

Session #12: Homework Problems

Problem #1

Silicon (Si) and chlorine (Cl) react with each other.

- What is the chemical formula of the reaction product?
- Do you expect the product to be a solid, a liquid, or a gas at room temperature? Rationalize your answer.

Problem #2

Hydrogen (H) and sulfur (S) react with each other and form a compound.

- Give a reasonable chemical formula for the reaction product.
- Do you expect the molecule to be linear or not? If not, suggest a bond angle for the bonds between the reactant atoms.
- At room temperature do you expect the compound to be a solid, a liquid, or a gas? Rationalize your answer.

Problem #3

What types of bonds can be expected to be formed in each of the compounds listed below, and in what "state of aggregation" (gaseous, liquid or solid) are they encountered at room temperature?

- O₂
- HCl
- SiO₂
- LiF
- CH₄

Problem #4

One of the two compounds, NH₃ or BF₃, is found to exhibit a permanent dipole moment. Identify the polar species and account for the different bonding characteristics of the two species. Make appropriate sketches of the respective bonding configurations.

Problem #5

Account for the following fact: H₂O and HF have much higher boiling points (100°C and 19.4°C respectively) than their homologues, H₂S and HCl (−60.7°C and −85°C), although the molecular weight of H₂O and HF is lower than that of H₂S and HCl.

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