1. What makes a molecule polar?

(A) the strength of the molecule's intramolecular bond
(B) the strength of the molecule's intermolecular bond
(C) the number of valence electrons in the molecule
(D) the distribution of electrons in the molecule

The correct answer is D. A molecule is polar when the distribution of electrons inside the molecule is imbalanced, and one side of the molecule is more positive or more negative than the other side.

2. Can an atom be polar, or does polarity only refer to molecules?

(A) An atom can be polar.
(B) Only molecules are polar.

The correct answer is B. Individual atoms are not polar until they bond to other atoms and only then can one side of the molecule become polar.

3. Why is water liquid and sodium chloride solid?

(A) Water is liquid and sodium chloride is solid because H_2O is more polar than NaCl.
(B) Water is liquid and sodium chloride is solid because H_2O is less polar than NaCl.

The correct answer is B. Water molecules are less polar than sodium chloride molecules, so water molecules don't stick to each other as firmly as sodium chloride molecules do. Being less sticky, water molecules slip and slide over one another which makes water fluid.

4. The name of the intermolecular bond between water molecules is _____.

(A) hydrogen bond
(B) oxygen bond
(C) polar covalent bond
(D) covalent bond

The correct answer is A. Hydrogen bonding is the intermolecular bond between the positive side of one polar covalent molecule and the negative side of another polar covalent bonding. It's called hydrogen bonding because the best example of hydrogen bonding occurs between

water molecules, but hydrogen bonding now refers to the intermolecular bond between any two polar covalent molecules.

5. Hydrogen bonding between water molecules is pretty strong. Examples of the strength of hydrogen bonding between water molecules include all but the following _____.

(A) water drops are able to hang there without dripping
(B) some insects can stand on water
(C) ice can burst metal pipes
(D) water is transparent

The correct answer is D. The reason water is transparent has nothing to do with the polarity of water molecules. In a later lesson, we'll learn what light is and why some things reflect light and some don't.

6. Why do water molecules form ice crystals when it's cold?

(A) Heat is energy, and less energy causes water molecule to slow down and stick to each other.
(B) Heat is energy, but heat rays cannot penetrate between six-sided ice crystals.
(C) Heat is energy, but heat rays are reflected away by ice.
(D) Heat is energy, but heat is trapped inside each six-sided ice crystal.

The correct answer is A. The reason ice forms is that with less heat energy, water molecules bounce around less and linger close enough and long enough to each other for hydrogen bonding to take hold and form six-sided ice crystals. Heat rays have no trouble penetrating ice, but you need a lot of them to break the hydrogen bonds holding ice crystals together.

7. Which statement about static electricity is untrue?

(A) Static electricity can occur when the negative side of polar molecules are all pointing in the same direction.
(B) Static electricity requires an excess number of electrons to form.
(C) Static electricity explains why your hair stands when you touch the dome of a van der Graaff generator when it's turned on.
(D) Static electricity has difficulty flowing through dry air.

The correct answer is A. Static electricity is due to an excess number of electrons that collect in one location because something – a good example is dry air -- is preventing the electrons from flowing. Because electrons repel each other, allowing electrons to flow through your body onto your hair causes you hair to repel every other strand and lift up.

8. How can water's hydrogen bonding, which is weaker than ionic bonding, pull apart sodium chloride molecules and dissolve salt so easily?

(A) Each water molecule has two hydrogen atoms, so two water molecules are able to pull apart a sodium chloride molecule by using both of their hydrogen bonds.
(B) More than one water molecule is involved in pulling apart sodium chloride molecules.
(C) Being mobile, water molecules collide with sodium chloride molecules and smash them apart.
(D) Water molecules hydrogen bond together into large groups that are able to slam into sodium chloride molecules and bust them apart.

The correct answer is B. Being mobile, water molecules are able to orient their negative oxygen ends toward the sodium atoms and their positive hydrogen ends toward the chloride side and pull sodium chloride apart into sodium and chloride ions. Additional water molecules arrive to completely surround the sodium and chloride ions and keep them suspended in the water. Thus, sodium chloride is pulled apart by electrical forces, not mechanical forces.