SOLIDS

Key idea: nature of attractive force

- densest, "packing" of particles of all size and shape
- high density, rigid, incompressible
- the stronger the attractive force, the higher the mp

AMORPHOUS

- no regular repeating pattern
- Ice's

CRYSTALLINE

- plastic, waxes, asphalt, glass
- diamond, hydrocarbons

3-D repeating pattern

- crystal lattice
- lattice points = ions, molecules, atoms

4 types

1. Molecular
2. Ionic
3. Metallic
4. Covalent (network)

Molecular solids

- molecules at lattice points
- molecules held together by 
  - strong forces within the molecules
  - weak forces between them
- low mfp, soft, crunchy

- ice, iodine (I₂), sulfur (S₈), phosphorus (P₄)
  - dry ice CO₂
SOLIDS  Key idea: nature of attractive force

generate: closest "packing" of particles of all 3 states
  → high density, rigid, incompressible
  → the stronger the attractive force
  the higher the mp

SOLIDS  MOLECULARS  ⇒ no regular repeating pattern

CRYSTALLINE
  → IMP'S (plastics, waxes, asphalt, glass)
  → network hydrocarbons

3-D repeating pattern
  1. Crystal lattice
     lattice points ⇒ ions, molecules, atoms

4 types
  1. MOLECULAR
  2. IONIC
  3. METALLIC
  4. COVALENT (NETWORK)

MOLECULAR SOLIDS
  → molecules at lattice points
  → molecules held together by IMP'S
     strong forces within the molecules
     weak forces between them
  → low mp, soft, crumbly

  ice, iodine (I₂), sulfur (S₈), phosphorus (P₄)
  dry ice $\text{CO}_2$
(2) **IONIC SOLIDS**

- **Ions** at **lattice points**
- **Held together by ionic bonds**: $F = \frac{kQq}{r^2}$

- **Rocks**
  - High up, brittle
  - Non-conducting solids
  - But conduct as liquids or aqueous solutions

(3) **METALLIC SOLIDS**

- **Metal atoms (ions)** at **lattice points**
  - Shiny
  - Malleable, ductile, high mp
  - Conductors

- **METALLIC BONDING**
  - *Strong, nondirectional*

  "SEA of Electrons"
  - Delocalized valence e-
  - Surrounding (+) ion cores

**Why are metals good conductors?**

**BAND THEORY**

- When atoms come together and bond, AO's combine to form **Molecular Orbitals (MO)**
- MO's will produce different E's based on which/how many AO's were combined

  "Band" of allowable E's
Valence band → $e^-$'s involved in bonding

Conduction band → $e^-$'s @ TE than
Valence band but NOT LOST

band gap is very small in metals