Chem 130
Problem Set Ch. 11

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1. Calculate the amount of energy required (in Joules) to convert 9.00 grams of ice (specific heat = 2.00 J/g^{o}C) at -15^{o}C to steam (specific heat = 2.00 J/g^{o}C) at 115^{o}C and 1.00 atm. The specific heat of liquid water is 4.184 J/g^{o}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.

a) NH_3

b) CO_2

c) NaBr

d) Ar

e) BN

f) H_3COH

g) Cd

h) MgO

i) C_2H_6

j) CH_3Cl

k) SiO_2

l) HF

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

a) OF_2 CO_2 SiO_2

b) NaCl KBr LiF

c) H_2O H_2S H_2Se

d) HBr HCl HF

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. _____

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KEY

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.

$q_{\text{WARM ICE}} = (2.00\ J/g°C)(9.0\ g)(15°) = 270\ J$
$q_{\text{melt}} = (6010\ J/mol)(0.5\ mol) = 3005\ J$
$q_{\text{WARM } H_2O} = (4.184\ J/g°)(9.0\ g)(100°) = 3766\ J$
$q_{\text{Boil}} = (40{,}660\ J/mol)(0.5\ mol) = 20{,}330\ J$
$q_{\text{WARM STEAM}} = (2.00\ J/g°C)(9.0\ g)(15°) = 270\ J$

TOTAL = 27641 J
OR ~27.6 kJ

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

a) NH_3 D/D, LONDON, H-BONDING.
b) CO_2 LONDON ONLY
c) NaBr IONIC BOND
d) Ar LONDON ONLY
e) BN COVALENT BOND (MACROMOLECULE)
f) H_3COH LONDON, D/D, H BONDING.
g) Cd METALLIC BOND.
h) MgO IONIC BOND.
i) C_2H_6 LONDON ONLY
j) CH_3Cl LONDON, D/D
k) SiO_2 COVALENT BOND (MACRO)
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**) MACRO
b) NaCl KBr (**LiF**) SMALLEST IONS ... STRONGEST BOND
c) (**H_2O**) H_2S H_2Se ONLY H_2O HAS H-BONDING IN THIS GROUP.
d) HBr HCl (**HF**) 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 CMPD) NaBr OR MgO
b) is a gas at room temperature. CO_2 OR Ar
c) conducts electricity both as a liquid and as a solid. (METALS) Cd
d) contains polar bonds but nonpolar molecules. CO_2