Chapter 12 – Solids and Modern Materials

- **12.1 Classification of Solids – 12.2 Crystalline & Amorphous Solids**

  - crystalline vs. amorphous solids
    - crystalline solid: cubic array of tightly packed atoms or molecules
      - ionic solids – NaCl, comprised of an anion and a cation
        - [NaCl Image](http://metafysica.nl/nacl.jpg)
      - atomic solids – buckminsterfullerene, C_{60}, composed of a single atom type (this encompasses both covalent-network & metallic solids)
        - [C_{60} Image](http://www.ill.fr/dif/3D-crystals/)
    - molecular solids – ice, composed of molecules
      - [Ice Image](http://chemed.chem.purdue.edu/genchem/topicreview/bp/ch14/graphics/14_12fig.gif)
  - amorphous solid: disordered structure e.g. volcanic glass
- **Unit Cells & Crystal Lattices**
  -- lattice: refers to the 3D array of particles in a crystalline solid
  --- lattice points: are the points of array that are occupied by a particle
  --- types of lattice points:
    ---- Corner which are shared among 8 unit cells so only 1/8th is in any cell
    ---- Edge which is shared with 4 unit cells making its contribution 1/4th
    ---- Face which is between 2 unit cells so 1/2
    ---- Body piece is completely inside a unit cell so it fully contributes 1
  -- unit cell: basic repeating unit of the particle arrangement in a crystalline solid
  -- types of arrangements:
    --- simple cubic: has lattice points only at the eight corners of a unit cell

![Simple Cubic Lattice](image)

--- body centered cubic: has eight corner lattice points as well as a center particle

![Body Centered Cubic Lattice](image)

--- face-centered cubic: has 8 corner lattice points and a particle at the center of each of the six faces

![Face-Centered Cubic Lattice](image)

- **12.3 – 12.9 – Skip it!**