

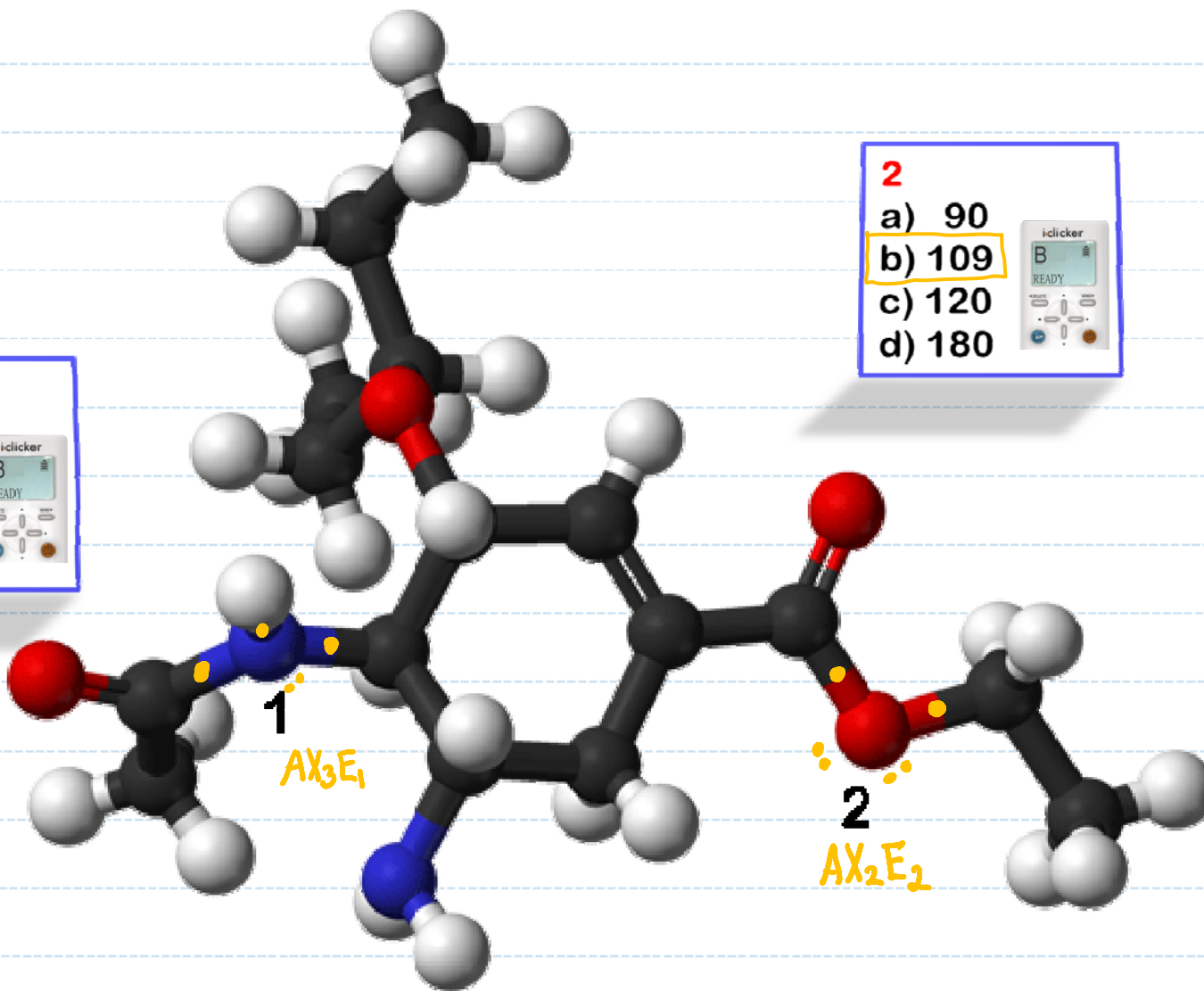
Class Announcements



3.10 Molecular Geometries and Bond Angles Tamiflu

1

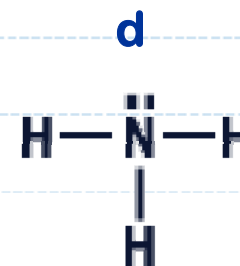
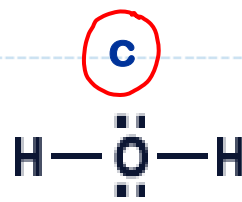
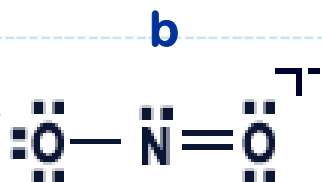
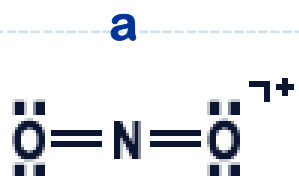
- a) 90
- b) 109**
- c) 120
- d) 180



2

- a) 90
- b) 109**
- c) 120
- d) 180

3.10 Molecular Geometries and Bond Angles



Which of the above molecules has the smallest bond angle?

AX_2
Linear
 180°

AX_2E_1
TRIGONAL planar
 120°

AX_2E_2
Tetrahedron
 $\sim 109^\circ$
2 lone pairs

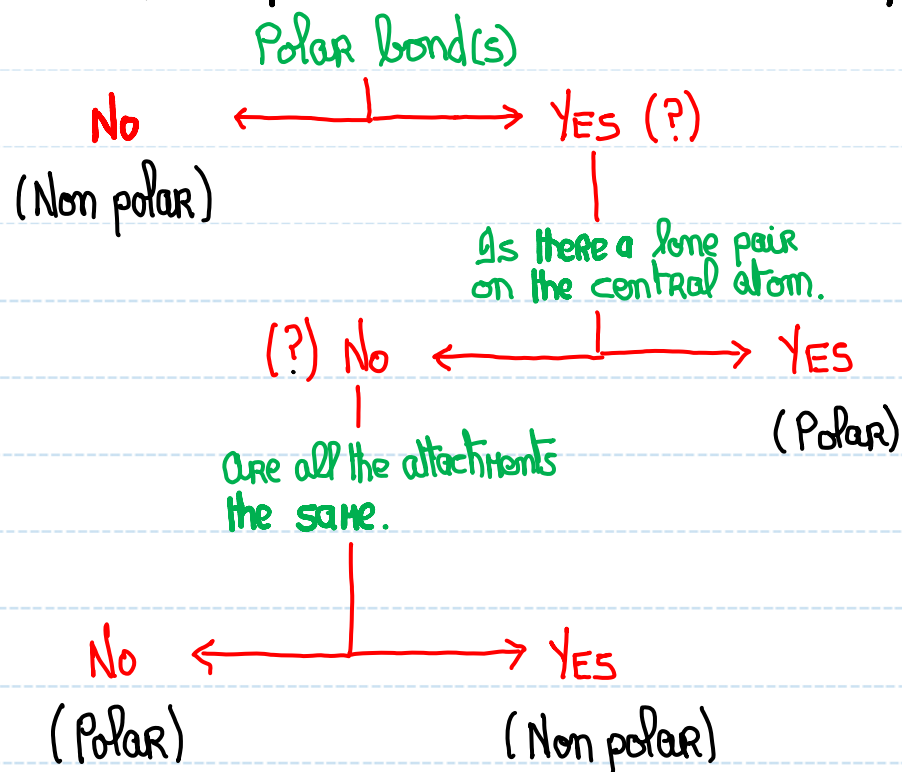
AX_3E_1
Tetrahedron
 $\sim 109^\circ$
1 lone pair



3.11 How Do We Determine if a Molecule is Polar

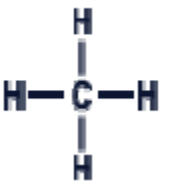
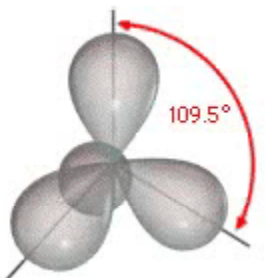
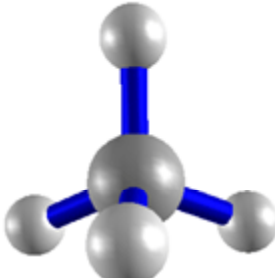
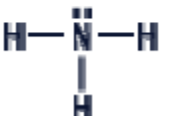
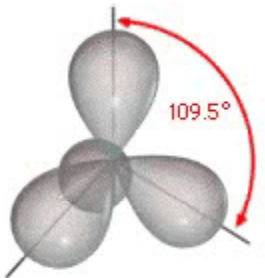
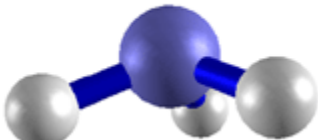

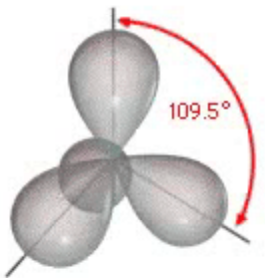
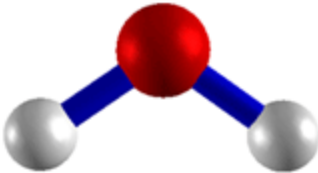
If the vector sum of the polar bonds is $\neq 0$, the molecule is polar.

The following works for simple molecules whose $X+E = 2, 3$ or 4 .



3.11 How Do We Determine if a Molecule is Polar

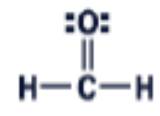
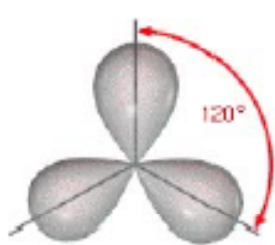
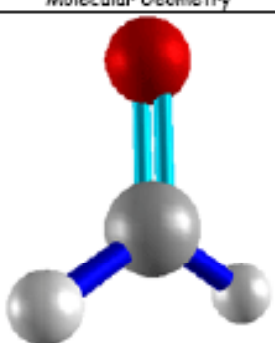
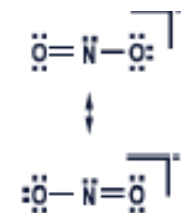
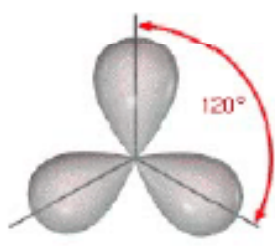
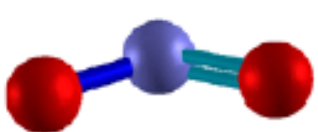

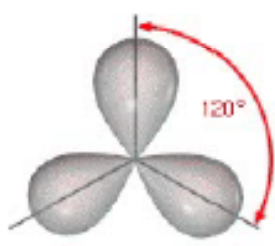
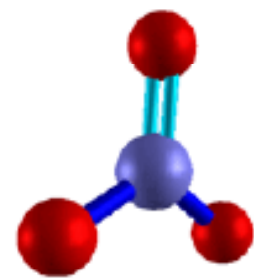
Molecular Geometry Worksheet ... Fall 2008 ... Whelan ... Page 1

| Lewis Structure | Classification | X+E | Parent Geometry | Molecular Geometry | Bond Angle | Polarity |
|---|-------------------------|-----|---|---|------------------|-----------|
| CH_4  | AX_4E_0 | 4 |  Tetrahedron |  Tetrahedron | $\sim 109^\circ$ | <u>NP</u> |
| NH_3  | AX_3E_1 | 4 |  Tetrahedron |  Trigonal pyramid | $\sim 109^\circ$ | <u>P</u> |
| H_2O  | AX_2E_2 | 4 |  Tetrahedron |  Bent/Angular (109°) | $\sim 109^\circ$ | <u>P</u> |



3.11 How Do We Determine if a Molecule is Polar

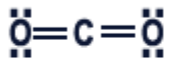
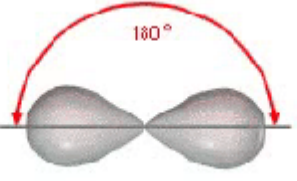

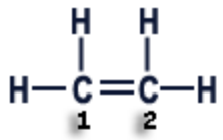
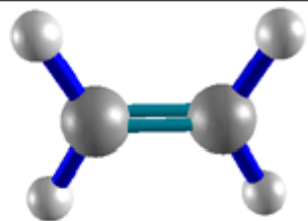
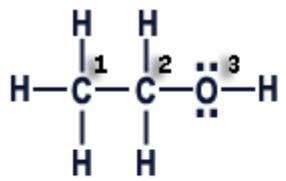
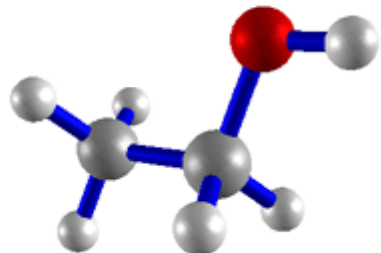
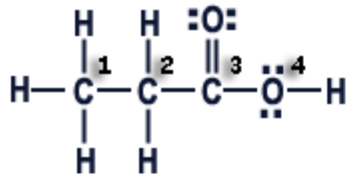
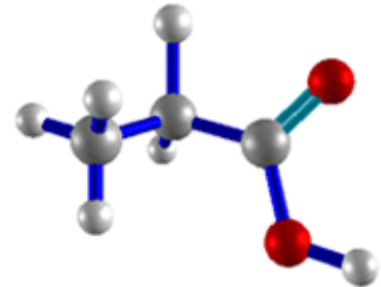
Molecular Geometry Worksheet ... Fall 2008 ... Whelan ... Page 2

| Lewis Structure | Classification | X+E | Parent Geometry | Molecular Geometry | Bond Angle | Polarity |
|--|-------------------------|-----|---|---|-------------|-----------|
| H_2CO  | AX_3E_0 | 3 |  Trigonal planar |  Trigonal planar | 120° | <u>P</u> |
| NO_2^-  | AX_2E_1 | 3 |  Trigonal planar |  Bent/Angular (120°) | 120° | <u>P</u> |
| NO_3^-  | AX_3E_0 | 3 |  Trigonal planar |  Trigonal planar | 120° | <u>NP</u> |



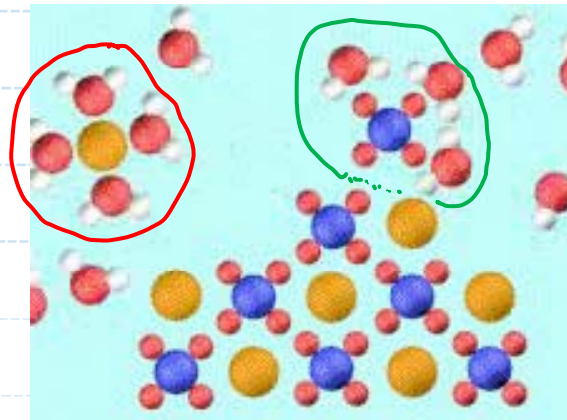
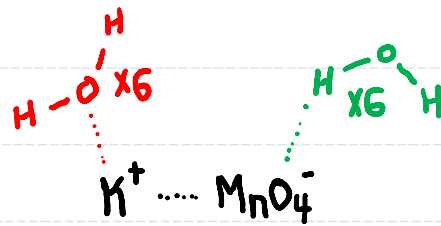
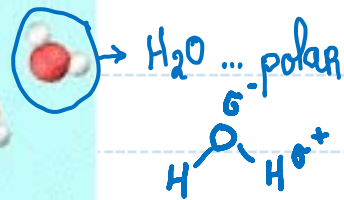
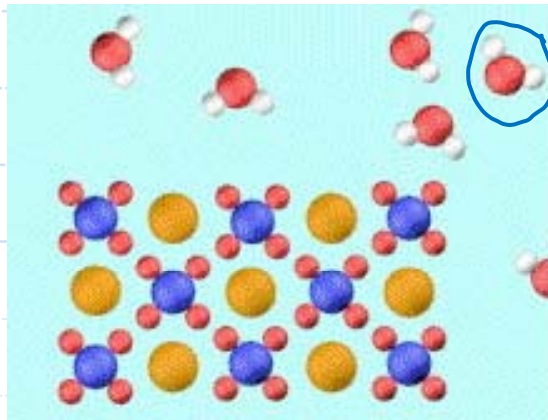
3.11 How Do We Determine if a Molecule is Polar

Molecular Geometry Worksheet ... Fall 2008 ... Whelan ... Page 3

| Lewis Structure | Classification | X+E | Parent Geometry | Molecular Geometry | Bond Angle | Polarity |
|---|--|------------------|--|---|---|-----------|
| CO_2  | AX_2 | 2 |  Linear |  Linear | 180° | NP |
| C_2H_4  | 1: AX_3E_0 2: AX_3E_0 | 3 3 | 1: Trigonal planar 2: Trigonal planar |  | 1: 120° 2: 120° | |
| C_2H_5OH  | 1: AX_4E_0 2: AX_4E_0 3: AX_2E_2 | 4 4 4 | 1: Tetrahedron 2: Tetrahedron 3: Tetrahedron |  | 1: $\sim 109^\circ$ 2: $\sim 109^\circ$ 3: $\sim 109^\circ$ | |
| C_2H_5COOH  | 1: AX_4E_0 2: AX_4E_0 3: AX_3E_0 4: AX_2E_2 | 4 4 3 4 | 1: Tetrahedron 2: Tetrahedron 3: Trigonal planar 4: Tetrahedron |  | 1: $\sim 109^\circ$ 2: $\sim 109^\circ$ 3: 120° 4: $\sim 109^\circ$ | |



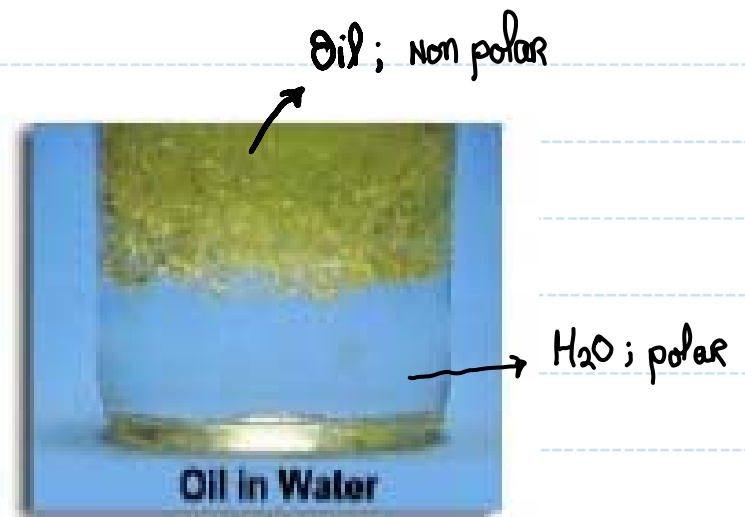
3.11 Consequence of Molecular Polarity



Solubility of Some Common Substances

| Compound | Solubility in H_2O g/100mL | Temperature |
|-----------------|---|-------------|
| 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 |

H_2O → polar



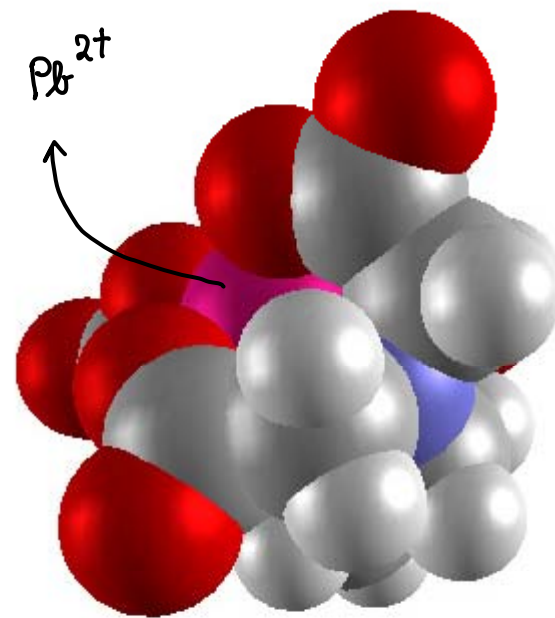
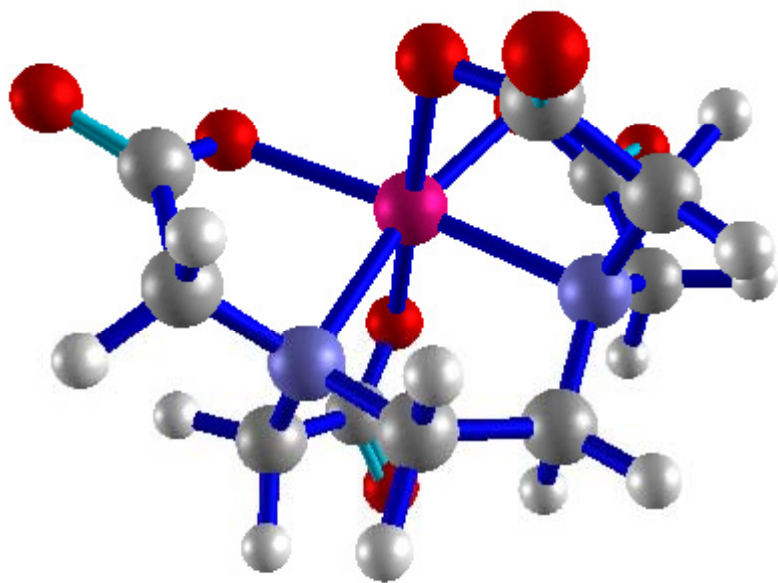
"like dissolves like"

3.11 Consequence of Molecular Polarity

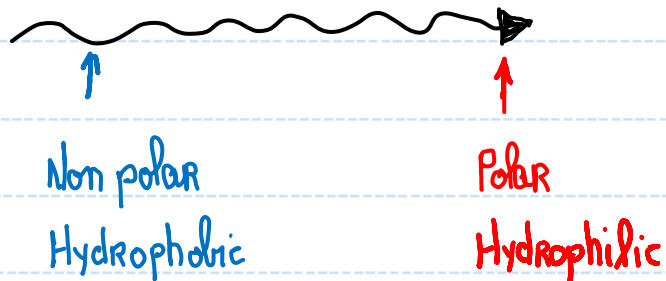
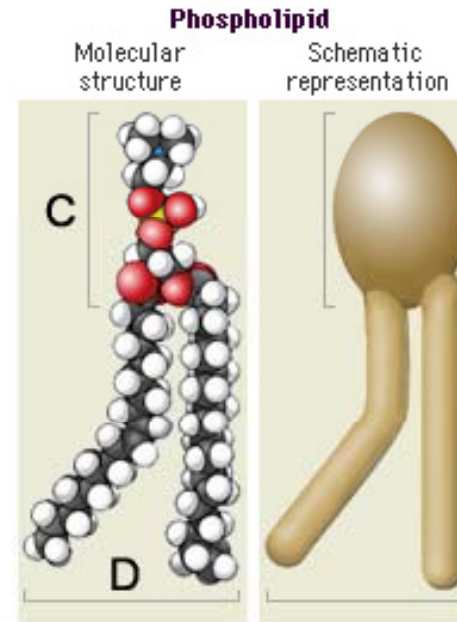
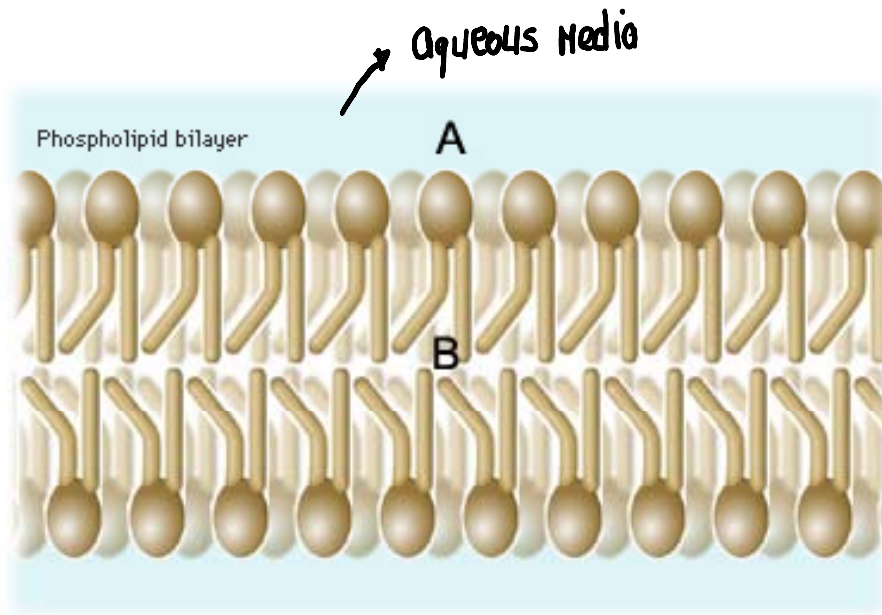
Salad dressings ... Lead poisoning ... Chelating therapy

EDTA: Ethylenediaminetetraacetic acid

see class web site ... Lead Poisoning

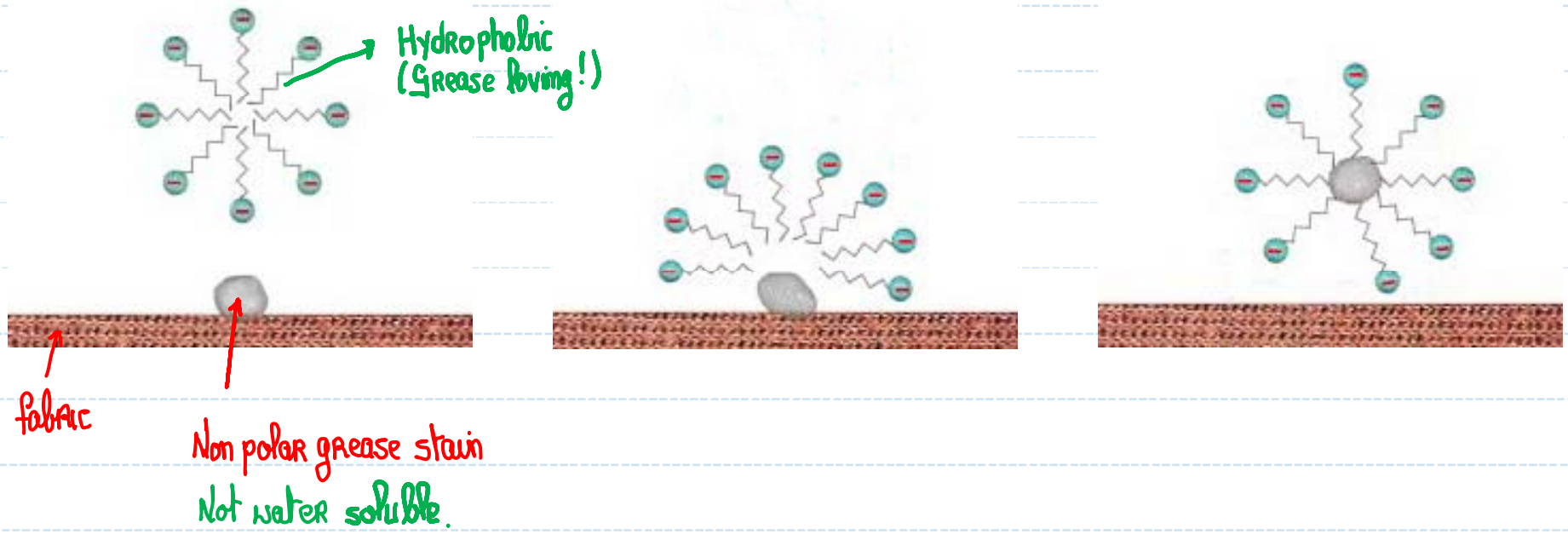


3.11 Consequence of Molecular Polarity



4.11 Consequence of Molecular Polarity

Detergents



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