**Unit 5: Bonding**

**Free Response Review #2**

**Directions:** The suggested time is about 15 minutes for answering the constructed response section of the chemistry test.  The parts within a question may not have equal weight. For calculations, show all your work in the spaces provided after each part. Pay particular attention to the proper use of units.  Be sure your final answer is rounded to the correct number of significant figures.  Make sure your work is legible. Illegible work will receive a grade of zero.

**Question 1 [10 POINTS]** Three substances are listed below. Use your knowledge of chemical bonding and molecular structure to answer the questions that follow.

|  |  |  |
| --- | --- | --- |
| **Substance 1** | **Substance 2** | **Substance 3** |
| KBr | NH3 | CH4 |

1. Describe, in terms of valence electrons, how the chemical bonds form in substance 1. **[2 POINTS]**

In ionic compounds electrons completely transfer from the metal to the nonmetal. Potassium’s single valence electron transfers to bromine resulting in bromine having a full octet of electrons.

1. Describe, in terms of valence electrons, how the chemical bonds form in substance 2. **[2 POINTS]**

In covalent compounds electrons are shared between two nonmetals. Nitrogen and hydrogen share their valence electrons

1. Are the molecular geometries for substances 2 and 3 the same? Explain. **[2 POINTS]**

The molecular geometries are different because they have a different number of atoms bonded to the central atom

1. Would you predict the H—N—H bond angle in substance 2 is larger than, smaller than, or equal to the H—C—H bond angle in substance 3? Explain. **[2 POINTS]**

Substance 2 will have a smaller bond angle than substance 3 because it has a lone pair repelling the bonded pairs instead of a bonded pair repelling the bonded pairs. Lone pairs repel more resulting in a smaller bond angle

1. Substance 2 has a boiling point of −33.3oC, whereas substance 3’s boiling point is −161.5oC. Account for the difference in boiling points between the two compounds in terms of intermolecular forces. **[2 POINTS]**

Substance 2 has hydrogen bonding while substance 3 only has dispersion forces. Because of this substance 2 has stronger intermolecular forces resulting in a high boiling point. More intermolecular forces, higher boiling point.