Warm Up

1675 kJ of energy is added to 8.90 L of water at 18.0°C. What is the new temperature of the water?

$q = 1675\,kJ$

$V = 8.90\,L$

$T_i = 18.0°C$

$T_f = ?$

$C = 4.19 \frac{kJ}{L \cdot °C}$

$q = VC\Delta T$ $\frac{q}{VC} = T_f - T_i$

$q = VC(T_f - T_i)$

$1675\,kJ = (8.90\,L)(4.19 \frac{kJ}{L \cdot °C})(T_f - 18.0°C)$

$\frac{1675\,kJ}{(8.90\,L)(4.19 \frac{kJ}{L \cdot °C})} = T_f - 18.0°C$

$44.9°C = T_f - 18.0°C$

$T_f = 62.9°C$

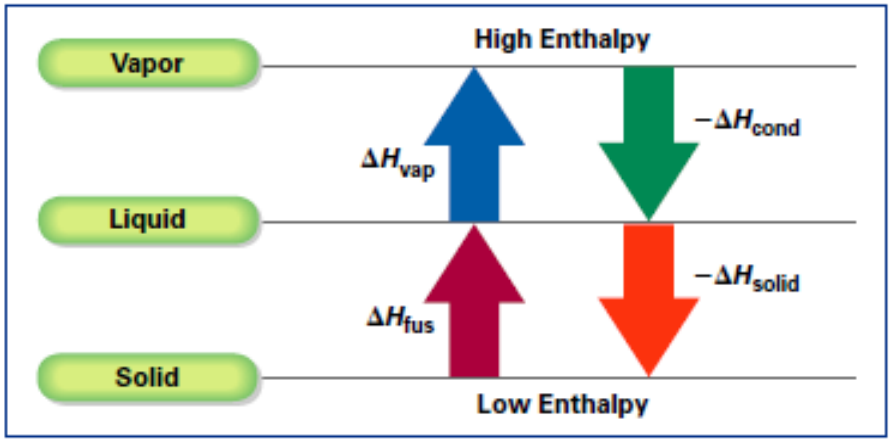
Oct 16-8:02 AM

17.3 Heat in Change of State

Heat in Changes of State.pptx

Check for up to date version with butane correct

Sep 25-4:25 PM



Sep 25-4:31 PM

$$10\text{ g ice} \times \frac{1\text{ mol}}{18.0\text{g}} \times \frac{6.01\text{ kJ}}{1\text{ mol}}$$

3.335 kJ 3335 J

Oct 10-2:38 PM

Remind
table 17.1

Specific heat of water

Ice	2.10 J/gC
Liquid	4.18 J/g C
Steam	1.70 J/g C

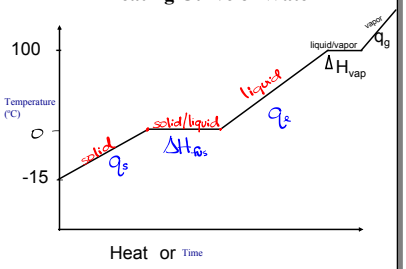
Oct 1-9:40 AM

What we've looked at so far...

- Energy changes when the temperature changes (heating water from 20 °C to 50°C)
- Energy changes when the temperature remains the same. (melting of ice at 0°C)

Total energy combines both of these energy changes together.

Heating Curve of Water



Δ Energy $_{total}$ (ΔE_{total}) = $q_{(solid, liquid, gas)}$ + $\Delta H_{(solid, fus, cond, vap)}$

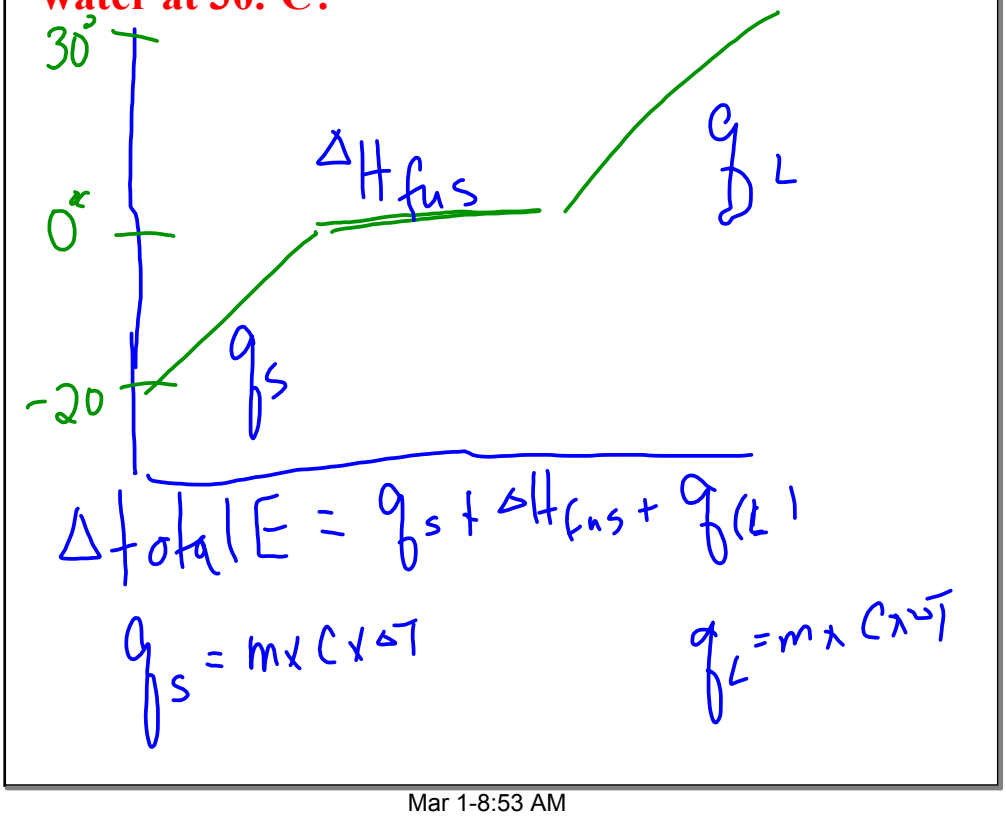
You use as many q's and ΔH as required by the information from the question and the graph you sketch out.

What is the energy required if you heat 10.0g of ice at -20.°C until it is water at 30.°C?

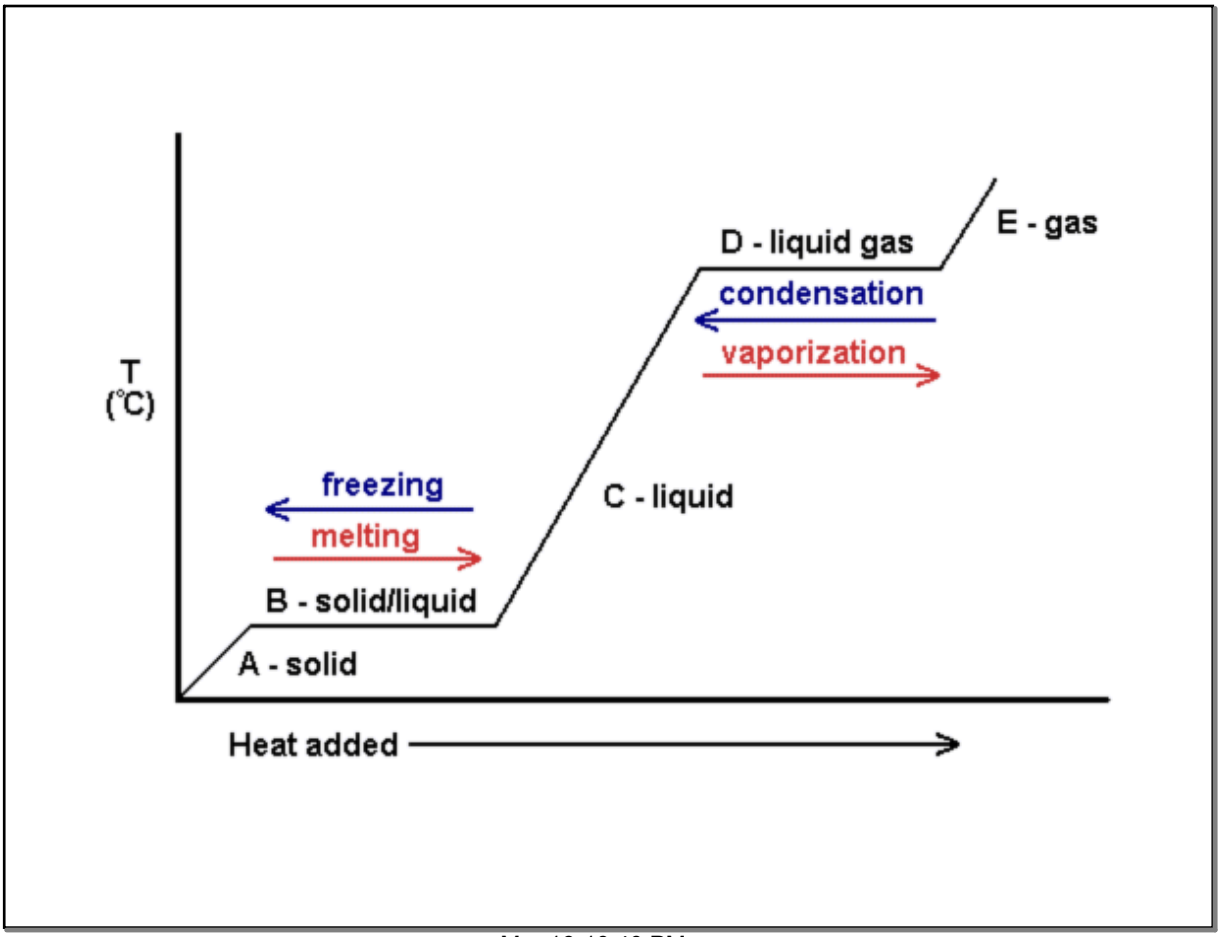
q_{tot} =

Oct 21-1:13 PM

What if you heat 10.0g of ice at -20.°C until it is water at 30.°C?



Mar 1-8:53 AM



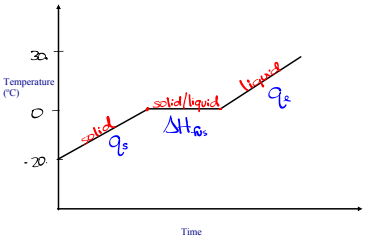
Mar 16-10:40 PM

What we've looked at so far...

- Energy changes when the temperature changes (heating water from 20 °C to 50°C)
- Energy changes when the temperature remains the same. (melting of ice at 0°C)

What if you heat 10. g of ice at -20. °C until it is water at 30.°C?

Heating Curve of Water



$\Delta E_T = q_s + \Delta H_{fus} + q_\ell$

$\Delta E_T = (0.402\,kJ) + (3.335\,kJ) + (1.257\,kJ)$

$\boxed{\Delta E_T = 5.0\,kJ}$

$q_s = mC\Delta T$

$q_s = (10.g)\left(2.01\frac{J}{g\cdot°C}\right)(20.°C)$

$q_s = 402\,J$

$\Delta H_{fus} = n H_{fus}$

$\Delta H_{fus} = \left(\frac{10.g}{18.02\,g/mol}\right)\left(6.01\frac{kJ}{mol}\right)$

$\Delta H_{fus} = 3.335\,kJ$

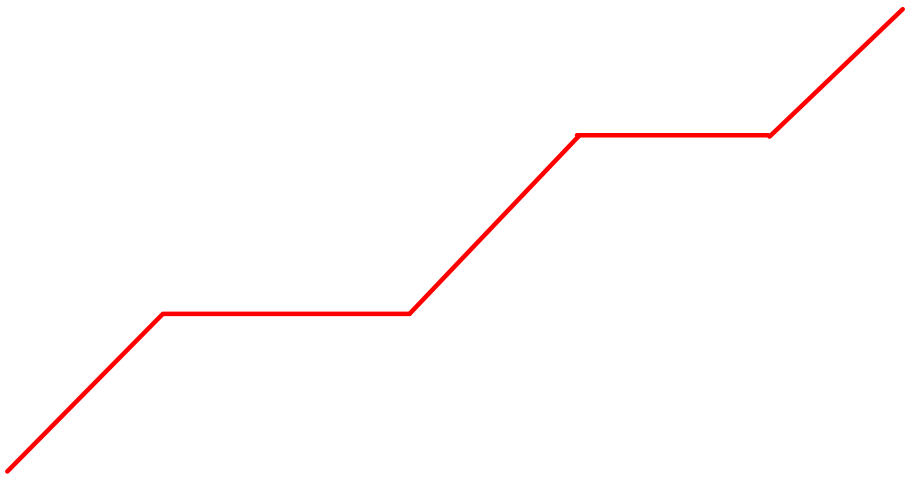
$q_\ell = mC\Delta T$

$q_\ell = (10.g)\left(4.19\frac{J}{g\cdot°C}\right)(30.°C)$

$q_\ell = 1257\,J$

Oct 21-1:13 PM

What could this represent for a heating curve of water?



Mar 26-12:15 PM

Total Energy Changes

Ex. Calculate the total energy change if 2.50 g of steam at 120.0°C is completely converted to ice at 0.0°C.

ΔE_{total} =

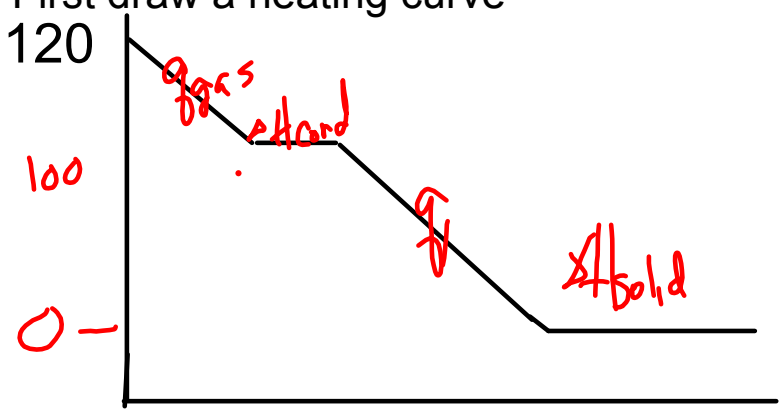
Oct 21-1:43 PM

Total Energy Changes

Ex. Calculate the total energy change if 2.50 g of steam at 120.0°C is completely converted to ice at 0.00 °C.

ΔE_{total} = $q_{gas} + \Delta H_{cond} + q_{\ell} + \Delta H_{solid}$

First draw a heating curve



total Energy = -7.6 KJ

Oct 21-1:43 PM

Homework

Section Review 17.3

Page 526 Q 27-31

#1 - A sample of water with a mass of 23.0 grams at a temperature of -46.0 C increases to 40.0 C.

A) sketch out a heat curve

B) Calculate the total heat needed.

#2 - A 10.0 kg grams of steam at a temperature of 130.0 C is converted to ice at a final temperature of -15.0 C.

A) sketch out a heat curve

B) Calculate the total energy change.

Mar 13-9:29 AM

A sample of water with a mass of 23.0 grams at a temperature of -46.0 C increases to 40.0 C.

A) sketch out a heat curve

B) Calculate the total heat needed.

Oct 11-8:50 AM

answer

Mar 15-9:24 AM

A 10.0 kg grams of steam at a temperature of 130.0 C is converted to ice at a final temperature of -15.0 C.

A) sketch out a heat curve

B) Calculate the total energy change.

Oct 11-8:50 AM

answer

Mar 15-9:23 AM

Worksheet

HeatingCurveofWaterWorksheet.pdf

Heating Curve of water Calculations involving phase change 9-13 more room.docx

ANS to Heating-Cooling Calcs.pdf

ANS to heating Cooling 6 question with more space.docx

Oct 22-6:26 PM

Monday, March 19

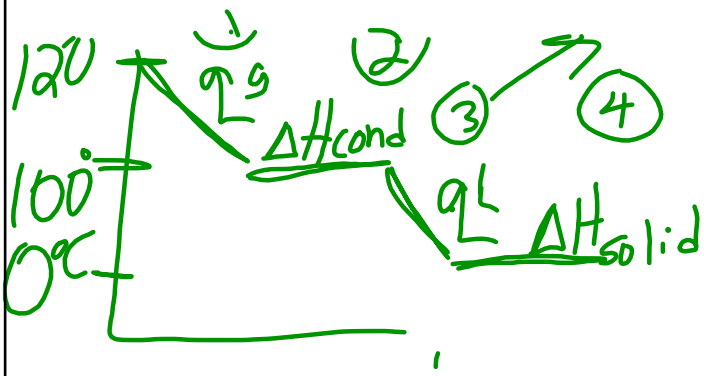
- Complete in class assignment
- Complete guided reading for section 17.4

Mar 19-8:31 AM

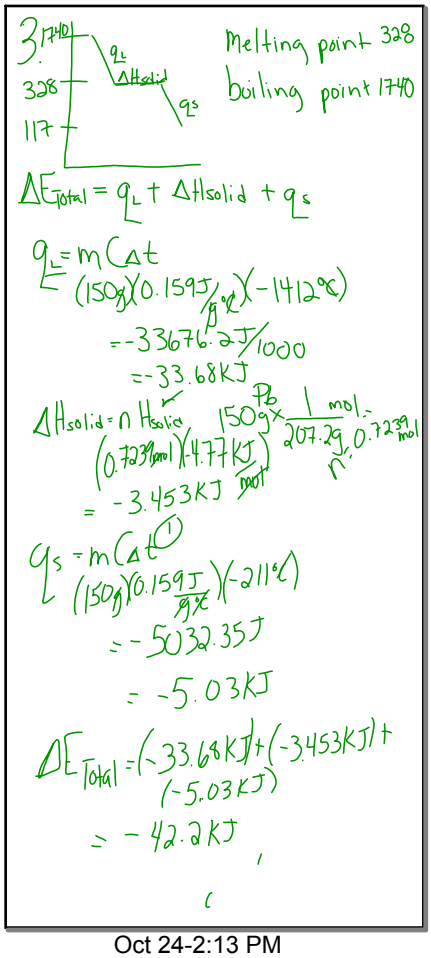
Total Energy Changes

Ex. Calculate the total energy change if 2.50 g of steam at 120.0°C is completely converted to ice at 0.0°C.

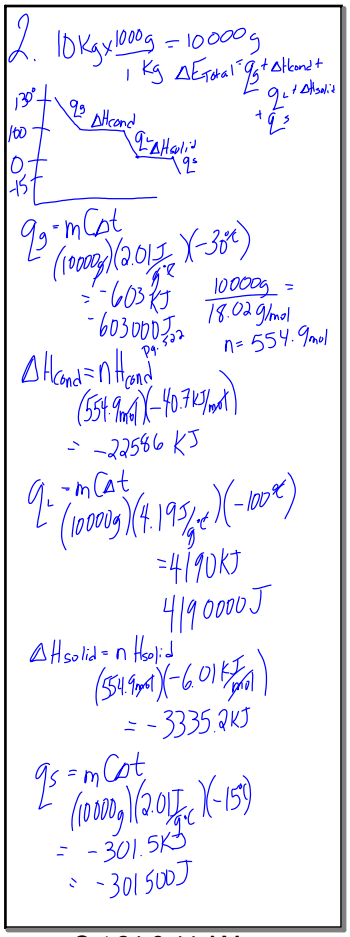
$\Delta E_{total} = q_g + \Delta H_{cond} + q_L + \Delta H_{solid}$



Oct 21-1:43 PM



Oct 24-2:13 PM



Oct 24-8:44 AM

Total Energy Changes

Worksheet 55

1) 1273 KJ 1270 KJ

2) 7231 J 7000 J 7 KJ

3) 478 KJ

4) -252670 KJ -300000 KJ

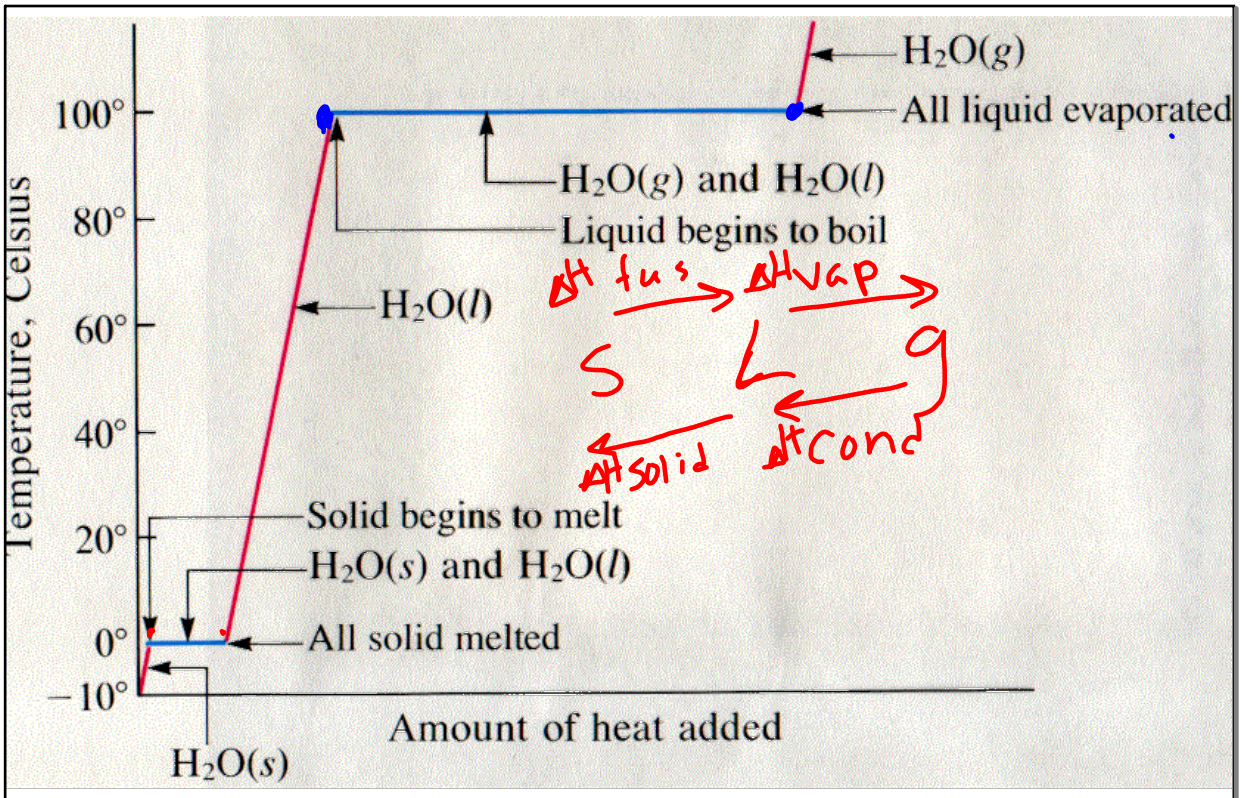
5) 539880 KJ 500000 KJ

Oct 21-1:55 PM

Oct 24-3:26 PM

Inert -A substance that is not chemically reactive.

Oct 24-10:41 AM



Oct 16-1:35 PM

2 328 ΔH_{fus}

25°C q_s

$\Delta E_{Total} = q_s + \Delta H_{fus}$

$(4817J) + (2413J)$

$7231J$

$q_s = mC\Delta t$

$q = (100g)(0.159\frac{J}{g°C})(303°C)$

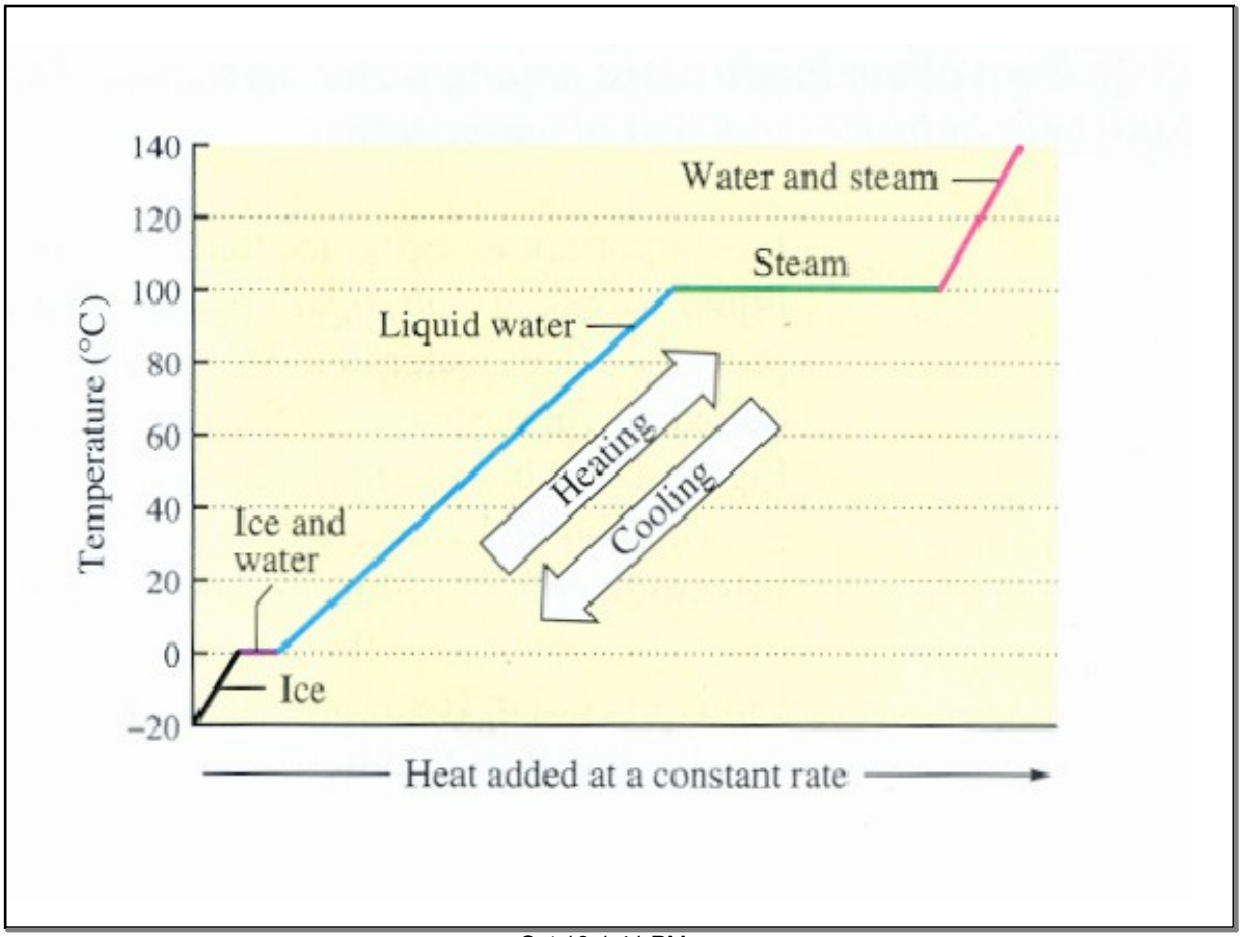
$= 4817.7J$

$\Delta H_{fus} = n H_{fus}$

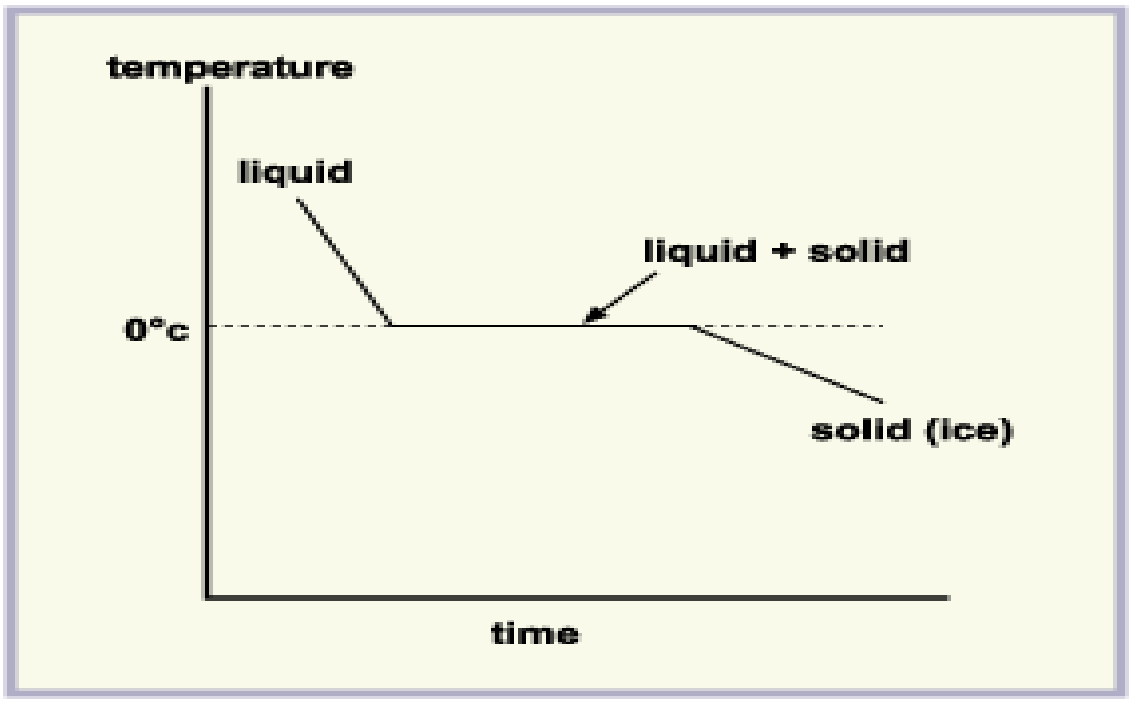
$(5.0KJ/mol)\ 100g\ Pb \times \frac{1mol\ Pb}{207.2g\ Pb}$

$= 2.413KJ \times \frac{1000J}{1KJ} = 2413J$

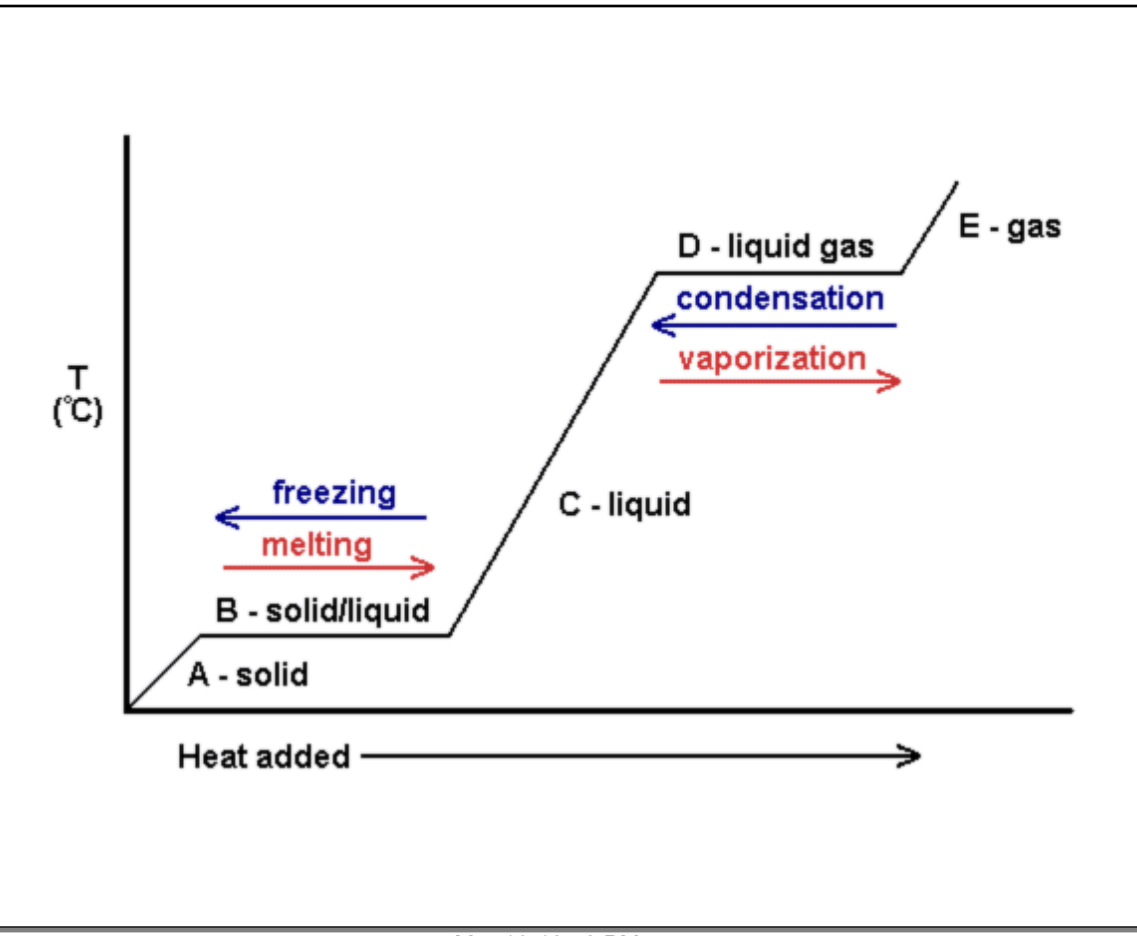
Oct 24-3:30 PM



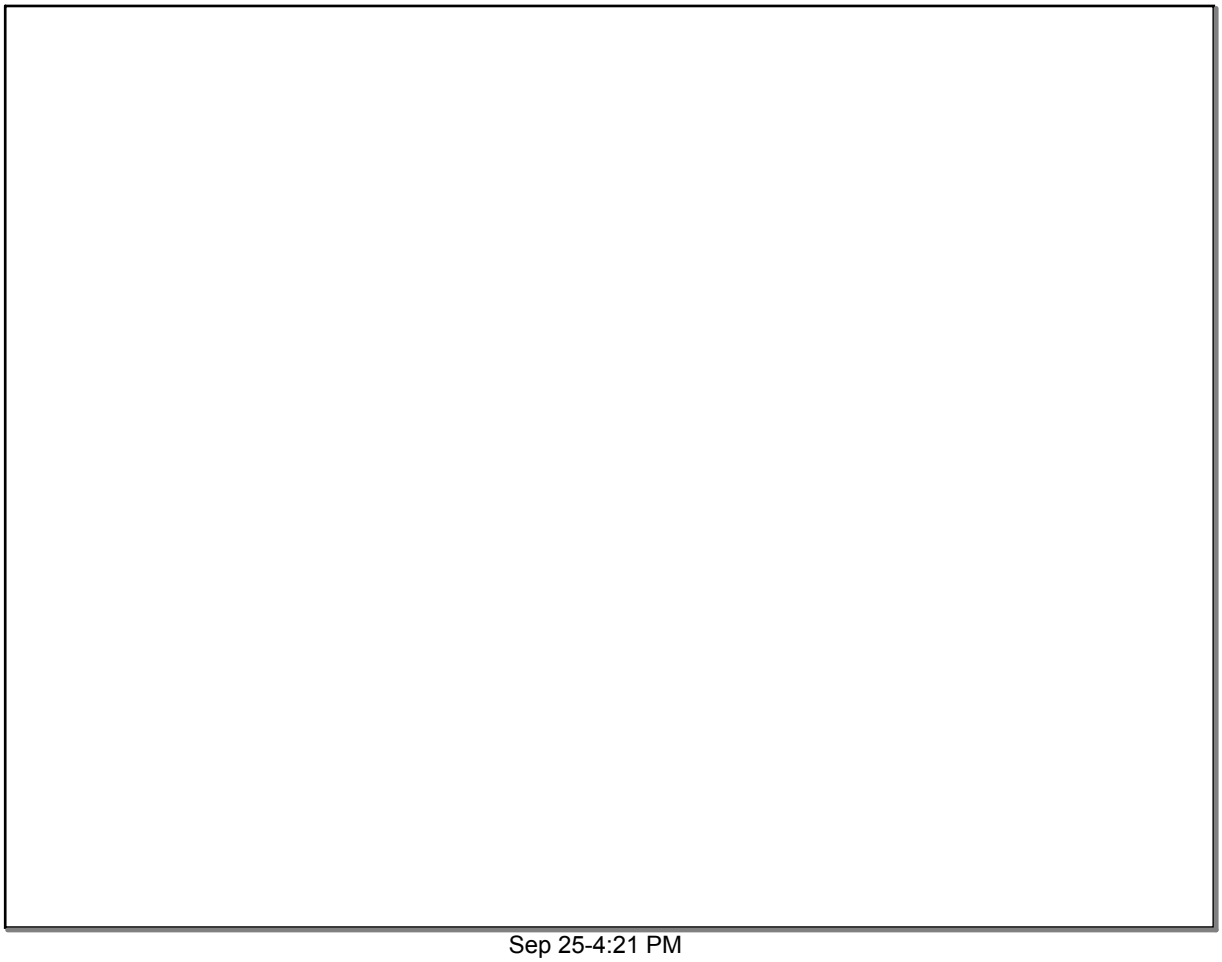
Oct 16-1:41 PM



Oct 16-1:42 PM



Mar 16-10:40 PM



Sep 25-4:21 PM

Attachments

Heat in Changes of State.pptx

ANS to Heating-Cooling Calcs.pdf

HeatingCurveofWaterWorksheet.pdf

ANS to heating Cooling 6 question with more space.docx

Heating Curve of water Calculations involving phase change 9-13 more room.docx