

Announcements – Lecture XVI – Monday, June 16th

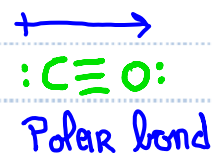
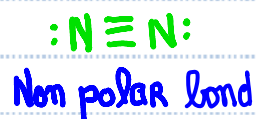
1. Fifth Lab: Tuesday, June 17th , ISB 155 (A-C)



8.6 Molecular Polarity

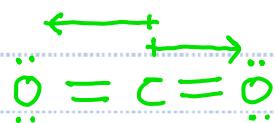
Bond Polarity

POLAR BOND: Is there a difference in electronegativity between the atoms forming the bond? ... yes ... polar bond

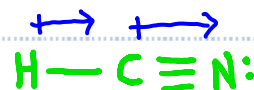


MOLECULAR POLARITY:

\sum Polar bonds (vector sum) = 0 or > 0
Non polar or Polar



$\Sigma = 0$
Non polar

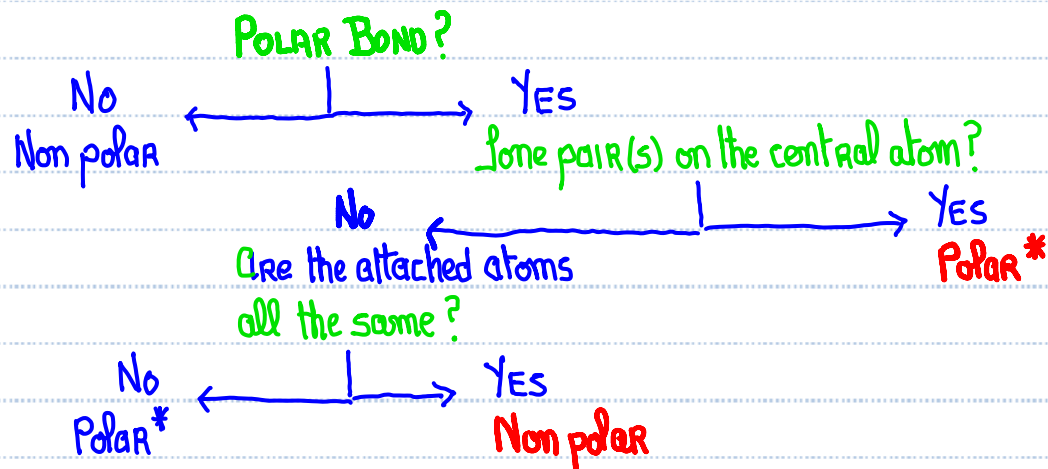


$\Sigma > 0$
Polar

8.6 Molecular Polarity

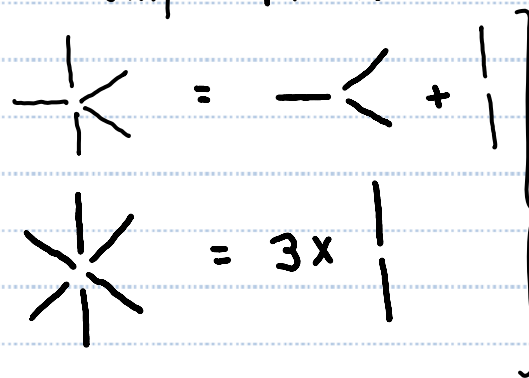
A: Molecular Polarity

With regards to the Lewis Structure:



* True if the Electron Pair Geometry is ... Linear, Trigonal planar, or Tetrahedron

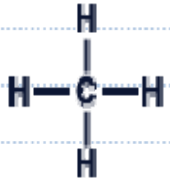
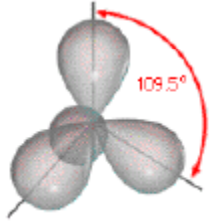
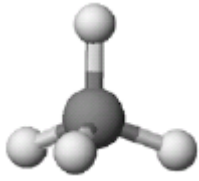
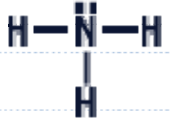
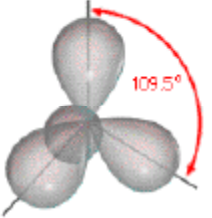


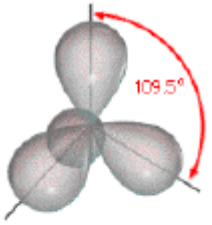
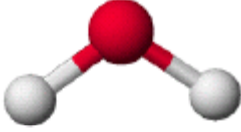
The Electron Pair Geometries ... Trigonal bipyramid and the Octahedron can be considered non unique structures:



These may require a closer look to determine whether they are polar or nonpolar.

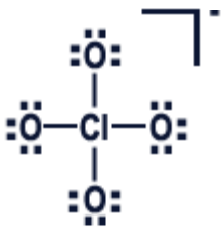
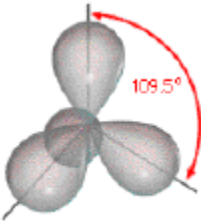
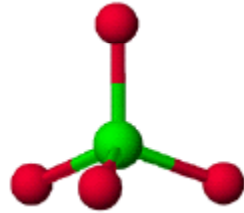
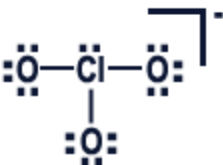
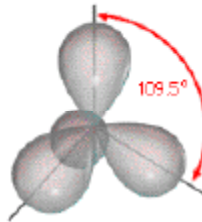
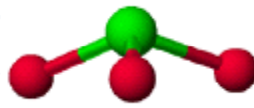
8.6 Molecular Polarity

A: Molecular Polarity -- Tetrahedron

| Lewis Structure | Class | Electron Pair Geometry | Molecular Geometry | Polarity |
|---|-------------------------|--|--|-----------|
| CH_4  | AX_4E_0 |  <p>Tetrahedron</p> |  <p>Tetrahedron</p> | Non polar |
| NH_3  | AX_3E_1 |  <p>Tetrahedron</p> |  <p>Trigonal pyramid</p> | Polar |
| H_2O  | AX_2E_2 |  <p>Tetrahedron</p> |  <p>Bent/Angular 109°</p> | Polar |

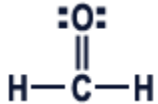
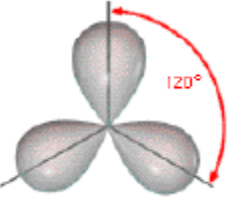
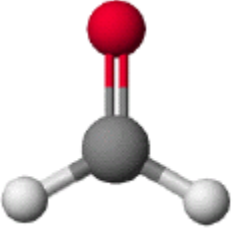
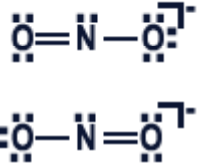
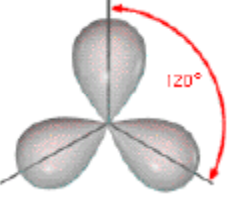
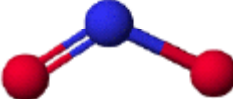
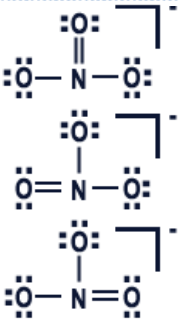
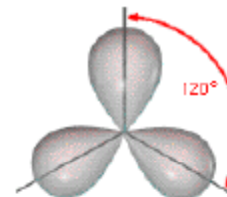
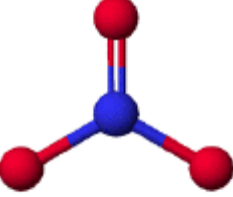
8.6 Molecular Polarity

A: Molecular Polarity – Tetrahedron

| Lewis Structure | Class | Electron Pair Geometry | Molecular Geometry | Polarity |
|--|-------------------------|---|---|-----------|
| ClO_4^-  | AX_4E_0 |  <p>Tetrahedron</p> |  <p>Tetrahedron</p> | Non polar |
| ClO_3^-  | AX_3E_1 |  <p>Tetrahedron</p> |  <p>Trigonal pyramid</p> | Polar |

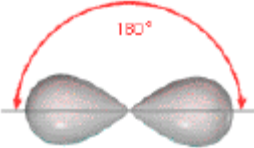

8.6 Molecular Polarity

A: Molecular Polarity – Trigonal Planar

| Lewis Structure | Class | Electron Pair Geometry | Molecular Geometry | Polarity |
|--|-------------------------|--|--|-----------|
| H_2CO  | AX_3E_0 |  <p>Trigonal Planar</p> |  <p>Trigonal Planar</p> | Polar |
| NO_2^-  | AX_2E_1 |  <p>Trigonal Planar</p> |  <p>Bent/Angular 120°</p> | Polar |
| NO_3^-  | AX_3E_0 |  <p>Trigonal Planar</p> |  <p>Trigonal Planar</p> | Non polar |


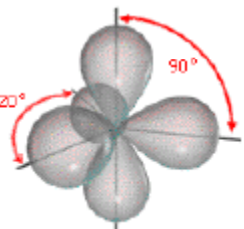

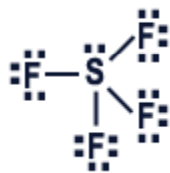
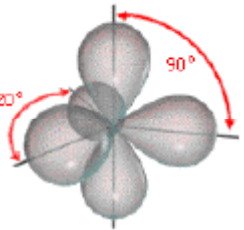

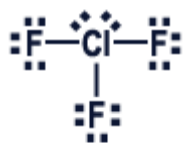
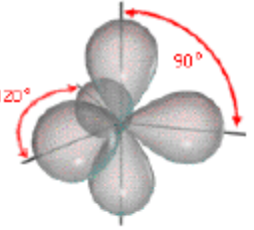
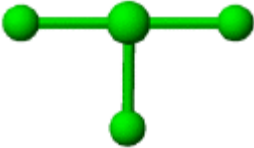
8.6 Molecular Polarity

A: Molecular Polarity – Linear

| Lewis Structure | Class | Electron Pair Geometry | Molecular Geometry | Polarity |
|---|-------------------------|---|---|----------|
| <p>HCN</p> <p>$\text{H}-\text{C}\equiv\text{N}:$</p> | AX_2E_0 |  <p>Linear</p> |  <p>Linear</p> | Polar |


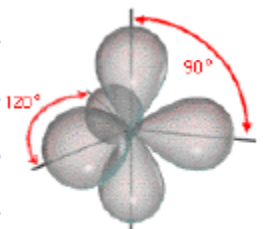

8.6 Molecular Polarity

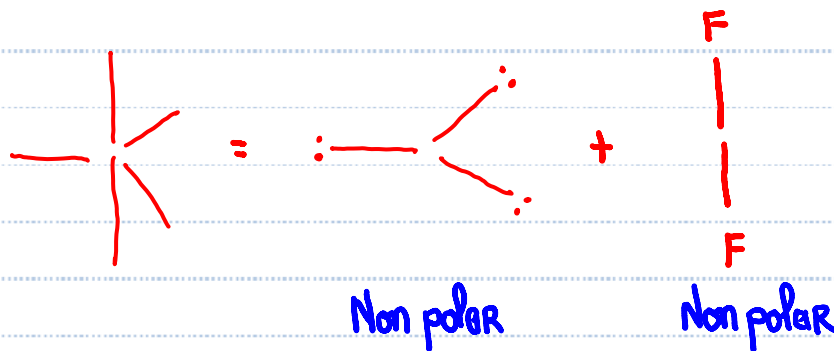
A: Molecular Polarity – Trigonal Bipyramid

| Lewis Structure | Class | Electron Pair Geometry | Molecular Geometry | Polarity |
|---|-------------------------|---|---|-----------|
| PF_5  | AX_5E_0 |  <p>Trigonal Bipyramid</p> |  <p>Trigonal Bipyramid</p> | Non polar |
| SF_4  | AX_4E_1 |  <p>Trigonal Bipyramid</p> |  <p>Seesaw</p> | Polar |
| ClF_3  | AX_3E_2 |  <p>Trigonal Bipyramid</p> |  <p>T-shaped</p> | Polar |

8.6 Molecular Polarity


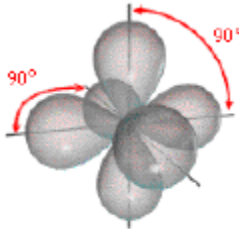
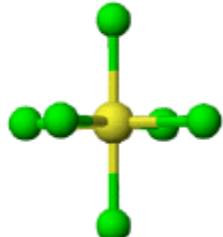

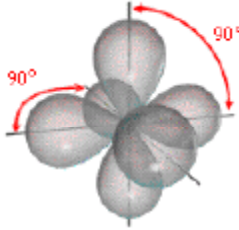
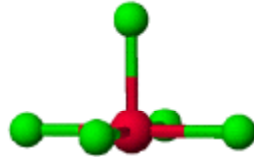

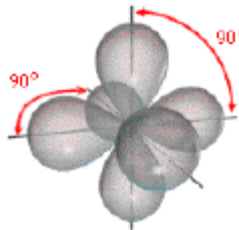

A: Molecular Polarity – Trigonal Bipyramid

| Lewis Structure | Class | Electron Pair Geometry | Molecular Geometry | Polarity |
|---|-------------------------|---|---|------------|
| XeF_2  | AX_2E_3 |  Trigonal Bipyramid |  Linear | Non polar! |



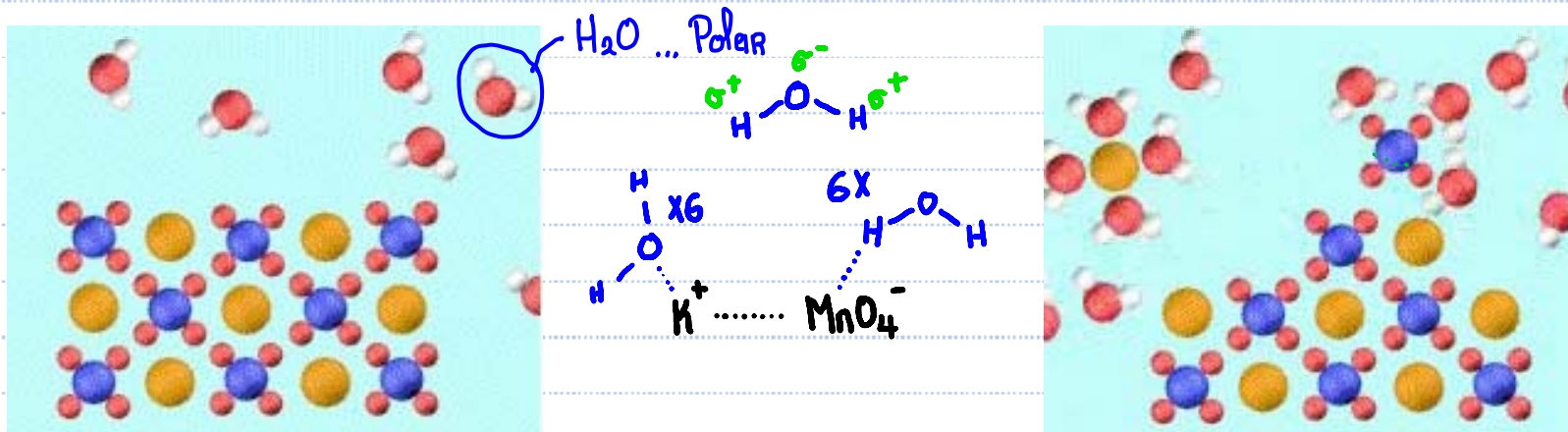
8.6 Molecular Polarity

A: Molecular Polarity – Octahedron

| Lewis Structure | Class | Electron Pair Geometry | Molecular Geometry | Polarity |
|---|-------------------------|---|--|------------|
| SF_6  | AX_6E_0 |  Octahedron |  Octahedron | Non polar |
| BrF_5  | AX_5E_1 |  Octahedron |  Square Pyramid | Polar |
| XeF_4  | AX_4E_2 |  Octahedron |  Square Planar | Non polar! |

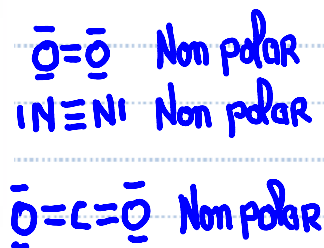
8.6 Molecular Polarity

Some Consequences of Molecular Polarity -- Solubility



| Solubility of Some Common Substances | | |
|--------------------------------------|---|------|
| Compound | Solubility in H_2O g/100mL | |
| NaCl | 35.7 | 0°C |
| O ₂ | 4.5x10 ⁻³ | 18°C |
| N ₂ | 2.0x10 ⁻³ | 18°C |
| NH ₃ | 89.5 | 0°C |
| CO ₂ | 0.179 | 18°C |
| HCl | 72.1 | 20°C |

POLAR



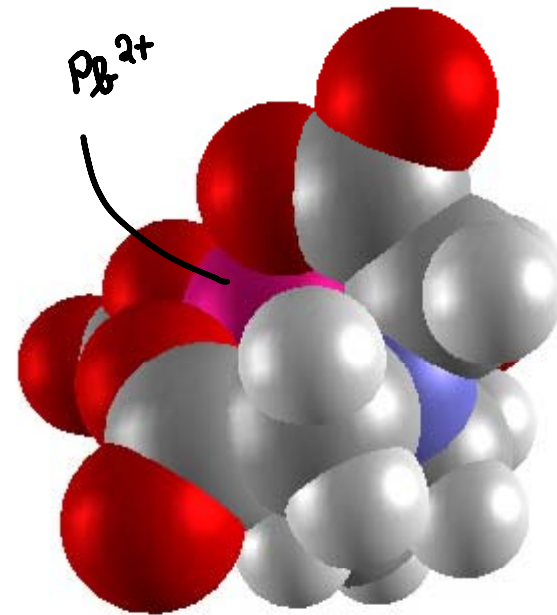
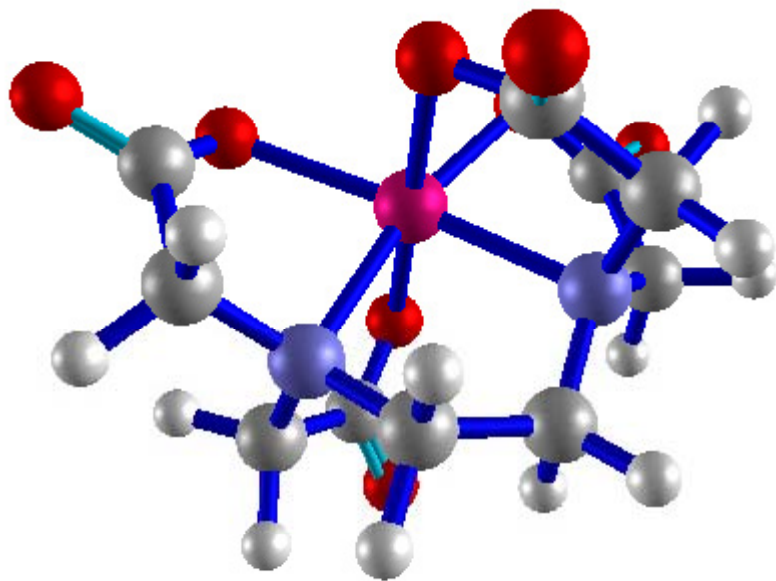
"like dissolves like"

8.6 Molecular Polarity

Some Consequences of Molecular Polarity – Chelating Agents

Salad dressings ... lead poisoning ... Chelating therapy

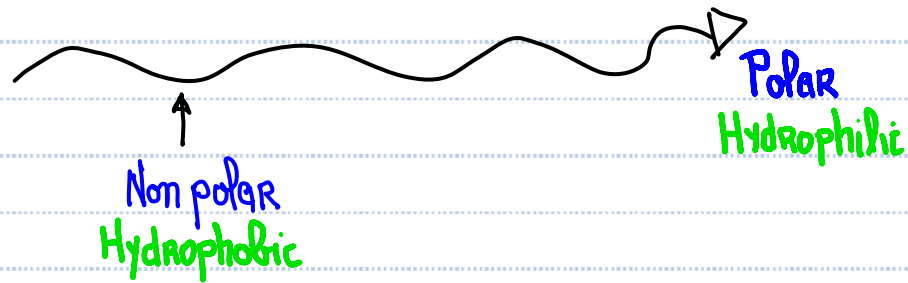
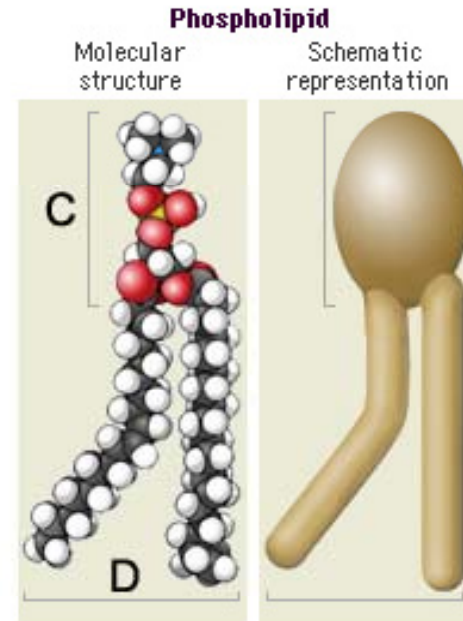
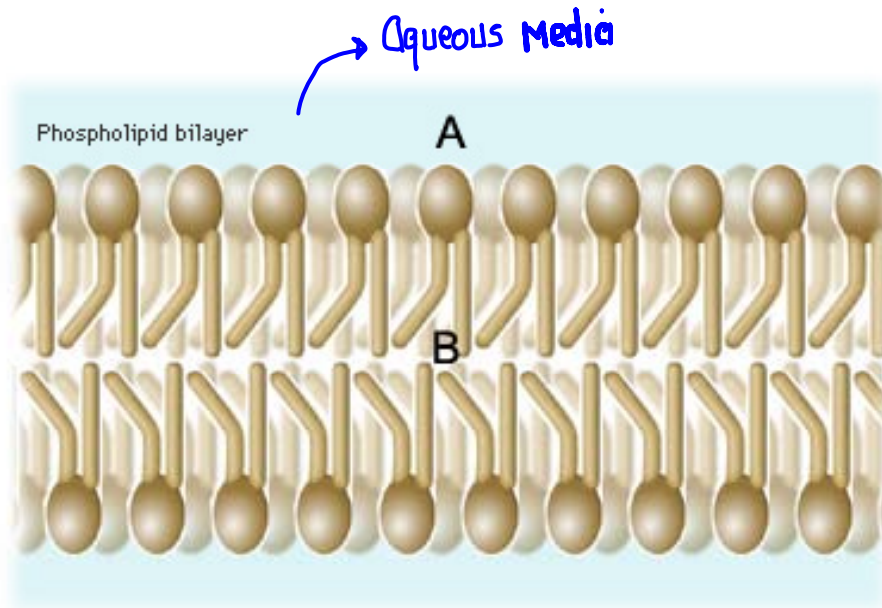
EDTA: ethylenediaminetetraacetic acid



8.6

Molecular Polarity

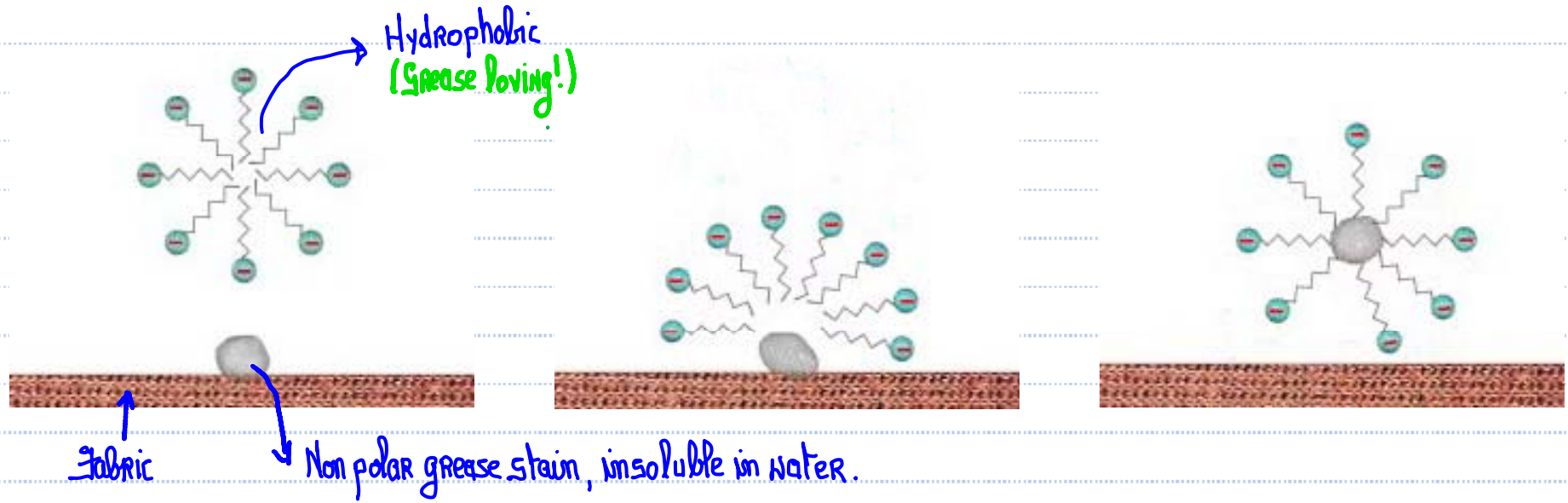
Some Consequences of Molecular Polarity -- Membranes



8.6

Molecular Polarity

Some Consequences of Molecular Polarity – Detergents

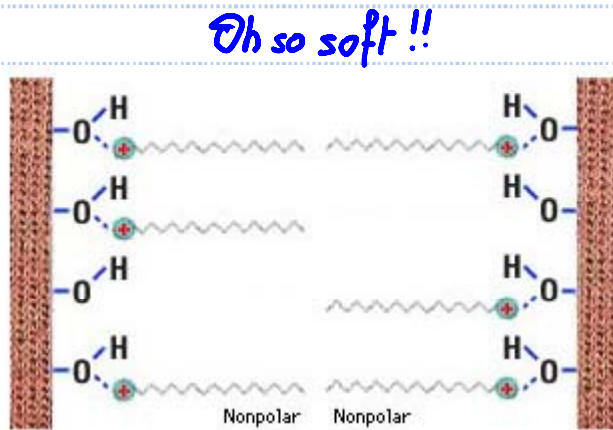
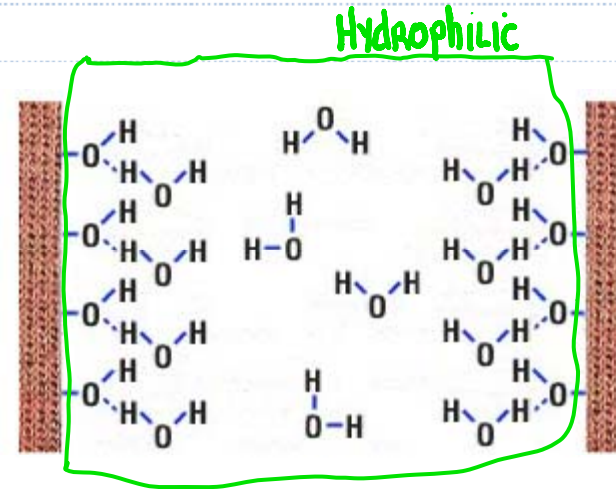
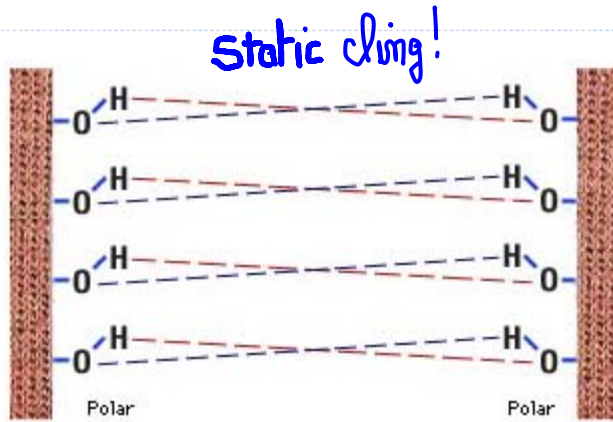


How might the reverse of this process be of use in medicine?

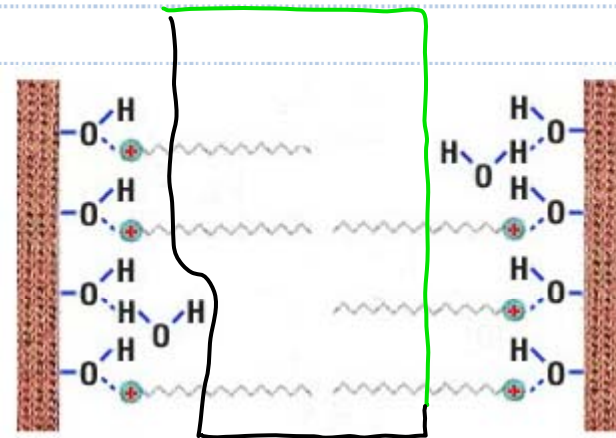
8.6

Molecular Polarity

Some Consequences of Molecular Polarity – Fabric Softener



Fabric softener



We use lotions for ?