

Answer on the question #68061, Chemistry / Physical Chemistry

Question:

b) The dipole moment of HBr is $2.60 \times 10^{-30} \text{ C m}$ and the interatomic distance is 141 pm. What is the percentage ionic character of HBr.

Solution:

Ionic character percentage can be calculated as the ratio between the observed dipole moment and the dipole moment of the molecule in the case of full transfer of the electron from one element to another:

$$\% \text{ionic character} = \frac{\mu_{obs}}{\mu_{100\%}}$$

As the charge of electron is $1.6 \cdot 10^{-19} \text{ (C)}$, $\mu_{100\%}$ dipole moment is the charge of electron times the interatomic distance:

$$\mu_{100\%} = qr = 1.6 \cdot 10^{-19} \text{ (C)} \cdot 141 \cdot 10^{-12} \text{ (m)} = 2.256 \cdot 10^{-29} \text{ (C} \cdot \text{m)}$$

$$\% \text{ionic character} = \frac{2.60 \cdot 10^{-30} \text{ (C} \cdot \text{m)}}{2.256 \cdot 10^{-29} \text{ (C} \cdot \text{m)}} = 0.115, \text{ or } 11.5\%$$

Answer: 11.5%

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