1. What is the major disagreement between the kinetic molecular theory and Coulomb's Law?

2. Which of the following gases would deviate the least from the ideal gas equation. Which one would deviate the most? Explain your answers.

   - Deviates least: \( \text{H}_2 \)  
     - Explain: smallest, least inst. dipole
   
   - Deviates most: \( \text{HF} \)  
     - Explain: strongest IMF from H bonds

3. True and false. Be able to explain your answer.

   - (a) Hydrogen bonds are sometimes stronger than covalent bonds.
     - T
     - 20 kJ 400 kJ

   - (b) A dipole moment in a molecule is caused by a difference in electron density.
     - T

   - (c) An ion-ion interaction involves the sharing of electrons between nuclei.
     - F

   - (d) In a series of ionic compounds, the compound with the largest charge density in the ions will have the highest melting point.
     - T

   - (e) Hydrogen bonds can exist between a hydrogen atom and any other element.
     - T
     - NEED HIGH ENthalpy ELEMENT like N, O, F, CI

   - (f) London forces in a compound can be large enough to create solid materials at room temperature
     - T

   - (g) Water rises in a capillary tube because it is attracted to the glass.
     - T

   - (h) Instantaneous dipoles exist in ALL compounds.
     - T

4. Classify each of the following interactions as a covalent bond, ion-ion interaction, hydrogen bonding, permanent dipole, or London forces:

   - (a) The interaction between potassium and bromine in KBr

   - (b) The interaction responsible for water's surface tension

   - (c) The attraction between two carbons in a hydrocarbon

   - (d) The interaction between one molecule of CH3F and another molecule of CH3F

   - (e) The attraction of the electrons of one Ar atom for another Ar atom's nucleus
5. If you spilled a few drops of ether on a lab bench, would you expect it to form beads of liquid on the surface, or spread out evenly? Why? What about water?

 Ether is fairly nonpolar so little surface tension, spread out
 H2O beads up because it isn’t nonpolar high surface tension

6. It takes longer to cook spaghetti at high altitude. Why?

 High altitude, lower atm pressure, lower b.p. for H2O

7. For each of the solution properties, explain the relationship to increasing intermolecular forces.

(a) Viscosity
(b) Capillary Action
  \[ IMF \uparrow \text{ all 3 properties} \uparrow \]
(c) Surface Tension
(d) Vapor Pressure
  \[ IMF \uparrow \text{ vapor pressure} \\]
(e) Tendency to Evaporate
  \[ IMF \uparrow \text{ evap} \\]

8. Predict the order of increasing capillary action for the following:
   \[ \text{H}_2\text{S}, \text{H}_2\text{O}, \text{CH}_4, \text{H}_2, \text{KBr} \]
   \[ \text{H}_2 < \text{CH}_4 < \text{H}_2\text{S} < \text{H}_2\text{O} < \text{KBr} \]

9. Put the following compounds in order from lowest boiling point to highest boiling point and justify your answer.
   \[ \text{CH}_4; \text{C}_4\text{H}_{10}; \text{C}_2\text{H}_6; \text{C}_3\text{H}_8; \text{C}_5\text{H}_{12} \]
   \[ \text{CH}_4 < \text{C}_2\text{H}_6 < \text{C}_3\text{H}_8 < \text{C}_4\text{H}_{10} < \text{C}_5\text{H}_{12} \]

10. Why is ethane less viscous than ethanol?

    Ethane has instantaneous intermolecular forces only.
    Ethanol has H-bonding which is stronger.

11. Put the following compounds in order from the lowest melting point to highest melting point:
    \[ \text{CaO, K}_2\text{O glass (SiO2), H}_2\text{O, CHCl}_3, \text{C}_2\text{H}_6, \text{Ar, He}} \]
    \[ \text{He < C}_2\text{H}_6 < \text{Ar < CHCl}_3 < \text{H}_2\text{O < K}_2\text{O < CaO < glass}} \]

12. For each solid classify its bonds as ionic, covalent, or metallic:

    (a) KF \text{ Ionic}
    (b) CsI \text{ Ionic}
    (c) Ni \text{ Metallic}
    (d) C_6H_6 \text{ Molecular}
    (e) H_2O \text{ Molecular}