FLINN SCIENTIFIC

Name_____

Properties of Solids

Data Table

Physical Property	Aluminum	Silicon Dioxide	Sodium Chloride	Stearic Acid	Sucrose
Color and Appearance					
Volatility and Odor					
Conductivity (Solid)					
Solubility in Water					
Conductivity of Aqueous Solution					
Solubility in Hexane					
Melting Point*					

**The average temperature of a Bunsen burner flame is greater than 1000 °C.*

Post-Lab Questions

1. Compare the volatility and odor of stearic acid and sucrose. Which is more volatile? Why? Is it possible for a compound to be volatile but have no odor? Explain.

2. Both stearic acid and sucrose are molecular solids, but one is polar and the other is nonpolar. Compare the solubility of the two compounds in water and in hexane to determine which is which.

3. Based on the answers to Questions #1 and #2, predict whether the intermolecular forces (forces between molecules) are stronger in polar or nonpolar substances.

4. In order for a substance to conduct electricity, it must have free-moving charged particles.

   a. Explain the conductivity results observed for sodium chloride in the solid state and in aqueous solution.

   b. Would you expect molten sodium chloride to conduct electricity? Why or why not?

   c. Use the model of metallic bonding described in the *Background* section to explain why metals conduct electricity.

5. Complete the following table (some of the entries have been filled in for you). Note that sand (silicon dioxide) is a covalent-network solid.

	Type of Solid			
General Properties	**Covalent-network**	**Ionic**	**Metallic**	**Molecular**
Melting Point			Low to High	
Solubility				Depends on polarity
Conductivity (Solid)		Nonconductors		

Activity B. Dyes, Dyeing, and Chemical Bonding

Data Table

	WoolAcrylic	Polyester	Nylon	Cotton	Acetate	
Malachite Green						
Crystal Violet						
Congo Red						

Post-Lab Questions *(Use a separate sheet of paper to answer the following questions.)*

1. Compare the general ease of dyeing the six different fabrics in the multifiber test fabric. Which fabric(s) consistently developed the most intense colors, regardless of the type of dye used? Which fabric was the most difficult to dye?
2. Consult Figure 1: What feature stands out as unique in the structure of the fabric that was the easiest to dye? What feature stands out as unique in the structure of the fabric that was hardest to dye?
3. Consult Figure 2: Which two dyes have very similar structures? Compare the relative color intensities produced by these dyes on the different fabrics in the multifiber test fabric. Are the color patterns (from lightest to darkest) similar for these two dyes? Explain.
4. Compare the color patterns produced on the different types of fabrics by crystal violet (a direct dye) and congo red (a substantive dye). Suggest a possible reason for any differences based on the chemical bonding interactions of direct versus substantive dyes (see the *Background* section).
5. Show by means of a diagram one hydrogen bond that might form between a glucose unit in cotton and congo red. *Hint:* Hydrogen bonds have the general form X—H --- :Y, where X and Y are highly electronegative atoms such as N, O, F, and Y has an unshared pair of electrons.