

Answer on Question #83816, Chemistry / General Chemistry

Indicate the type of hybrid orbitals used by central atom in PCl_3 ?

Answer

The hybridization of PCl_3 can be calculated according to the formula:

$H = GA + \frac{1}{2} \times (VE - V - C)$, where H – hybridization number ;

GA – number of atoms attached to the central atom;

VE – the number of valence electrons of the central atom;

V – the valency of the central atom;

C – the charge over the molecule .

In PCl_3 , the central atom of phosphorus is attached by three chlorine atoms. The number of valence electrons in phosphorus atom is 5. As it is attached to three chlorine atoms by means of single covalent bonds, its valency is 3. The molecule is neutral as a whole so charge present over the molecule is 0. Hence:

$$H = 3 + \frac{1}{2} \times (5 - 3 - 0)$$

$$H = 3 + \frac{2}{2}$$

$$H = 3 + 1$$

$$H = 4$$

So the hybridization number of PCl_3 molecule is 4. So it is a molecule with **sp³-hybridization**.

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