Answer on Question #44170 - Chemistry - Other

Question:

How to calculate total number of atoms of the compound $\mathrm{CuSO_4 \cdot 5H_2O}$.

Solution:

1. One molecular entity consist of one molecule of Copper (II) Sulphate and five molecules of water.

2. Copper (II) sulphate consist of: one atom of Copper, one atom of Sulfur and four atoms of Oxygen. To calculate the total number of atoms in molecule of Copper (II) Sulphate you should add the quantity of atoms for each element:
$$N(\mathrm{CuSO_4}) = N(Cu) + N(S) + N(O) = 1 + 1 + 4 = 6 \text{ atoms}$$

3. One molecule of water consist of one atom of Oxygen and two atoms of Hydrogen:
$$N(\mathrm{H_2}O) = N(H) + N(O) = 2 + 1 = 3 \text{ atoms}$$

   For five molecules of water that are in the composition of Copper (II) Sulphate, the total number of atoms is the following:
$$N(5\mathrm{H_2}O) = 5 \cdot N(\mathrm{H_2}O) = 5 \cdot 3 = 15 \text{ atoms}$$

4. The total number of atoms in one molecule is the following:
$$N(\mathrm{CuSO_4} \cdot 5\mathrm{H_2}O) = N(\mathrm{CuSO_4}) + N(5\mathrm{H_2}O) = 6 + 15 = 21 \text{ atoms}$$

Answer: The total number of atoms of the compound $\mathrm{CuSO_4 \cdot 5H_2O}$ is 21 atoms.