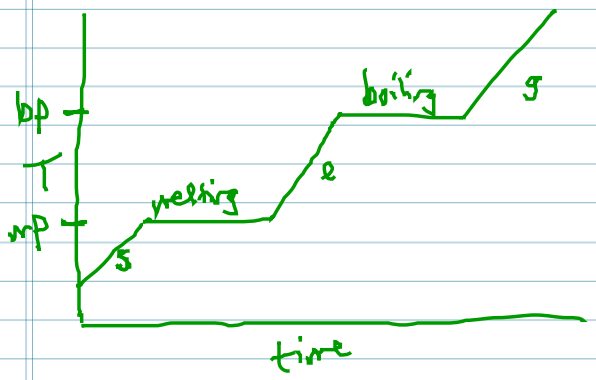
heating / cooling curves (time temperature graph)



heat flow (q) $\longrightarrow \Delta T$
$\longrightarrow \Delta H$

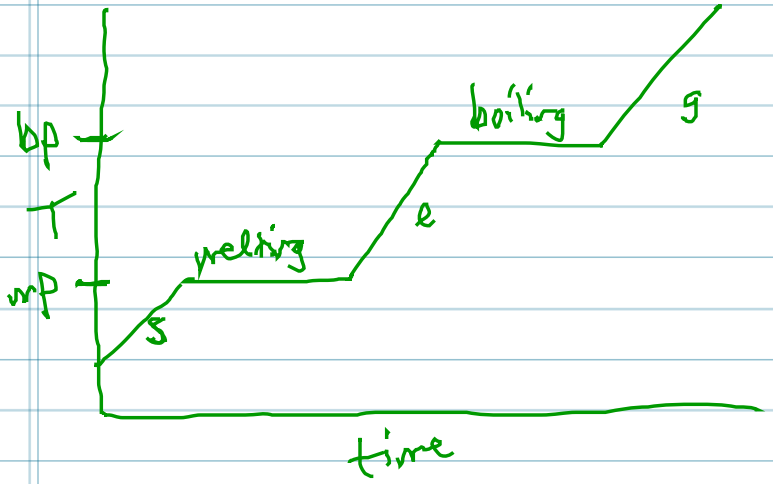
if $\Delta T \Rightarrow$ $q = ms\Delta T$
m = mass (g), s = specific heat J/g°C

if $\Delta H \Rightarrow$ $q = n\Delta H$ n = moles

ΔH_{fus} → melting, freezing

ΔH_{vap} → boiling, condensing

heating / cooling curves (time-temperature graph)



heat flow (q) $\longrightarrow \Delta T$

$\longrightarrow \Delta H$

if $\Delta T \Rightarrow$ $q = m s \Delta T$

m = mass (g); s = specific heat, J/g°C

if $\Delta H \Rightarrow$ $q = n \Delta H$, kJ/mol

ΔH_{fus} → melting, freezing

ΔH_{vap} → boiling, condensing

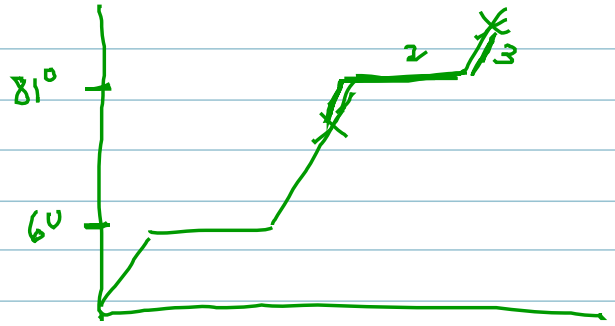
Cyclohexane C_6H_{12}

$mp = 6.00°C$
$bp = 81.0°C$

$S_{solid} = 1.20 J/g°C$
$S_{Liquid} = 2.80 J/g°C$
$S_{gas} = 0.90 J/g°C$

$\Delta H_{fus} = 2.40 kJ/mol$
$\Delta H_{vap} = 18.0 kJ/mol$

50.0 g T = 75.0°C ⟶ 125°C (q = ?)



① $q = mS\Delta T = (50.0\,g)(2.80\,J/g°C)(6°C) = 840 J = 0.840 kJ$

② $q = n\Delta H = (50.0\,g)\left(\frac{1\ mole}{84.18\,g}\right)(18.0\,kJ/mol) = 10.7 kJ$

③ $q = mS\Delta T = (50.0\,g)(0.90\,J/g°C)(44°C) = 1980 J = 1.98 kJ$

0.840 kJ
10.7 kJ
1.98 kJ
13.5 kJ

C_6H_{12} 1.00×10^2 g @ 20.0°C ⇒ remove 8.00 kJ of heat

What's in your dish?

1) $q = (100\text{g})(2.80\text{J/g°C})(6° - 20°) = \ominus 3.92\text{ kJ}$ $(T_2 - T_1)$ (4.08 kJ)

2) freeze $q = n\Delta H = \left(100\text{g}\left(\frac{1\text{ mole}}{84.18\text{g}}\right)(-2.4\text{ kJ/mol}\right) = \ominus 2.85\text{ kJ}$ (1.23 kJ)

3) $-1230\text{J} = (100\text{g})(1.20\text{ J/g°C})\,\Delta T$

$\Delta T = -10.3°C \Rightarrow$ $T = -4.3°C$

100 g solid C_6H_{12}