

**Sample exam 2: Chapters 10 and 11**

*Closed book; open homework, handouts, lab book, notes and calculators; no collaboration, including using other people's materials. You have **sixty minutes** to complete the quiz. There are 60 points possible. For partial credit, please show your work.*

Constants:  $R = 0.08206 \text{ L}\cdot\text{atm}/\text{mol}\cdot\text{K} = 8.314 \text{ J}/\text{mol}\cdot\text{K}$

4. Metals typically have high *melting* points, but they have ludicrously high *boiling* points. For instance, lithium metal melts at  $180^\circ\text{C}$  and boils at  $1347^\circ\text{C}$ . Explain the huge **difference** in melting and boiling temperatures. In this one, I *am* looking for a good justification, involving the phrase "**sea of electrons model**".

5. a. Given the z-diagrams to the side, determine the stoichiometry (chemical formula) of the compound represented by the model. There is no significance to the unit cell being turned 45 degrees.

Key: large spheres = iodine; small dark spheres = copper;  
small light spheres = mercury



b. Draw  $z = 1$  for the unit cell of the compound in part a.

6. A 0.205 g sample of white phosphorus was dissolved in 25.0 g of carbon disulfide. The boiling point of the resulting solution was  $0.159^{\circ}\text{C}$  higher than the boiling point of pure carbon disulfide. What is the **molar mass** and **chemical formula** of white phosphorous?  $K_b$  of  $\text{CS}_2 = 2.40^{\circ}\text{C}/\underline{\text{m}}$ .

7. Chicago is on the shore of freshwater Lake Michigan; Seattle is next to saline (salt water) Puget Sound. Both are cities next to large bodies of water. On a nice hot ( $30^{\circ}\text{C}$ ) summer day, why is Chicago **more humid** than Seattle? Use Raoult's Law in your explanation.

8. An element crystallizes in a **face-centered cubic lattice** and has a **density** of  $21.45\text{ g}/\text{cm}^3$ . The edge of its unit cell is  $3.924 \times 10^{-8}\text{ cm}$ .

a. **How many atoms** of this element are in each unit cell?

b. What is the **volume** of the unit cell?

c. What is the **mass** of the unit cell?

d. Calculate an approximate **atomic mass** (as usual, in  $\text{g}/\text{mol}$ ) for the element.