Covalent bond

Polar covalent bond

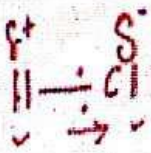
Two dissimilar atom combined

Difference in their electronegativity

Bonding electrons pair slightly shifted Towards more electronegative atom

The atom acquire δ^- charge while other acquire δ^+ charge

A permanent dipole is created



Non polar covalent bond

Two Similar atom combined

No difference in their electronegativity

Bonding electrons pair remain in middle of both atom

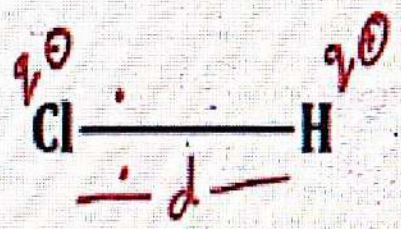
No charge appear on the atoms

No dipole is present

CP

Dipole moment

Polar covalent bond

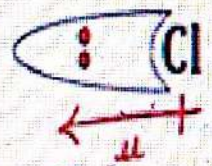


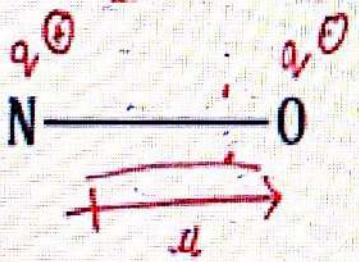
Product of magnitude of charge and distance between two dipole

$$\mu = q \times d$$

Unit is C m

Debye or D





Dipole moment is vector quantity having both magnitude as well as direction.

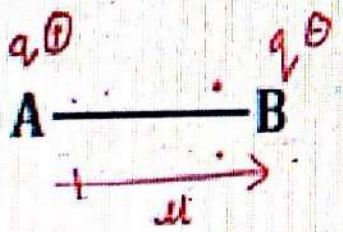
How to check Dipole moment in a molecules

$\mu_{net} = 0$

then molecule is nonpolar

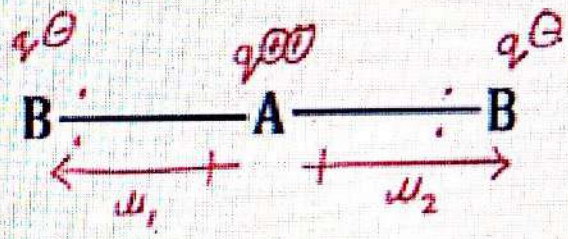
$\mu_{net} \neq 0$

then molecule is polar



$\mu \neq 0$

Polar

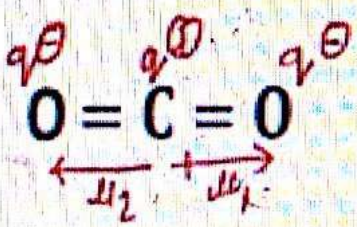


$\mu_{net} = \mu_1 + \mu_2$

$\mu_{net} = 0$ NP

Exercise 1: AB_2 type molecules

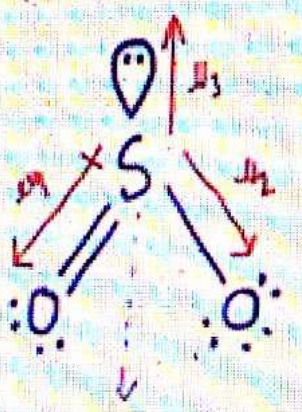
CO_2 ✓



$\mu_{net} = 0$

NP

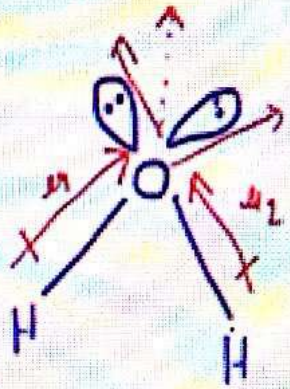
SO_2 ✓



$\mu_{net} \neq 0$

polar

OH_2 ✓

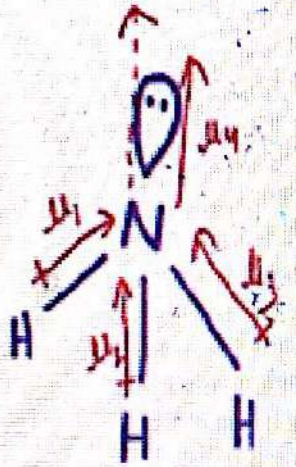


$\mu_{net} \neq 0$

polar

Exercise 2: AB_3 type molecules

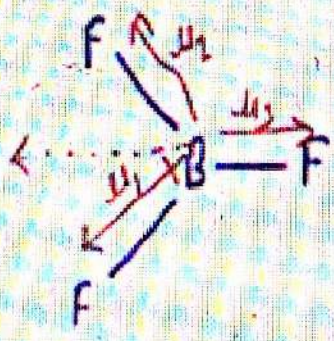
NH_3



$\mu_{net} \neq 0$

polar

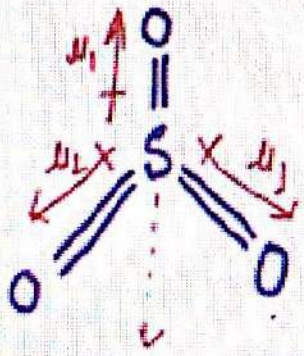
BF_3



$\mu_{net} = 0$

(np)

SO_3

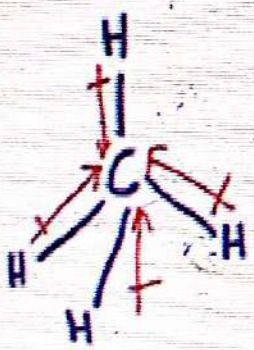


$\mu_{net} = 0$

(np)

Exercise 3: AB_4 type molecules

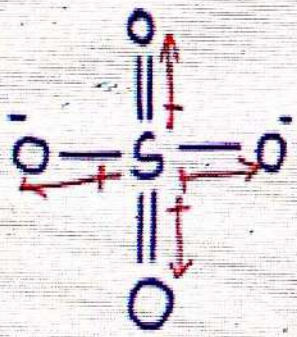
CH_4



$\mu_{net} = 0$

np

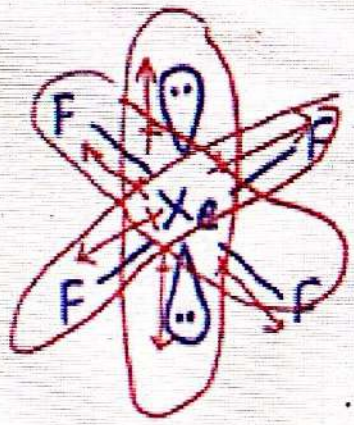
SO_4^{--}



$\mu_{net} = 0$

np

XeF_4



$\mu_{net} = 0$

np

CP