

/Midterm 1 Review

Outline of Topics

Lectures 1-8

→ See previous worksheets

Lectures 9-11

→ Solid State Structures (cont.)

- ◆ Metallic Solid Structures
 - Cubic Close-Packed or Face-Centered Cubic Arrangement
 - Hexagonal Close-Packed Arrangement
- ◆ Ionic Solid Structures
 - Cesium Chloride Structure
 - Sodium Chloride or Rock Salt Structure
 - Zinc Sulfide or Zinc Blende Structure
 - Calcium Fluoride or Fluorite Structure
 - Antifluorite Structure
- ◆ Calculations with Metallic & Ionic Solids

Practice Problems

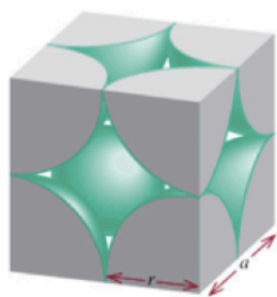
- 1) Determine the kinds of intermolecular forces that are present in each element or compound.
 - a) HCl
 - b) H₂O
 - c) Br₂
 - d) He

- 2) Arrange these compounds in order of increasing boiling point. Explain your reasoning.
 - a) H₂S
 - b) H₂Se
 - c) H₂O

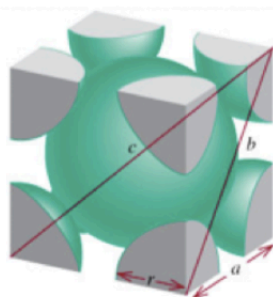
- 3) Pick the compound with the highest boiling point in each pair. Explain your reasoning.
 - a) CH₃OH or CH₃SH
 - b) CH₃OCH₃ or CH₃CH₂OH
 - c) CH₄ or CH₃CH₃

- 4) Classify each compound as ionic or molecular.
 - a) CF₂Cl₂
 - b) CCl₄
 - c) PtO₂

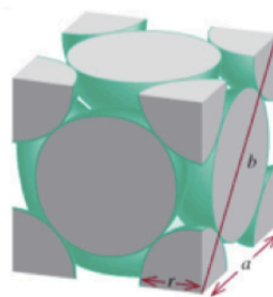
- d) SO_3
- 5) Identify each solid as molecular, ionic, or atomic.
- a) CaCl_2 (s)
 - b) CO_2 (s)
 - c) Ni (s)
 - d) I_2 (s)
- 6) Which solid in each pair has the higher melting point and why?
- a) TiO_2 (s) or HOOH (s)
 - b) CCl_4 (s) or SiCl_4 (s)
 - c) Kr (s) or Xe (s)
 - d) NaCl (s) or CaO (s)
- 7) What is the number of atoms per unit cell for each metal?



(a) Palladium, Po

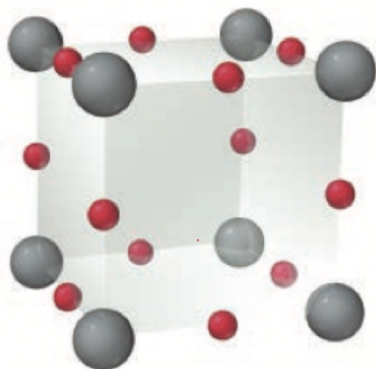


(b) Iron, Fe

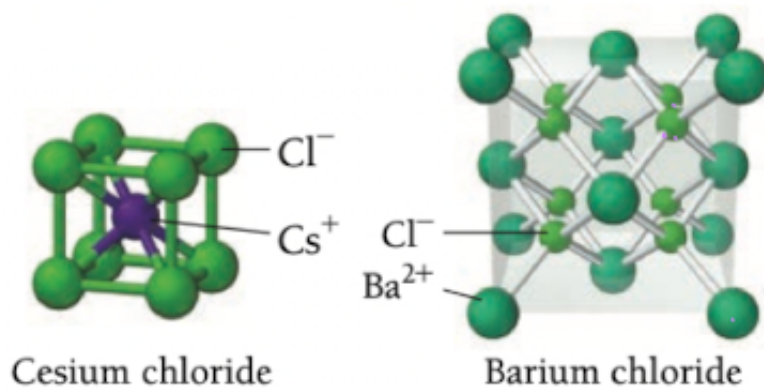


(c) Silver, Ag

- 8) An oxide of rhenium crystallizes with the unit cell shown here (rhenium = gray; oxygen = red). What is the formula of the oxide?



- 9) The unit cells for cesium chloride and barium (II) chloride are shown here. Show that the ratio of cations to anions in each unit cell corresponds to the ratio of cations to anions in the formula of each compound.



- 10) Rhodium has a density of 12.41g/cm^3 and crystallizes with the face-centered cubic unit cell. Calculate the radius of a rhodium atom.

- 11) Iridium (Ir) has a face-centered cubic unit cell with an edge length of 383.3 pm . The density of iridium is 22.61 g/cm^3 . Use this data to calculate a value for Avogadro's number.

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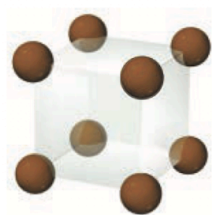
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12) Metallic potassium has a body-centered cubic structure. If the edge length of unit cell is 533 pm, calculate the radius of potassium atom.

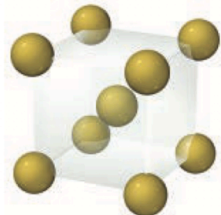
13) Aluminum B is a solid phase of aluminum still unknown to science. The only difference between it and ordinary aluminum is that Aluminum B forms a crystal with a bcc unit cell and a lattice constant $a = 331$ pm. Calculate the density of Aluminum B.

14) Metallic gold has a face-centered cubic unit cell. How many Au atoms are in each unit cell?

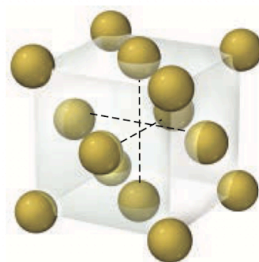
15) Determine the number of atoms per unit cell for each metal.



a. Polonium



b. Tungsten



c. Nickel