Answer on Question #58815, Chemistry / General Chemistry

Oxidation state for PCl_3

Solution:

In connections with covalent polar bonds the negative charge is carried to more electronegative element, a positive charge - to less electronegative element.

We will write down electronic formulas of phosphorus and chlorine:

$_{15}P$: $1s^2 2s^2 2p^6 3s^2 3p^3$. Or, in a short form, $_{15}P$: $[Ne]3s^2 3p^3$.

$_{17}Cl$: $1s^2 2s^2 2p^6 3s^2 3p^5$. Or, in a short form, $_{17}Cl$: $[Ne]3s^2 3p^5$.

On the top layer of a nitrogen atom has 5 electrons, while the upper layer of the chlorine atom has 7 electrons.. Electronegativity of elements increases on the period. Phosphorus and chlorine both are in the third period of Periodic system, but phosphorus – in the fifth group, and chlorine – in the seventh group. Therefore electronegativity of chlorine is higher, than electronegativity of nitrogen, and in the PCl_3 connection atoms of chlorine will have a negative charge. As the atom of chlorine for filling of the top layer to a condition of inert gas lacks only one electron, his oxidation level will be equal in the PCl_3 connection (–1). And as the molecule in general has to be electroneutral, the oxidation level of nitrogen is equal $3 \cdot (+1) = +3$.

Answer: The oxidation level of chlorine is equal (–1), the oxidation level of nitrogen is equal +3.

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