Warm-Up!

Determine the enthalpy change associated with changing 250. g of water to ice at 0.0°C.

$m = 250.\ g$

$MM = 18.02\ g\ mol^{-1}$

$\Delta H_{solid} = n\,\Delta H_{solid}$

$= \left(\frac{250.\ g}{18.02\ g\ mol^{-1}}\right)(-6.03)$

$= -83.7\ kJ$

Any questions from the homework?

2.) vaporize 500.g $C_2H_4(OH)_2$ @ 198°C

2×12.01
6×1.01
2×16.00
62.08

$\Delta H = n H_{vap}$

$= \left(\frac{500.g}{62.1 g/mol}\right)(56.8)$

$= 474\ kJ$

4)

9.53 g
ice -> water
fus

$\Delta H = n H_{fus}$

$= \left(\frac{9.53\,g}{18.02\,g}\right)\left(6.03\,\frac{kJ}{}\right)$

$= 3.19\ kJ$

Heat (q)

- change in kinetic energy
- measures transfer of energy when there are temperature changes (heating or cooling)

Enthalpy (H)

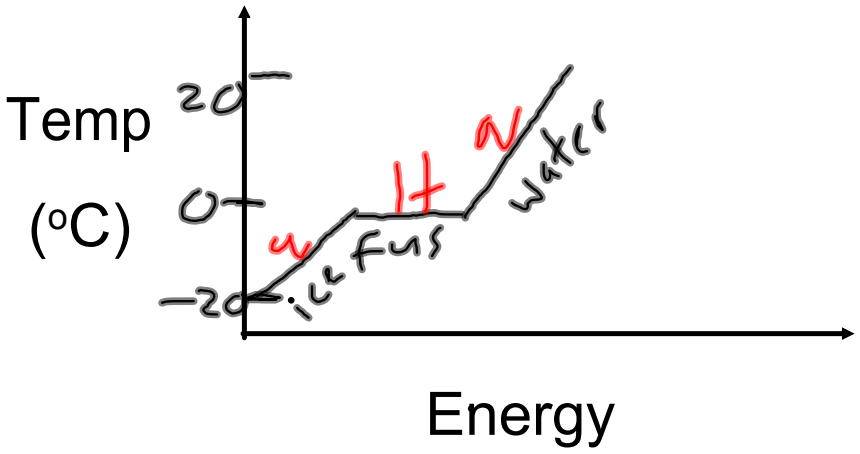
- measures potential energy
- change in energy transfer when system is at constant pressure and same initial and final temperatures

phase change

T.P.S.

What if you heat 10.g of ice at -20.^{o}C until it is water at 20.^{o}C?

Heating Curve



What is the total energy if you heat 10.g of ice at -20.°C until it is water at 20.°C?

$E_T = q_{ice} + \Delta H_{fus} + q_{liquid}$ newbit

$q_{ice} = mC\Delta T = (10.g)(2.01\ J/g\cdot°C)(0-(-20))$

$= q_s = 402\ J$

$\Delta H_{fus} = nH_{fus} = \left(\frac{10.g}{18.02\ g/mol}\right)(6.03\ kJ/mol)$

$H_{fus} = 3.346\ kJ$

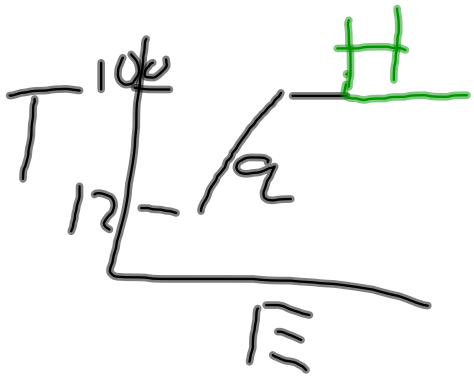
$q_{liquid} = mC\Delta T = (10.g)(4.18\ J/g°C)(0-0)$

$q_l = 838\ J$

$E_T = 402\ J + 3,346\ J + 838\ J$

$= 4600\ J$

Calculate the total energy change if 2.50g of water at 12.0°C is completely converted to steam at 100.°C. (include a heating curve)



$E_T = q_\ell + \Delta H_{vap}$

$q_\ell = mC\Delta T = (2.50)(4.19)(88^\circ C)$

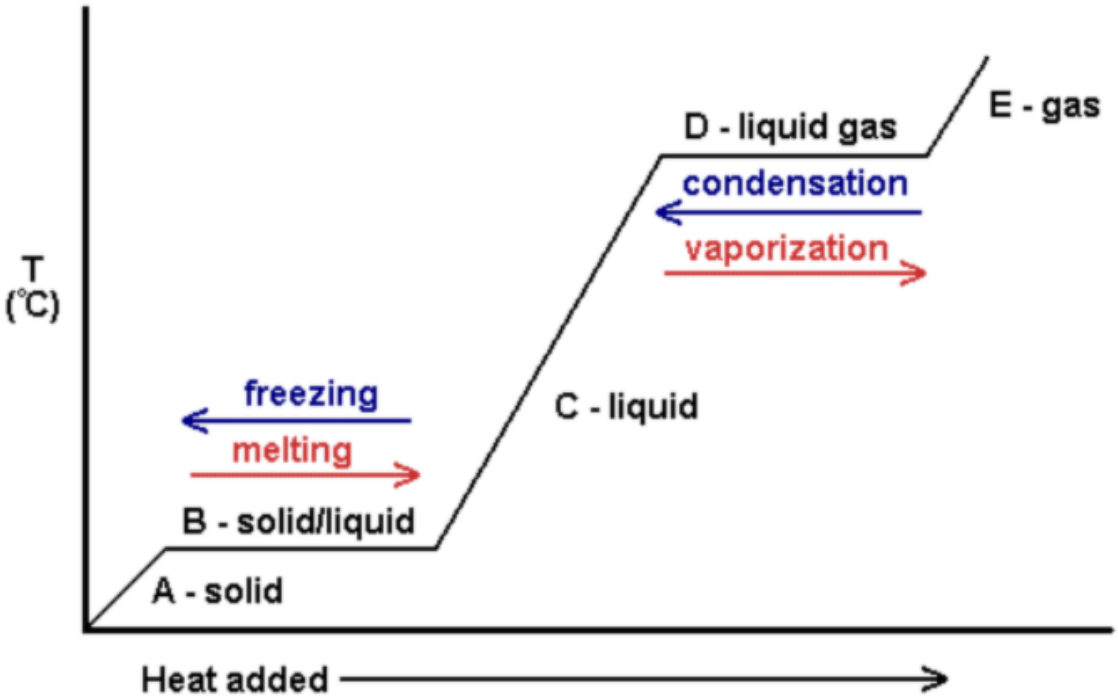
$= 921.8\ J$

$= 0.9218\ kJ$

$\Delta H_{vap} = nH_{vap} = \left(\frac{2.50}{18.02}\right)(40.8)$

$= 5.66\ kJ$

$E_T =$ 6.58 kJ


T
(°C)
E - gas
D - liquid gas
condensation
vaporization
freezing
melting
C - liquid
B - solid/liquid
A - solid
Heat added

Worksheet