$$\chi = \frac{1}{2}(IE + EA)$$

2) Allred - Rochows scale

It is the electrostatic force exerted by the nucleus on Valence electron

$$\chi = 0.359 \frac{Z_{eff}}{r^2} + 0.744$$

Z_{eff} on periphery, r is radius in Å

3) Pauling scale

Consider the bond A - B

$A^{\delta+} - B^{\delta-}$ Polar bond

B is more electronegative

A-B bond is strong because of +− attraction. The excess energy associated with A-B bond over A-A or B-B can be attributed to ionic contribution to covalent bonding

Diff in −vty

$$|X_A - X_B| = 0.102 \times \sqrt{\Delta} \text{ Kj/mol}$$

where $\Delta = E_{(A-B)} - \frac{1}{2}\{E_{(A-A)} + E_{(B-B)}\}$

Dipole moment

Consider the polar covalent bond $A^{\delta+} - B^{\delta-}$

It has 2 poles, 2 charges

If 'q' is the electric charge (charge of $e = 1.602 \times 10^{-19}$ C) and l is the bond length, the product $q \times l = \mu$ (D.M)

$\mu \longrightarrow$ Cm Coulumbs metre

unit of μ is Debye

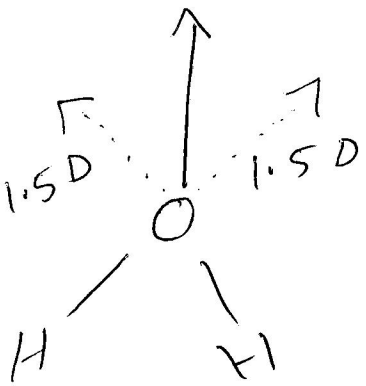
1 Debye = 3.33×10^{-30} Cm.

Q If the bond length of HI molecule is 1.61 Å. What is its dipole moment

$$\mu = q \times l = 1.602 \times 10^{-19}\ C \times 1.61 \times 10^{-10}\ m$$

$$= 2.57 \times 10^{-29}\ Cm$$

D.M is a vector quantity

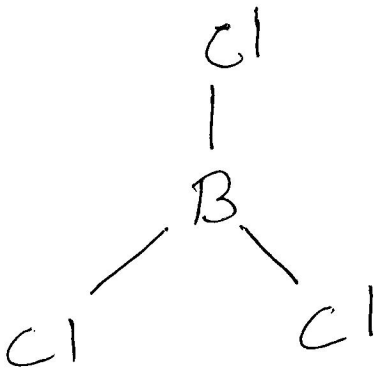


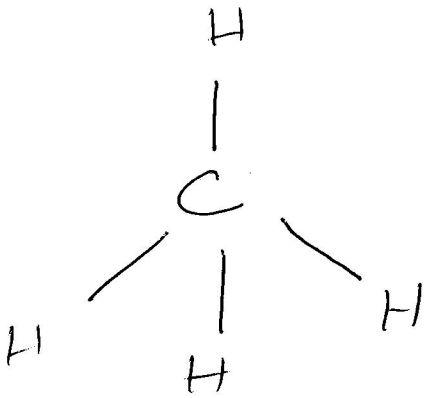
2 identical O-H bonds

Net D.M

$$\sqrt{(1.5)^2 + (1.5)^2 + 2 \times 1.5 \times 1.5 \cos 104.5}$$

$$= 1.85$$





D.M acts in opposite direction

So no net D.M

$O=C=O$ linear So D.M is O

OCS There is net D.M

N_2O , O_3 polar

D.M gives an idea about

Symmetry / geometry of molecule

% ionic character

$$\frac{\mu_{exp}}{\mu_{cal}} \times 100$$

exp - true value
cal - theoretical (assumed the bond to be ionic)

Q μ_{exp} for HCl is 0.343×10^{-29} Cm. BL is 1.27 Å. Calculate % ionic character.

$$\mu_{cal} = q \times l = 1.609 \times 10^{-19} C \times 1.27 \times 10^{-10} m$$
$$= 2.03 \times 10^{-29} Cm$$

$$\% \text{ ionic character} = \frac{\mu_{exp}}{\mu_{cal}} \times 100$$

$$\frac{0.343 \times 10^{-29}}{2.03 \times 10^{-29}} = 16.8\ \%$$