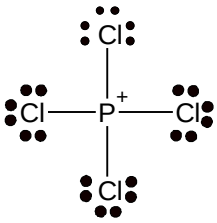
Question45553

Question:

Q-Draw a Lewis structures of PCl4+ and PCl6- .
predict the shapes of these ions using VSPER thoery and hybridization states of phosphorus atom in these two ions .

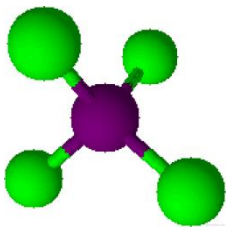
Answer:

Q1. Lewis formula for PCl_4^+ is the following:

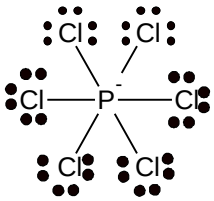


Each chlorine atom is surrounded with eight electrons and phosphorus is surrounded with eight electrons.

The structure of this ion according to VSPER is tetrahedral, because phosphorus is surrounded with four ligands (chlorine atoms). The hybridization of central atom is sp^3.



On the other hand, PCl_6^- has one additional chlorine ion and one extra electron:



The structure of this ion planar, as it has extra electron and the repulsion between extra electron and planar situated chlorine atoms is sufficient. Hybridization of phosphorus atom is sp^3d^3.