

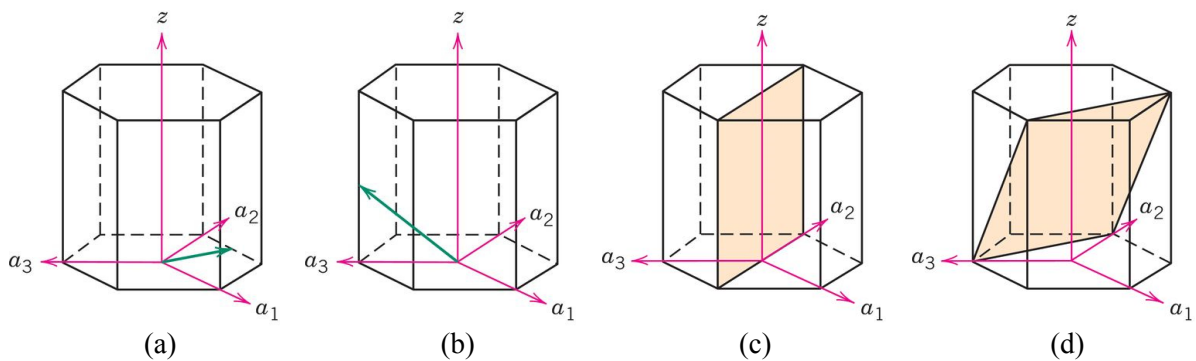
Mid-Term Exam

2017. 04. 25. 13:00~15:00, Closed Book

Instructor: Seungtae CHOI

1. (20 points) Please answer to the following questions about electrons in atoms.
 - (a) List up and explain four quantum numbers characterizing electron states in an atom.
 - (b) Explain Pauli's exclusion principle.
 - (c) Explain the meaning of valence electrons.
 - (d) Write down the electron configuration of Argon (atomic number = 18) and explain why Argon is a very stable element.

2. (20 points) Determine indices for the directions and planes shown in the following hexagonal unit cells.



3. (16 points) For FCC and BCC crystal structures, determine (a) the number of atoms per unit cell, N , (b) atomic packing factor (APF), (c) coordination number, (d) the theoretical density, ρ .
4. (20 points) (a) Compare thermoplastic and thermosetting polymers, and explain their characteristics. (b) Draw and explain four types of copolymers.
5. (10 points) Explain the close-packed crystal structures in FCC and HCP crystal structures.
6. (14 points) Calculate the equilibrium number of vacancies per cubic meter for iron at 727 °C. The energy per vacancy formation is Q_v (eV/atom); the atomic weight and density (at 727 °C) for iron are A_{Fe} (g/mol) and ρ_{Fe} (g/cm³), respectively. If needed, please use Avogadro's number, N_A (atoms/mol) and Boltzmann's constant, k (eV/atom·K).