**Solids Worksheet**

1. Identify the main type of bonding and the type of solid for each of the following:

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| * 1. SiO2
 | * 1. Na2S
 | * 1. CH4
 |
| * 1. C
 | * 1. Cr
 | * 1. CaO
 |

1. How does the melting point of a solid relate to the type of particles and forces present?
2. State the similarities and differences in the properties of each of the following pairs of substances. In terms of the particles and forces present, briefly explain each answer.

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| 1. Al (s) and Al2O3 (s)
 | 1. CO2 (s) and SiC (s)
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1. Match the solids, NaBr (s), V (s), P2O5 (s), SiO2 (s), to the property listed below:
	1. high melting point, conducts electricity
	2. low melting point, soft
	3. high melting point, soluble in water
	4. very high melting point, nonconductor
2. The electrical conductivity of solid silver is much better than that of molten silver chloride, AgCl. In turn, the electrical conductivity of molten AgCl is much better than that of solid AgCl. Explain these facts.
3. Name the type of solid present (atomic, molecular, metallic, ionic, covalent network) and state which type of intermolecular forces and/or intramolecular forces (van der Waals, dipole-dipole, hydrogen bonding, non-polar covalent bonds, polar covalent bonds, metallic bonds, ionic bonds) are present in each of the following substances?

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| --- | --- | --- | --- | --- | --- |
| 1. Ne (l)
 | 1. Fe (s)
 | 1. diamond (s)
 | 1. CH4 (g)
 | 1. KCl (s)
 | 1. Ag (s)
 |
| 1. Si (s)
 | 1. SiO2 (s)
 | 1. I2 (g)
 | 1. C2H2 (l)
 | 1. SO2 (l)
 | 1. SiC (s)
 |
| 1. MgO (s)
 |  |  |  |  |  |

1. Explain why NaCl dissolves readily in water but very poorly in gasoline (C8H18).
2. To which class of solid does each of the following belong:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 1. NO2
 | 1. BaCl2
 | 1. CBr4
 | 1. SiO2
 | 1. Zn
 |
| 1. He
 | 1. Hg
 | 1. HBr
 | 1. Kr
 | 1. I2
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1. Which of Na, Si, He, KF, and HF in the solid phase would be an example of:
	1. a solid in which the atoms are covalently bonded together in a network?
	2. a solid with strong hydrogen bonds?
	3. a solid which is a good conductor of electricity?
	4. a substance which does not conduct electricity except in liquid state?
	5. a solid held together only by van der Waals (London Dispersion) forces?
2. Using the data from Table 1, identify the type of solid and identify the forces of attraction that give each substance its characteristic melting point/boiling point. Remember that you are describing the solid phase of each substance whether it is a solid at room temperature or not.

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| ***Table 1: Properties of Five Substances*** |
| *Substance* | *M.P.**(℃)* | *B.P.**(℃)* | *Electrical Conductivity* | *Solubility in Water* |
| of Solid | of Liquid |
| A | 776 | 1500 | poor | good | soluble |
| B | -39 | 356 | good | good | insoluble |
| C | -190 | -42 | poor | poor | low solubility |
| D | 961 | 1950 | good | good | insoluble |
| E | 1420 | 2355 | poor | poor | insoluble |

1. Predict the order of increasing melting points for the following chlorine containing substances: Cl2, NaCl, and CCl4. Explain your prediction.
2. What kind of attractive force must be overcome to melt the following substances: lithium chloride crystals, ice, solid argon, and silicon dioxide?
3. What type(s) of bonding exists in the following substances: solid Ne, Cu, and diamond?
4. Germanium (Ge) is a solid whose atoms are all covalently bonded to each other, much like those of the carbon atoms in a diamond crystal. Glycerol (C3H5(OH)3) is an alcohol. Potassium chloride (KCl) is a white crystalline solid. Methane (CH4) is a gas which can be liquified only under high pressures and low temperatures. Rubidium metal is very malleable and is an excellent conductor of electricity. Which of these substances has:
	1. hydrogen bonding
	2. the greatest hardness in the solid phase
	3. the highest melting point
	4. good conductivity of electricity when melted
	5. the lowest molar heat of vapourization (i.e. boils at the lowest temperature)
	6. particles held together primarily by van der Waals forces?
5. For each of the following pairs of substances, predict which will have the higher melting point and indicate why.
	1. CuBr2, Br2
	2. CO2, SiO2
	3. S, Cr
	4. CsBr, CaF2
6. Which compound in each of these pairs will have the higher melting point?
	1. CaO or KI
	2. KCl or KI
	3. RbCl or ICl