PH 550 – Soft Matter Physics:

Soft Condensed Matter Physics

Course Content:

1. Introduction to Soft Matter
2. Viscoelasticity.
3. Colloids
4. Polymers
5. Surfactants.
6. Liquid Crystals.

Books: ① Soft Matter Physics by Richard Jones

② " " " Masao Doi

③ Introduction to the theory of soft Matter by Jonathan Selinger (liquid crystals)

Soft Condensed Matter Physics

① Matter: Atoms or molecules

↳ Collection of atoms & molecules.

↳ Very large no. of building constit

1 mol of a element ~ N_A ~ 6.023×10^{23}

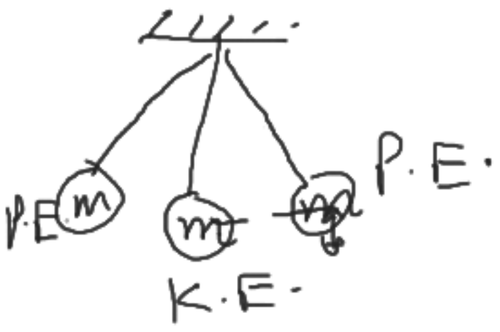
① classical physics :— Newtons laws $F = ma$

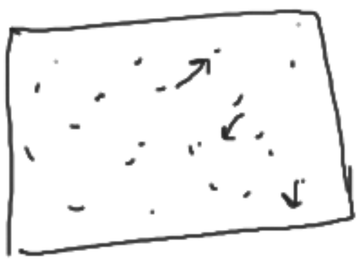
10^{23} ⟶ very difficult

Use laws of statistical physics (Use principle of statistical averaging)

Matter :- Collection of atoms/molecules

Energy : $E = K.E. + P.E.$





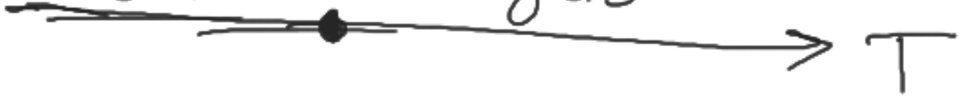
⟶ Gas (K.E. wins)

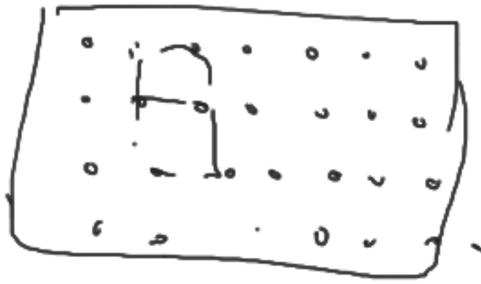
$K.E. >> P.E.$

P.E. >> K.E.

gas solids

T↓



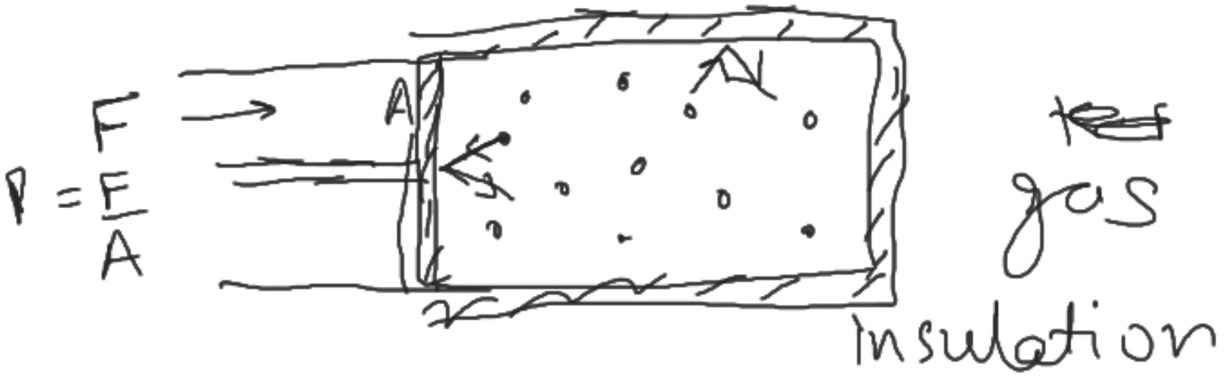


ordered state

→ solids

Liquid: P.E. ≈ K.E.

Pressure!



For liquids, P > 0

P.E. > 0 (interacting) T > 0

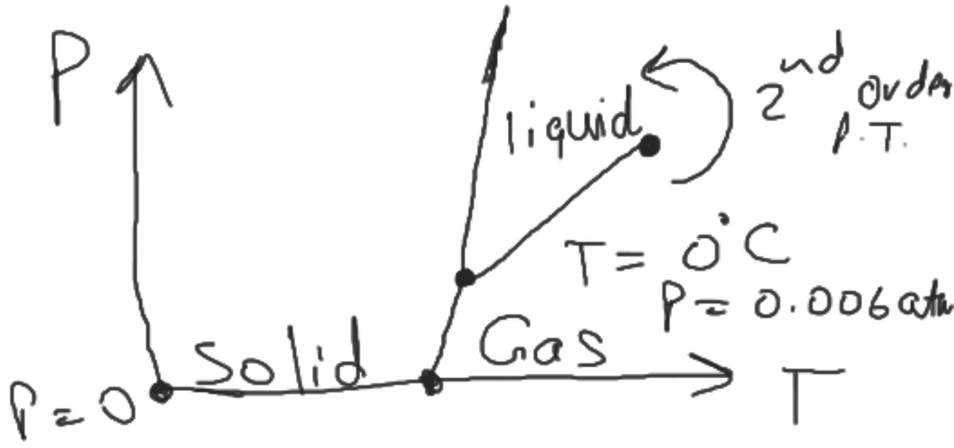
We understand

Phases of matter ←

gas, liquid & solids

Tooth paste, shampoo

plastic



(Phase diagram for He)

Solid:

⇒ (Rotational) order

Translational order

(Translationally broken symm

(Broken rot. Symmetry)

liquid (fluid)

→ Translationally disorder

(Translationally symmetri

Rotational

Restore order

← Restoring force

(Elastic moduli)

(No trans. or rot. order)

(Elastic moduli = 0)

(Rotational order but no translational order) → 1991

Pierre-Gilles de Gennes

Soft Matter → Complexity

→ Flexibility

Grading: Home Assignments : 33%

Midsem : 33%

End sem : 33%