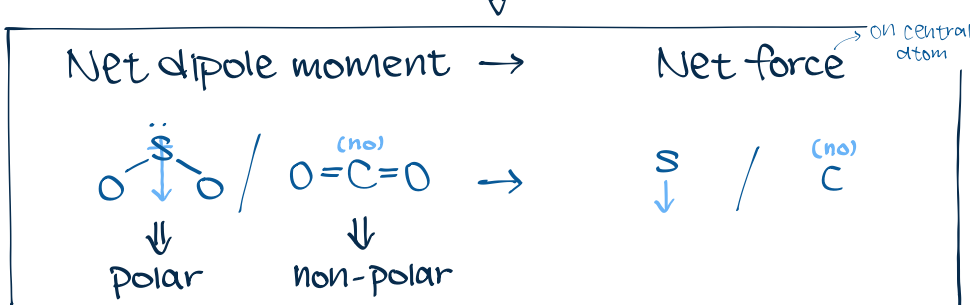
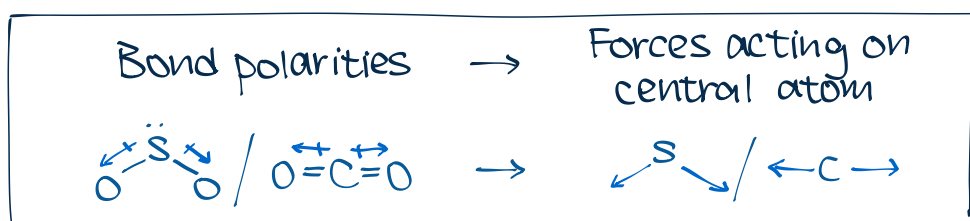


## Polar molecules

## 1 Determining if a molecule is polar

- Polar molecule = permanently relative charged ( $\delta^-$   $\text{H}^{\delta+}$   $\text{O}^{\delta-}$ )
- Whether a molecule is polar: determined by
  - 1) polar bonds
  - 2) shape



Non-polar = 所有 bond polarities 互相抵消  
 → 条件 - molecule shape 对称  
 - 所有 bond 一样 polar (→ force 一样)

- Marking scheme:
  - The molecule is in a \_\_\_\_\_ shape
  - Molecule is (not) symmetrical, bond polarities (cannot) cancel out each other
  - Resulting in (no) net dipole moment
  - ∴ Molecule is polar/non-polar
- Tricks to determine:
  - > Central atom 爆手 } non-polar
    - 个个疼住都一样
    - 与 central atom bond 的全是同-元素
  - > 若 molecule 带 charge, 就一定是 polar

## 2 Example questions

$$\text{CH}_4$$

C 最多4只手,  $4 \times H$  用尽4只手  $\rightarrow \checkmark$  爆手  $\Rightarrow$  non-polar  
全部瘀住也是H

→  $\text{CH}_4$  is tetrahedral in shape and is symmetrical.  
The bond polarities cancel out each other,  
resulting in no net dipole moment  
∴ Non-polar

$$\text{NH}_3$$

N最多3只手, 被3个H用尽后还剩1个l.p.  $\Rightarrow$  polar

$\text{NH}_3$  is trigonal pyramidal in shape.

$\text{NH}_3$  is not symmetrical, bond polarities cannot cancel out each other, resulting in a net dipole moment.

$\therefore$  Polar

$$\text{H}_2\text{S}$$

S最多有6只手,但两个H只用了2只  $\rightarrow$  X爆手  $\Rightarrow$  polar

$\text{H}_2\text{S}$  is v-shaped.

$\text{H}_2\text{S}$  is not symmetrical, bond polarities cannot cancel out each other, resulting in net dipole moment.

$\therefore$  polar

$$\text{CH}_3\text{Cl}$$

C有4只手,  $3 \times \text{H} + 1 \times \text{Cl}$  用尽  $\rightarrow$  爆手  $\Rightarrow$  polar  
与C bond 的 atoms 有H跟Cl  $\rightarrow$  不一样

$\text{CH}_3\text{Cl}$  is tetrahedral in shape.

$\text{CH}_3\text{Cl}$  is not symmetrical, bond polarities cannot cancel out each other, resulting in net dipole moment.

$\therefore$  Polar

$$\text{NH}_4^+$$

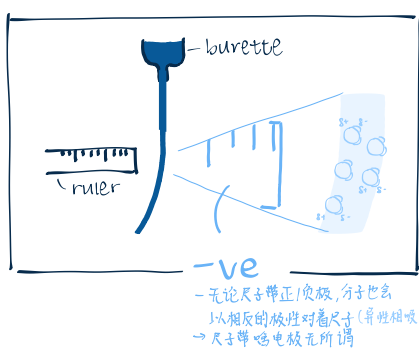
有 charge  $\rightarrow$  - 定 polar

$\text{NH}_4^+$  is tetrahedral.

$\text{NH}_4^+$  is not symmetrical, bond polarities cannot cancel out each other, resulting in net dipole moment.

$\therefore$  Polar

### 3 Test for polar liquids



1. Bring a <sup>two -ve or both ok</sup> charged rod towards a running jet of liquid being tested from a burette.
2. If the liquid is polar, it will deflect towards the charged rod. (异性相吸)