Polarity Review

Name: _____

Date: _____

1. Consider the following experimental data. (All of the substances freeze below zero.)

Substance	Boiling Point (^oC)
A	75^o
B	82^o
C	69^o

   a) Based on the data, which substance has the weakest intermolecular forces?

   b) One of the substances has dipole-dipole forces; which substance?

   c) Which substance(s) is/are liquid at room temperature (25^oC)?

2. Draw each of the following molecules …

   A) CO B) SO_2 C) F_2 D) CF_4 E) H_2O

   a) Which of the above substances has <u>bonds</u> that are most polar?

   b) Which of the above molecules is/are polar?

   c) How can a substance have polar bonds and yet not be polar overall?

3. Identify the following as having polar covalent (P), nonpolar covalent (NP), or ionic bonds (I).

   A) CaF_2 B) NH_3 C) HF D) NO E) CCl_4 F) MgO

4. What kind of forces exist between the following…

   A) two CH_4 molecules B) two water molecules

5. Do polar substances tend to have stronger or weaker intermolecular forces than similarly sized nonpolar molecules? Explain.

6. Which of the following would <u>definitely</u> lead to a polar covalent bond? (There could be more than one.)
    a) An atom with a high electronegativity is involved in a covalent bond.
    b) An atom with a low electronegativity is involved in a covalent bond.
    c) A metal and a nonmetal bond together.
    d) Two nonmetals bond together.
    e) An atom with high and an atom with a low electronegativity bond covalently.

7. Why do nonpolar substances tend to have lower boiling points than polar substances?

8. Which of the following bonds is the most polar?
    A) H—C B) C—O C) O—F D) H—O E) H—N

9. The more polar the molecules, the _____ the intermolecular forces.
    (stronger or weaker)

10. Which molecule would you expect to have the highest melting point: water or CH_4? Explain.

11. Which molecule would you expect to have the lowest freezing point—F_2 or Cl_2? Explain.

12. Consider the molecules in the previous question. Which one would have the strongest surface tension when in the liquid state?

13. Consider two molecules: CH_2OH and C_2H_6. Only one of them will dissolve well in water. Which one? Explain.

14. Draw Lewis structures for the following substances. Circle the structures that allow for polarity and list <u>bond angles and the name of the geometry</u> (tetrahedral, bent, etc).

    a) PO_2^+ b) BrO_2^- c) N_2 d) CS_2