4/8/17

3. IB: Thermal Concepts

Day 1

Covers: ① Internal Energy, ② Temperature ③ Heat Energy (Transferred Energy)

Internal Energy (U)

- Energy of the particles (molecules or atoms) in the object (Not internal to the particle - electrons moving around nucleus)

KE: Vibrational / Rotational / translational motion (For a gas)

PE: Bonding between the particles

Internal Energy: Sum of all particles KE + PE for object

Temperature

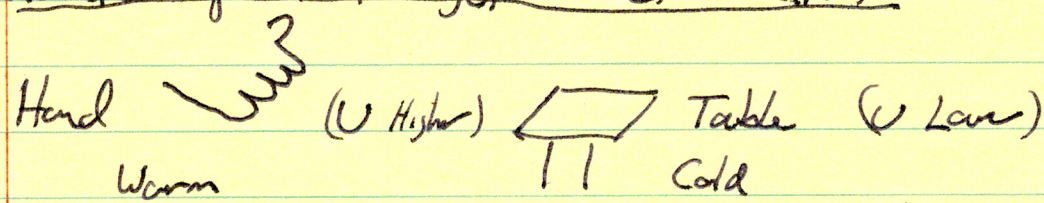
- Measure of avg. KE per molecule
- Higher Temperatures mean higher KE per molecule
  PE of a molecule does not effect temperature

Transferred Energy (Heat) Symbol Q

(Q  Heat object up transfer of Energy

Relationship Put Together between all Three

Example



Molecules in hand will vibrate more than in table

Put hand on Table

By Vibrations on hand ~~than in table~~ will cause molecules to shake around more in table: Result

① Table will warm up

Heat Flow from warm body to cold body ② Transfer of Q

Energy is transfered from higher Temperature to lower temp body

(Transfered Energy)

Summary

	Q →	
High Temp		Low Temp
(U) Internal Energy Dec. as molecules slow & get closer together		(U) Internal Energy Inc. as molecules move fast and further apart

IB Questions 1. For 2 objects in Thermal Equilibrium they must (Q=0)

13:13

Answer (D) Be @ the same temp

13:30 IB Question 2: Which graph best shows the variation of internal Energy (U) of the system with time

If System is insolated no energy escape Q=0

Answer For System U → t (A)

PE of the Particles are related to the Bonding

Quest: If there is more bonding (particles closer together) is there more PE? No

- 2 Particles Far Apart O PE=0 No Bondy O
- Close together Now O O Bondy (Attractive Forces)
  F F
- Now if ya want to separate them ya will need to do work to separate them by exerting Forces apart ← F O → ← O → F
  * PE = Negative Must do work to set trapped particle free

** Ya get an increase in PE (less Negative) as you spread them apart.

Quest As Ice goes from Solid → Liquid → Gas how does PE & KE change

Solid	Liquid	Gas
Some KE Vibration	↑KE	↑KE
Some PE (Negative)	↑PE (less neg)	PE=0