

P2800 Fall 2008

## Homework Assignment #1 (September 11, 2008)

Due date: September 23, 2008

### Problems:

1. An alloy consist of 80 weight % Cu and 20 weight % Be. What are the atomic percentages of Cu and Be in the alloy? (1.5 points)
2. Calculate the energy in joules and electron volts of the photon whose wavelength is 226.4nm. (1 point)
3. Electronic configuration of chlorine is  $1s^2 2s^2 2p^6 3s^2 3p^5$ . Using the table of electronegativity (see lecture notes) and assuming that the full electron transfer occurs from less electronegative to more electronegative element:
  - (a) determine the oxidation number of chlorine in the compounds in the table;
  - (b) write the electron configuration of the chlorine ions using *spdf* notation (1.5 point).

Compound	Cl oxidation number	Cl ion electron configuration
KCl		
HClO		
HClO <sub>2</sub>		
HClO <sub>3</sub>		
HClO <sub>4</sub>		

4. Calculate the attractive force between a pair of K<sup>+</sup> and Br<sup>-</sup> ions that are located on equilibrium distance between each other. Assume the ionic radius of the K<sup>+</sup> ion to be 0.133nm and that of the Br<sup>-</sup> ion to be 0.196nm. (1.5 points)
5. Predict a predominant (and, if applicable, secondary) bonding type in the compound X-Y, where electronic configuration for X and Y in their neutral states are listed below. Identify the elements and suggest stoichiometry, whenever appropriate (2 points):
  - a) X=Y: [Ar]4s<sup>2</sup>3d<sup>8</sup>;
  - b) X: [Kr]5s<sup>2</sup>4d<sup>2</sup>; Y: [He]2s<sup>2</sup>2p<sup>4</sup>;
  - c) X=Y: [He]2s<sup>2</sup>2p<sup>2</sup>;
  - d) X=Y: [Ar]4s<sup>2</sup>3d<sup>10</sup>4p<sup>6</sup>;
  - e) X: [Ne]3s<sup>2</sup>3p<sup>2</sup>; Y: [He]2s<sup>2</sup>2p<sup>2</sup>;
  - f) X: [He]2s<sup>2</sup>2p<sup>3</sup>; Y: [He]2s<sup>2</sup>2p<sup>4</sup>;
  - g) X: [Ar]4s<sup>2</sup>3d<sup>6</sup>; Y: [He]2s<sup>2</sup>2p<sup>4</sup>;

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h) X:  $[\text{Ne}]3s^2$ ;      Y:  $[\text{He}]2s^22p^4$ ;

i) X:  $1s^2$ ;              Y:  $[\text{He}]2s^22p^5$ ;

j) X=Y:  $[\text{He}]2s^22p^5$

6. Compare the percentage ionic character in the semiconducting compound InSb and ZnTe. (1.5 points)

7. Methane ( $\text{CH}_4$ ) has a much lower boiling temperature than does water ( $\text{H}_2\text{O}$ ). Explain why this is true in terms of the bonding **between molecules** in each of these two substances (1 point).