4/7/16

Prop + Changes Hmwk

1. b a → 7. intermolecular (Vander Waals, Dipole-Dipole, Hydrogen bonds)
2. b
3. c
4. b
5. a
6. c

8. intramolecular (covalent/ionic)

9. Dispersion or Vander Waals

10. boiling

11. amorphous

12. higher

13. dipole-dipole

14. freezing

15. hydrogen bond

16. (1 ATM) 30°C

17. 1 ATM

18. 40°C

19. 46-49°C

20. 0.3-0.4 ATM

21. ↑ Temp ↑ molecule activity (movement) ↓ viscosity

22. Hg - strongest H_2O - medium Alcohol - lowest

IF strong med. weak

23. Metallic, molecular, ionic + covalent network

good conductors, some are ductile, repetitive pattern,

definite shape, organized, sharp melting point

unit cell = repetitive pattern.

24. KMT = Kinetic Molecular Theory = all particles are in constant motion

- motion stops at absolute zero

0K (zero K)

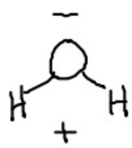
-273°C

Properties of Water

H_2O or $H(OH)$

Hydrogen ion + hydroxide ion

H^{1+} OH^{1-}



bent shape

if a molecule dissociates (becomes ions) in H_2O the solution is called an electrolyte

H_2O is the universal solvent

$1cm \times 1cm \times 1cm = 1cm^3$
hold 1 ml = mass 1g

Liquid at RT, 1 g/cm^3 or g/ml

Solid H_2O (ice) is less dense than liquid water

Intermolecular Force = Hydrogen Bond

↑ Boiling Pt ↑ heat of fusion ↑ surface tension

↑ Specific Heat ↑ heat of vaporization ↑ viscosity

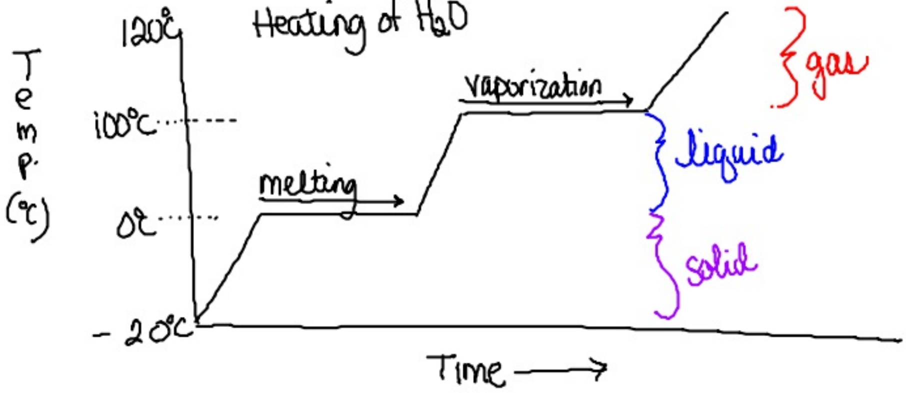
H_2O requires a large amount of energy to change temperature or change phase - great climate moderator

Calorie = the energy required to raise the temp. of 1 gram of H_2O by 1°C.

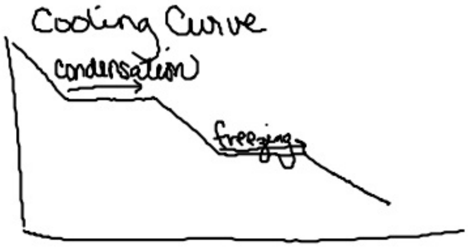
1 Calorie = 1000 calories   1 calorie = 4.184 joules

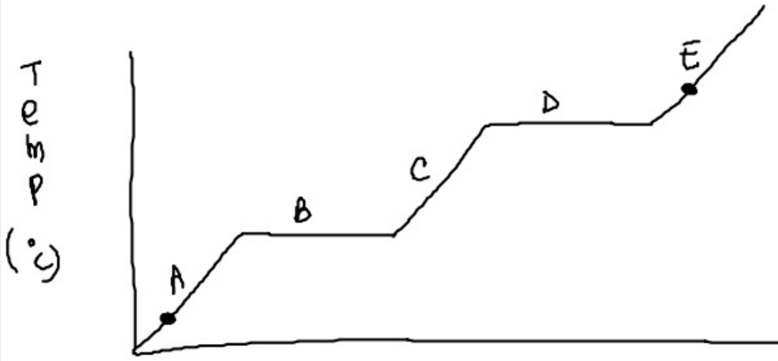
[redacted]

Heating / Cooling Curve illustrates the time required to absorb energy + change temperature + phase



plateau – area when substance is changing phase.



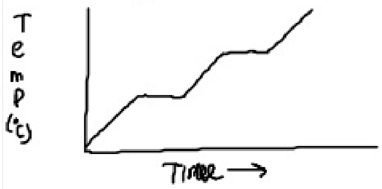


A = Energy = mass $(\Delta T)(Cp_{solid})$
+
B = Energy = mass (Heat of Fusion)
+
C = Energy = mass $(\Delta T)(Cp_{liquid})$
+
D = Energy = mass (Heat of Vap.)
+
E = Energy = mass $(\Delta T)(Cp_{gas})$

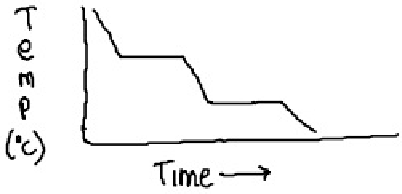
$\Delta T = T_{final} - T_{initial}$ * only for the line segment

Cp = specific heat capacity

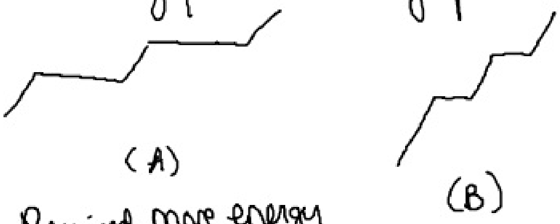
Heating Curve



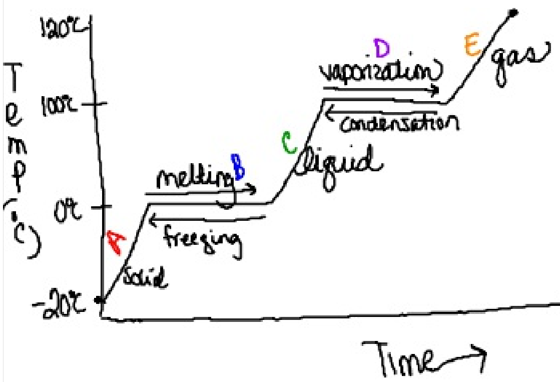
Cooling Curve



The plateaus represent the time needed for the substance to gather energy and change phase.



Required more energy to change phase ∴ greater intermolecular forces.



$\Delta T = T_{final} - T_{initial}$ (for the line segment)

C_p = specific heat capacity

$C_{p_{H_2O\ liquid}} = 1\ cal/g°C = 4.184\ J/g°C$

A solid Energy = mass · ΔT · $C_{p_{solid}}$

\+

B melting Energy = mass · Heat of fusion

\+

C liquid Energy = mass · ΔT · $C_{p_{liquid}}$

\+

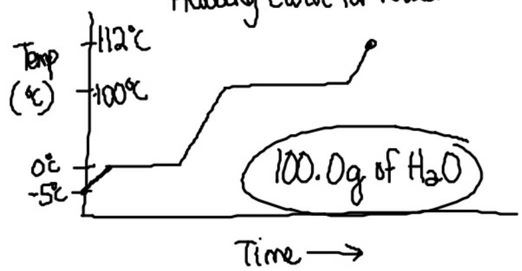
D vaporization Energy = mass · Heat of Vaporization

\+

E gas Energy = mass · ΔT · $C_{p_{gas}}$

Practice

Heating Curve for Water



$C_{P\,sol.} = 2.06\ J/g°C$ $\quad$ $H_{fus} = 333\ J/g$

$C_{P\,liq.} = 4.184\ J/g°C$ $\quad$ $H_{vap} = 2260\ J/g$

$C_{P\,gas} = 2.03\ J/g°C$

$A = (100g)(5°C)(2.06\ J/g°C) = 1030\ J$

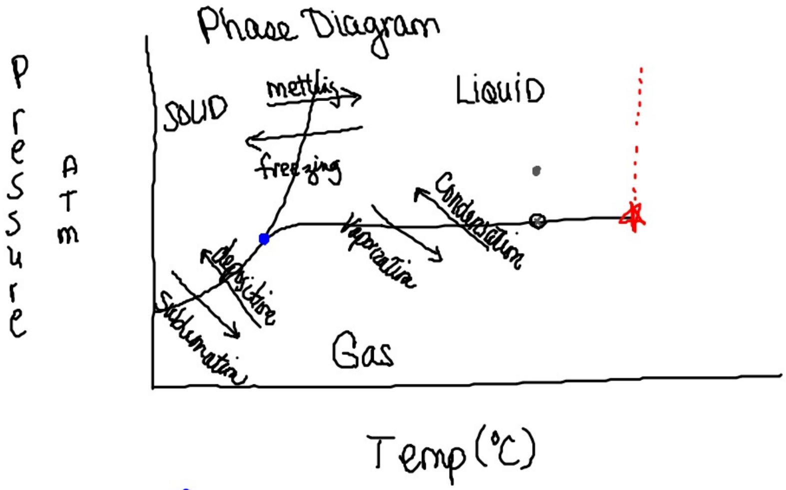
$B = (100g)(333\ J/g) = 33300\ J$

$C = (100g)(100°C)(4.184\ J/g°C) = 41840\ J$

$D = (100g)(2260\ J/g) = 226\,000\ J$

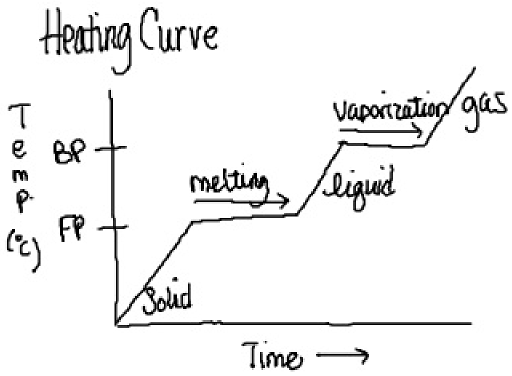
$E = (100g)(12°C)(2.03\ J/g°C) = 2436\ J$

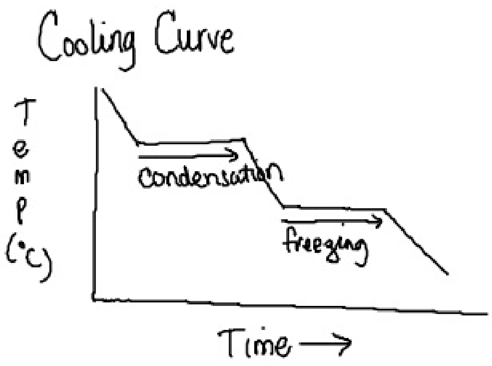
total: $304606\ J \rightarrow$ $\boxed{3 \times 10^5\ J}$

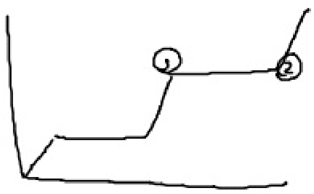


- Triple Point = all 3 phases of matter exist in equilibrium

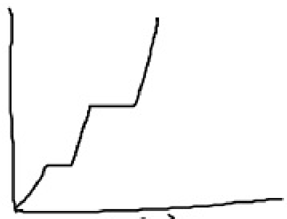
☆ Critical Point = the point at which you can no longer change the gas back into liquid by applying pressure.







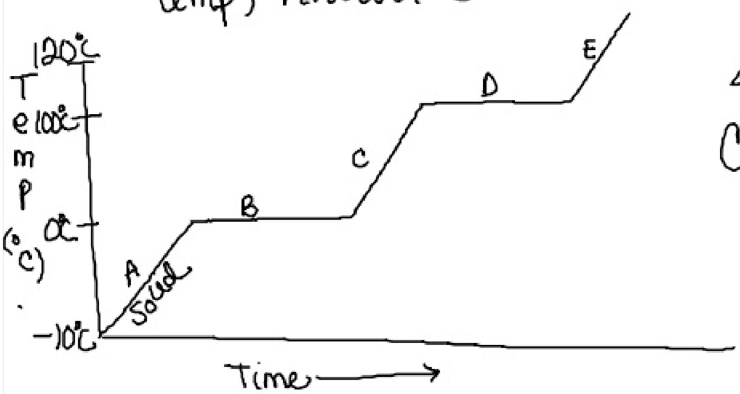
(A)



(B)

Substance A has stronger intermolecular Forces
∴ it requires more energy to change phase

Looking at particle (1) and (2) particles (1) + (2) have the same temp, however (2) has more energy.



$\Delta T = T_{final} - T_{initial}$ (for line segment)

C_p = specific heat capacity

A = energy = mass · ΔT · $C_{p_{solid}}$
+
B = energy = mass · heat of fusion
+
C = energy = mass · ΔT · $C_{p_{liquid}}$
+
D = energy = mass · heat of vaporization
+
E = energy = mass · ΔT · $C_{p_{gas}}$

Total sum