

Answer on Question #76271, Chemistry / Inorganic Chemistry

- a) The dipole moment of HBr is $2.60 \cdot 10^{-30} \text{ C}\cdot\text{m}$ and interatomic distance 141 pm. What is the percentage ionic character of HBr?
- b) Draw all of the stereoisomers of 2,3-butandiol, label meso compounds and pairs of enantiomer.

Solution

Question a

- a) To determine the percentage ionic character of HBr we should find the ratio of μ_{exp} experimentally obtained to the μ_{theor} mathematically calculated. When calculating μ_{theor} we make an assumption that one electron from hydrogen is completely transferred to bromine.

The percentage ionic character = $(\mu_{\text{exp}}/\mu_{\text{theor}}) \cdot 100\%$

Find μ_{theor} :

$$\mu_{\text{theor}} = q \cdot r,$$

Where q is charge of an electron, $q = 1.602 \cdot 10^{-19} \text{ C}$,

r - interatomic distance, $r = 141 \text{ pm} = 1.41 \cdot 10^{-10} \text{ m}$

$$\mu_{\text{theor}} = q \cdot r = 1.602 \cdot 10^{-19} \text{ C} \cdot 1.41 \cdot 10^{-10} \text{ m} = 2.259 \cdot 10^{-29} \text{ C}\cdot\text{m}$$

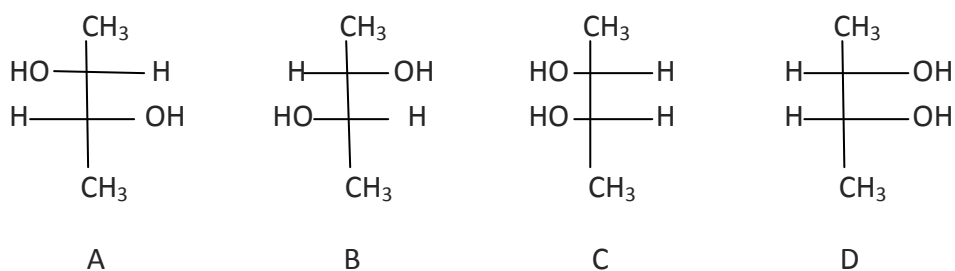
$$\text{The percentage ionic character} = (2.60 \cdot 10^{-30} \text{ C}\cdot\text{m} / 2.259 \cdot 10^{-29} \text{ C}\cdot\text{m}) \cdot 100\% = 12\%.$$

Answer: 12%

Question b

- b) Enantiomer (optical isomer) is one of two stereoisomers that are mirror images of each other that are non-superposable (not identical).
Meso isomer is a stereoisomer with an identical or superimposable mirror image i.e., a non-optically active member of a set of stereoisomers, at least two of which are optically active.

2,3-butandiol has three stereoisomers (there are four forms are shown, where C=D, D and C are the same forms):



A and B are enantiomers, C and D are the same form, C is meso form.

A = (2R,3R)-2,3-butandiol (optically active)

B= (2R,3R)-2,3-butandiol (optically active)

C=D = *meso*-2,3-butandiol (non-optically active, has plane of symmetry).