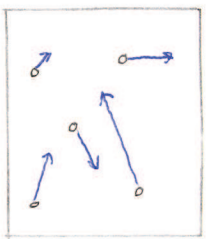


MICROSCOPIC VIEW OF MATTER

PHASES

- GAS



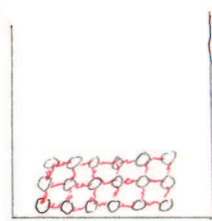
- EVENLY DISTRIBUTED THROUGHOUT CONTAINER
 - RANDOM DIRECTION
 - DISTRIBUTION OF SPEEDS
 - WEAK OR NO LONG RANGE INTERACTIONS BETWEEN PARTICLES
 - LOTS OF FREE SPACE
 - COMPRESSIBLE
- } RANDOM MOTION

- LIQUID

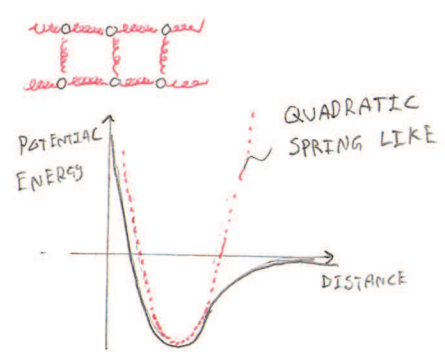


- CONFORMS TO SHAPE OF CONTAINER
- LESS RANDOM MOTION
- VIBRATE AND "ROLL"
- WEAK BONDING - MOLECULES "ROLL" AROUND EACH OTHER
- LITTLE FREE SPACE
- NOT EASILY COMPRESSIBLE

- SOLID

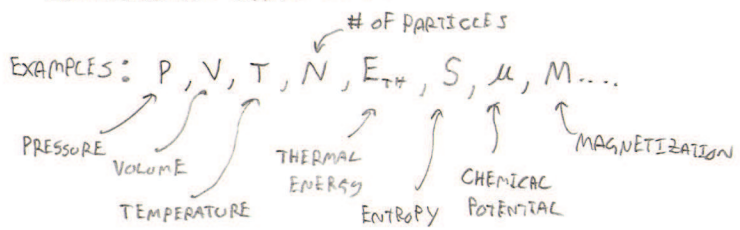


- CRYSTALLINE LATTICE
- MOTION IS VIBRATION ABOUT A FIXED POINT
- STRONG SPRING-LIKE BONDS



STATE VARIABLES

- PROPERTIES THAT DESCRIBE THE EQUILIBRIUM STATE OF MATTER



• CHOOSE STATE VARIABLES RELEVANT TO THE PHYSICS

• NUMBER OF PARTICLES [UNITS] $\equiv N$

1 MOLE (n) = 6.022×10^{23} PARTICLES (N_A)

$n = \frac{N}{N_A}$ $N k_B = n R$ ← CONSTANTS

• PRESSURE $\frac{[M]}{[L][T]^2} \equiv P$ *SI UNITS → PASCAL (Pa)

- COLLECTIVE FORCE PER AREA FROM IMPULSES DUE TO THE COLLISIONS OF THE PARTICLES WITH THE CONTAINER WALLS.

MICROSCOPIC VIEW ($\vec{p} \equiv$ momentum)

VECTOR-OP

IMPULSE CHANGE IN momentum

$\vec{j} = \Delta \vec{p} = \sum \vec{F} \Delta t$

MACROSCOPIC VIEW

$P = \frac{F_{\perp}}{A}$ AREA

PRESSURE EXAMPLE FOR GASES

• VOLUME [L]³ $\equiv V$

- MEASURE OF PHYSICAL LENGTH CUBED

- OPEN - SYSTEM CAN EXCHANGE MASS AND ENERGY (HEAT) WITH SURROUNDINGS
- CLOSED - SYSTEM CAN NOT EXCHANGE MASS, BUT CAN EXCHANGE ENERGY (HEAT) WITH SURROUNDINGS
- ISOLATED - SYSTEM CAN NOT EXCHANGE MASS OR ENERGY (HEAT) WITH SURROUNDINGS