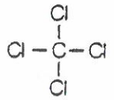
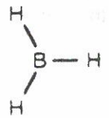
Name: Key
Blk:___Date:_____

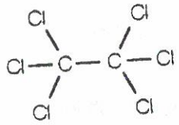
Chemistry 11
SYMMETRY IN MOLECULES

Concept attainment: recognizing symmetric molecules

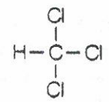
YES EXAMPLES: NON-POLAR

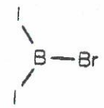


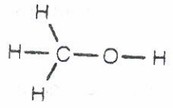




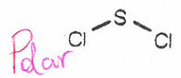
NO EXAMPLES: POLAR







TESTERS: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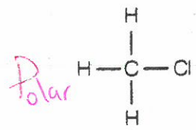
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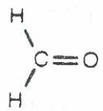
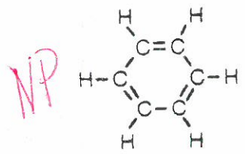

Polar

NP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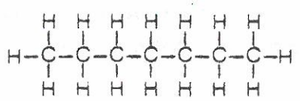
NP

SUMMARY: "MOLECULAR POLARITY" and "POLAR and NONPOLAR SOLVENTS"

London forces

London forces arise from temporary dipoles existing when electrons on one atom temporarily repel the electrons and attract the nucleus of an adjacent atom: the more electrons in an atom or molecule, the stronger the London forces.

London forces are weak intermolecular attractions. (Substances bonded together with London forces melt and boil at low temperatures. If individual **covalently–bonded** molecules are held together by ***LONDON FORCES***, then melting and boiling involve breaking the London attraction rather than the stronger covalent bonds.)

London forces are always present but are most important if no other bond exists between two particles.

Dipole–Dipole Forces

Dipole–dipole forces arise when a permanent dipole on one molecule experiences electrostatic attraction for a permanent dipole on another molecule.

Dipole–dipole forces are about as strong as London forces, but weaker than hydrogen bonds and much weaker than covalent or ionic bonds.

A bond dipole arises when two atoms with different electronegativities are covalently bonded. The negative end of the dipole exists at the more electronegative atom and the positive end at the more electropositive atom.

A polar molecule exists whenever the molecule has bond dipoles and is ASYMMETRICAL.

Hydrogen Bonding

Hydrogen bonds only exist between molecules possessing NH, OH or HF bonds.

Hydrogen bonds are simply strong dipole–dipole bonds.

Hydrogen bonds are the strongest van der Waals bonds but still weaker than covalent or ionic bonds.

Polar and Nonpolar Solvents

"Like–dissolves–like" means polar and ionic solutes are most soluble in polar solvents, and nonpolar solutes are most soluble in nonpolar solvents.

Polar and ionic solutes have relatively strong bonds holding the solid together and only polar solvents have sufficient attraction to the solute to be able to pull the solute out of a crystal and into solution.

Nonpolar solutes require solvents with sufficient London forces to remove the solute from the crystal and into solution; polar solvents tend to have small London forces while nonpolar solvents tend to have large London forces.

How to Distinguish the Most Important Bonds or Forces Holding Substances Together

IONIC BOND – the substance is an ionic crystal (made of metal and nonmetal atoms or recognizable ions)
eg. NaCl(s), NH_4NO_3(s)

COVALENT BOND – the bond in question is intramolecular (bond holds two atoms together **IN** a molecule)
eg. C–H in CH_4

The remaining types of bonding are all intermolecular (bonds **between** existing molecules)

HYDROGEN BONDS – look for HF or any molecule having OH or NH in its formula

If not present then

DIPOLE–DIPOLE FORCE – look for an asymmetric molecule

If not present then

LONDON FORCE is all that is present