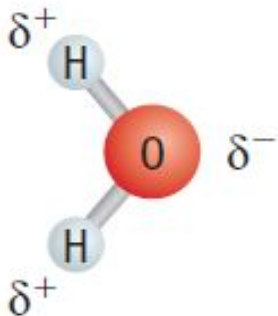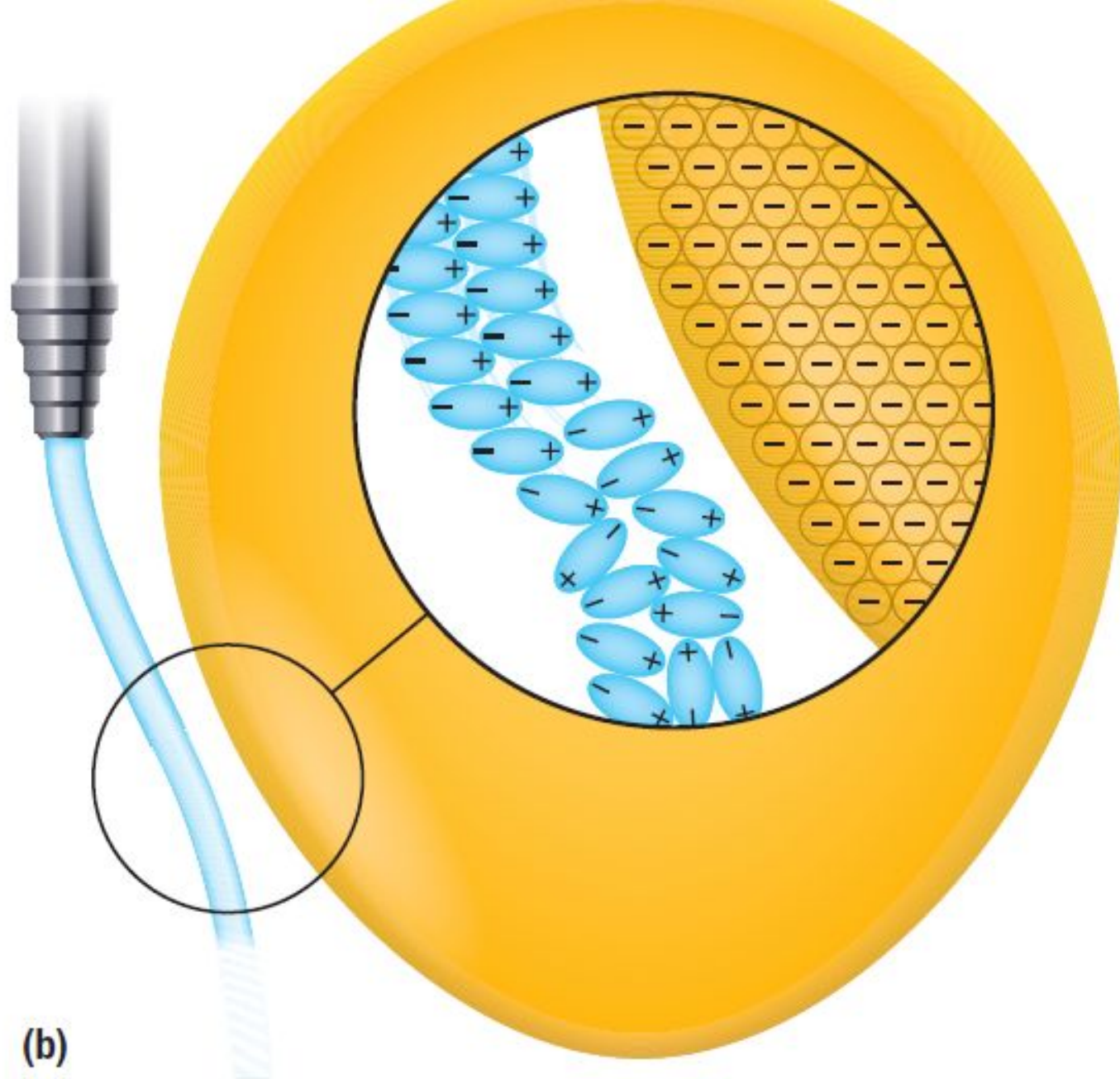# 4.5 MOLECULAR POLARITY

RECALL...

When two atoms with sufficiently different electronegativities combine, a dipole forms: one end of the bond is negative and the other end is positive.
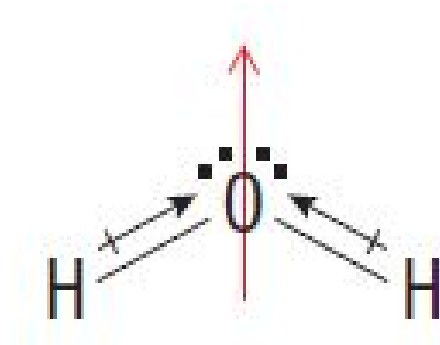
Consider the water molecule:

(a)

(b)

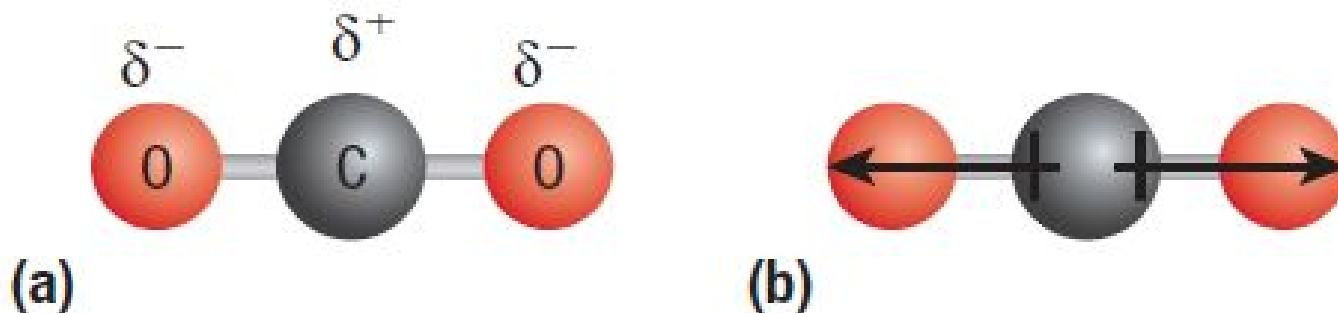# Let's look at the water molecule in more detail...

- 2 lone pairs
- causes bent structure
- bond dipoles add together to give the water molecule a net dipole
- molecules with net dipoles are POLAR MOLECULES!

~ BUT ~
Not every molecule that has polar covalent bonds is a polar molecule!
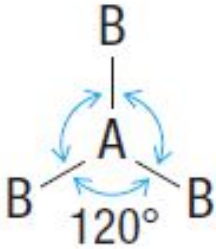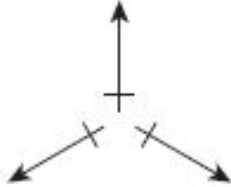
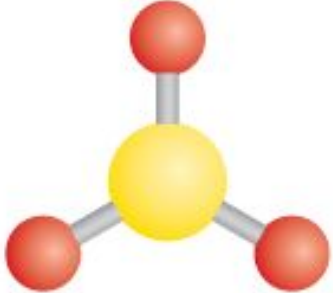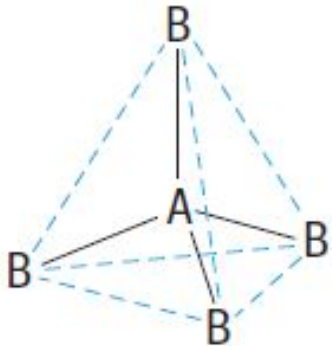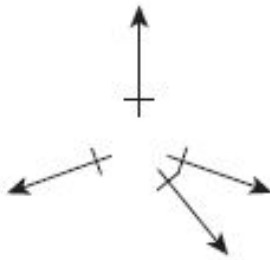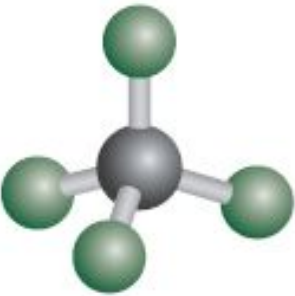# Consider carbon dioxide.

(a) (b)

- linear shape
- bond polarities are equal and opposite, so they cancel each other out
- no net dipole
- CO_2 is a NON-POLAR MOLECULE!

To predict molecular polarity, consider two things:

1) the types of bonds in the molecule
2) the geometric shape of the molecule

TYPES OF MOLECULAR STRUCTURES WITH POLAR BONDS BUT NO NET DIPOLE:

Type	General example	Cancellation of polar bonds	Specific example	Ball-and-stick model
linear molecules with 2 identical bonds	B—A—B		CO_2	
planar molecules with 3 identical bonds	B above A, B B below, 120°		SO_3	
tetrahedral molecules with 4 identical bonds (109.5° apart)	B, A, B, B, B		CCl_4	

EX. 1: Predict whether tetrafluoromethane, CF_4, is a polar or non-polar molecule.

EX. 2: Predict whether ammonia, NH_3, is a polar or non-polar molecule.

HOMEWORK:

but first…

check out the flowchart on p. 228

p. 229 #1-4,5(a,b,c,f) 7(a,b,d)