18.4: Structure and General Properties of the Nonmetals**

45. Nitrogen in the atmosphere exists as very stable diatomic molecules. Why does phosphorus form less stable P4 molecules instead of P2 molecules?

Solution

In the N2 molecule, the nitrogen atoms have an σ bond and two π bonds holding the two atoms together. The presence of three strong bonds makes N2 a very stable molecule. Phosphorus is a third-period element, and as such, does not form π bonds efficiently; therefore, it must fulfill its bonding requirement by forming three σ bonds.

47. Determine the oxidation number of each element in each of the following compounds:

(a) HCN

(b) OF2

(c) AsCl3

Solution

(a) H = 1+, C = 2+, and N = 3–; (b) O = 2+ and F = 1–; (c) As = 3+ and Cl = 1–

49. Arrange the following in order of increasing electronegativity: F; Cl; O; and S.

Solution

S < Cl < O < F

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