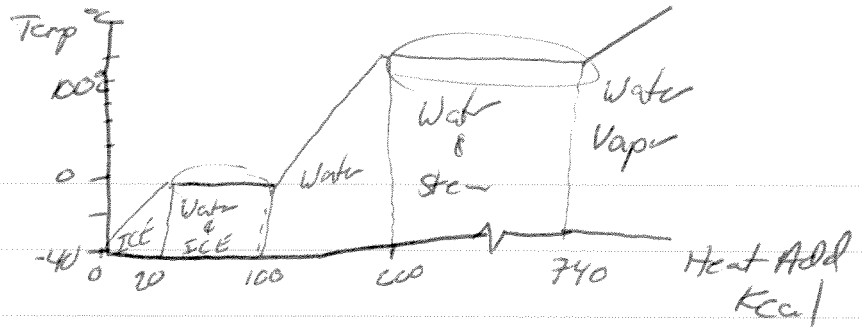

11-6 Latent Heat

Change of phase

Given: 1 kg of Wat

* Temp stops increasing even though heat is still being added

Heat released while undergoing phase change:

Heat of Fusion - Heat required to change 1 kg of substance from solid to liquid

Heat of Vapor - Heat required to change fr liq. to Gas

Ex. How much energy does a refrigerator have to remove from 1.5 kg of water at 20°C to make ice at -12°C?

	Specific Heat (J/kg °C)	Heat of Fusion	Heat of Vaporization
	Water (Ice) 2100		
	(liquid) 4186	J/kg	J/kg
	(Vapor) 2010	3.33×10^5	22.6×10^5

$$Q = m_{water} C_{water} (\Delta T) + m H_f + m c_{ice} (\Delta T)$$

$$Q = 1.5\,kg\,(4186\,J/kg\,°C)(20°C - 0°) + 1.5\,kg\,(3.33\times10^5\,J/kg) + 6\,kg\,(2100\,J/kg)(12$$

$$= 6.6\times10^5\,J = 660\,kJ$$

Ex. A .5 kg chunk of ice at -10 °C is placed in 3 kg of water @ 20°C. If what temp. and in what phase will the final mixture be?

Cons. of Energy: Ice -10°C to 0°C + Ice → Water + Water 0°C to T°C = Heat lost by 3 kg of Wat 20°C to T°C

$$.5\,kg\,(2100)(10°C) + .5(333\,kJ/kg)$$

$$10.5\,kJ + 167\,kJ + (.5\,kg)(4186)(T) = 3\,kg\,(4186\,J/kg\,°C)(20 - T°C)$$

$$14{,}600T = 73{,}800$$

$$T = 5.1°C$$

* Must be careful when using kJ 333

Increase PE by adding
Energy For Phase Changes

Solid → liquid → Gas

←

Energy is Released
through kinetic Energy

Freeze needs to act to remove this Energy