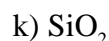


Chem 130
Problem Set Ch. 11

[Key begins on page 2.](#)

1. Calculate the amount of energy required (in Joules) to convert 9.00 grams of ice (specific heat = 2.00 J/g°C) at -15°C to steam (specific heat = 2.00 J/g°C) at 115°C and 1.00 atm. The specific heat of liquid water is 4.184 J/g°C. The Heat of Fusion for water is 6.01 kJ/mol and the Heat of Vaporization is 40.66 kJ/mol.

2. List the forces one must overcome in order to melt or boil the following.



3. Select the highest boiling substance among each of the following groups.



4. From question #2 select a different compound that fits each of the following.

a) conducts electricity as a liquid but not as a solid.

b) is a gas at room temperature.

c) conducts electricity both as a liquid and as a solid.

d) contains polar bonds but nonpolar molecules.

1. Calculate the amount of energy required (in Joules) to convert 9.00 grams of ice (specific heat = 2.00 J/g°C) at -15°C to steam (specific heat = 2.00 J/g°C) at 115°C and 1.00 atm. The specific heat of liquid water is 4.184 J/g°C. The Heat of Fusion for water is 6.01 kJ/mol and the Heat of Vaporization is 40.66 kJ/mol.

$$\begin{aligned}
 q_{\text{WARM ICE}} &= (2.00 \text{ J/g}^\circ\text{C})(9.0\text{g})(15^\circ) = 270 \text{ J} \\
 q_{\text{melt}} &= (6010 \text{ J/mol})(0.5 \text{ mol}) = 3005 \text{ J} \\
 q_{\text{WARM H}_2\text{O}} &= (4.184 \text{ J/g}^\circ\text{C})(9.0\text{g})(100^\circ) = 3766 \text{ J} \\
 q_{\text{Boil}} &= (40,660 \text{ J/mol})(0.5 \text{ mol}) = 20,330 \text{ J} \\
 q_{\text{WARM STEAM}} &= (2.00 \text{ J/g}^\circ\text{C})(9.0\text{g})(15^\circ) = 270 \text{ J}
 \end{aligned}
 \left. \vphantom{\begin{aligned} q_{\text{WARM ICE}} \\ q_{\text{melt}} \\ q_{\text{WARM H}_2\text{O}} \\ q_{\text{Boil}} \\ q_{\text{WARM STEAM}} \end{aligned}} \right\} \begin{aligned} \text{TOTAL} &= 27641 \text{ J} \\ \text{OR} &\sim 27.6 \text{ kJ} \end{aligned}$$

2. List the forces one must overcome in order to melt or boil the following.

- | | |
|---|--|
| a) NH ₃ D/D, LONDON, H-BONDING. | g) Cd METALLIC BOND. |
| b) CO ₂ LONDON ONLY | h) MgO IONIC BOND. |
| c) NaBr IONIC BOND | i) C ₂ H ₆ LONDON ONLY |
| d) Ar LONDON ONLY | j) CH ₃ Cl LONDON, D/D |
| e) BN COVALENT BOND (MACROMOLECULE) | k) SiO ₂ COVALENT BOND (MACRO) |
| f) H ₃ COH LONDON, D/D, H-BONDING. | l) HF LONDON, D/D, H-BONDING. |

3. Select the highest boiling substance among each of the following groups.

- | | | |
|-------------------------------|------------------|--|
| a) OF ₂ | CO ₂ | SiO ₂ (circled) MACRO |
| b) NaCl | KBr | LiF (circled) SMALLEST IONS...STRONGEST BOND |
| c) H ₂ O (circled) | H ₂ S | H ₂ Se ONLY H ₂ O HAS H-BONDING IN THIS GROUP. |
| d) HBr | HCl | HF (circled) ONLY HF HAS H-BONDING IN THIS GROUP. |

4. From question #2 select a different compound that fits each of the following.

- | | |
|---|-----------------------------|
| a) conducts electricity as a liquid but not as a solid. (ANY IONIC COMPD) | <u>NaBr OR MgO</u> |
| b) is a gas at room temperature. | <u>CO₂ OR Ar</u> |
| c) conducts electricity both as a liquid and as a solid. (METALS) | <u>Cd</u> |
| d) contains polar bonds but nonpolar molecules. | <u>CO₂</u> |