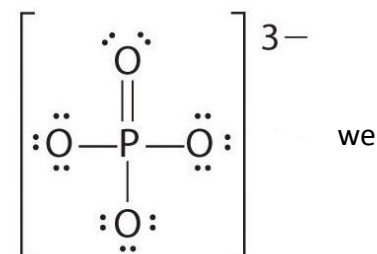


Answer on Question #57192 - Chemistry - Inorganic chemistry

Question:How does PO_4^{3-} , phosphate bond with four oxygen atoms (one by double bond and three through by single bonds) when bonding with only two oxygen atoms (one through double bond and the other through single bond) can fulfill its octet? Is it not violating the octet rule?

Answer:

Phosphorus has an $[\text{Ne}]3s^23p^33d^0$ electron configuration, so in principle it could accommodate more than eight valence electrons by using one or more d orbitals. If we argue that a molecule is a double bond, it is an exception to the octet rule and have expanded valence shell.



However, we can use formal charges that write PO_4^{3-} with octet:

And with expanded octet:

In effect we can have a series of Lewis structures PO_4^{3-} in resonance with one another.