Answer on Question #44195 – Chemistry – Physical Chemistry

Question:

a)i) The dipole moment of HBr is 2.602 × 10^(-30) C m and its bond length is 141 pm. Calculate its percentage ionic character.

ii) Draw a rough sketch of total molar polarization versus 1/temperature curve for CO2 and SnCl2.

b) i) Nitrogen dioxide can exist as both monomer and dimer. Based on magnetic characteristics, how can you differentiate between the two?

ii) For 2, 3–Dichlorobutane, draw the structures for the enatiomers and mesoforms.

Answer a(i):

The dipole moment is: $D = q \times L$, q – the charge and L – the bond length

$q(HBr) = D/L = 2.602 \times 10^{-30}$ C m $/ 141 \times 10^{-12}$ m $= 0.0184539 \times 10^{-18}$ C

The ionic character percentage can be determined as follow: $I = (q/q_e) \times 100\%$, where q_e – the electron charge

$I = (0.0184539 \times 10^{-18}$ C$/1.60217657 \times 10^{-19}$ C$) \times 100\% = 11.518$ %

Answer a(ii):

CO_2 is a non-polar molecule (the slope is zero), but it has a positive polarizibility value (the intercept with Y-axis). On the contrary, $SnCl_2$ is a polar molecule (the slope is positive), which has also a polarizibility.
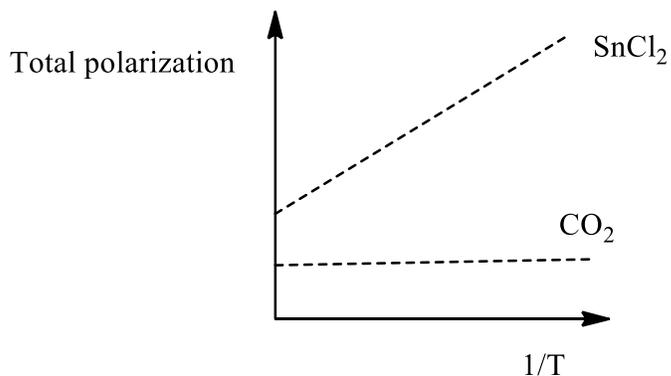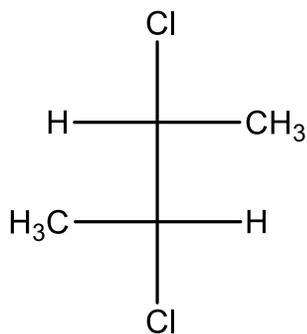
Answer b(i):

The monomeric form of NO_2 has a dipole moment, and the dimeric form consists of non-polar N_2O_4 molecules with a zero dipole value. The first compound interacts with the magnetic field and the dimeric one doesn't
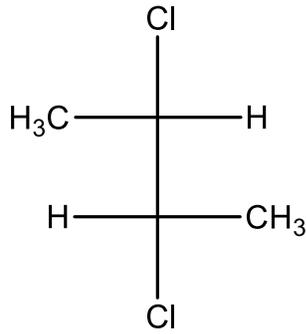
Answer b(ii):
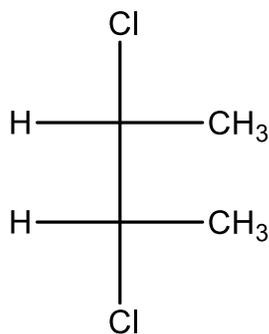
| L, D -mesomer | L,L- enantiomer | D, D- enantiomer |