

**HOMEWORK #2 (55 PTS)**

NAME: \_\_\_\_\_

BMEN 343

ID #: \_\_\_\_\_

**DUE: 25 September 2009 at the BEGINNING OF CLASS:**

- There are 2 pages (front and back) to this homework. Answers should be given neatly, in order, and in the space provided or in stapled attached pages if necessary. Show work for full credit. Put the final answer in a box when appropriate.

True or False:

1. (2 pt)      T      F      The close-packed plane stacking sequence for HCP is “ABCABC...”.
2. (2 pt)      T      F      There is 1 atom in the interior mid-plane of a HCP (expanded) unit cell.
3. (2 pt)      T      F      In the rock salt (NaCl) crystal structure, the coordination numbers of anions and cations are both 8.
4. (2 pt)      T      F      In the unit cell of CsCl, one cation is situated at the center of the cube.
5. (2 pt)      T      F      In a FCC unit cell, atoms touch each other across a face diagonal.
6. (2 pt)      T      F      In ZnS, ionic bonding predominates.
7. (2 pt)      T      F      Silica glasses do not have short-range order.

Brief Answer

1. Provide a brief definition of “polycrystalline” (4 pts).

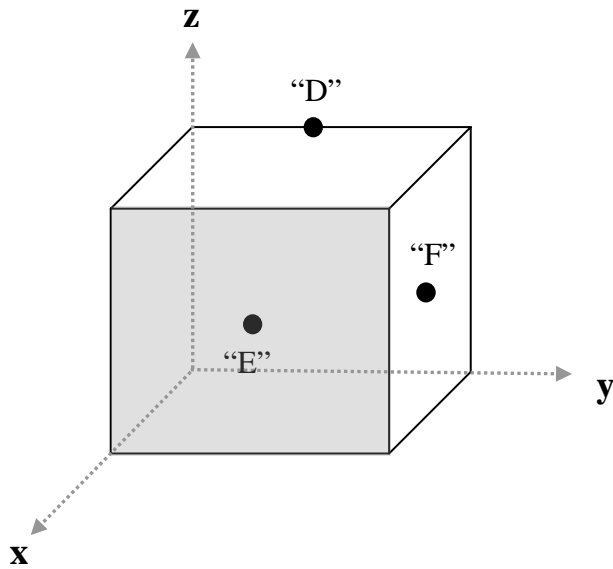
2. Explain why the ceramic silicon nitride has the formula:  $\text{Si}_3\text{N}_4$ . (10 pts)

Note: (a) In other words, why is the ratio of Si:N = 3:4. (b) To answer this question you must: for each element, specifically explain *what ions forms and why* (i.e. state the valence electronic configuration of each neutral atom and why it forms a specific charged ion). Can continue answer in space on top of page 2.

Problem Solving

2. Determine the *point coordinates* of the points “D”, “E”, and “F” designated within the cubic unit cell below. Fill in the table below. (9 pts)

Note: “D” is at the mid-point of the edge length; “E” is at the center of the “front face” (shaded), “F” is at the center of the “right face”.



	<i>Fractional Lengths</i>			
<i>Point</i>	<i>x axis</i>	<i>y axis</i>	<i>z axis</i>	<i>Point Coordinates</i>
D				
E				
F				

2. Clearly draw a  $[\bar{2} 1 0]$  direction within a cubic unit cell. Fill in table below. Label x, y, and z axes (and any negative axes) and origin. **(8 pts)**

3. Sketch within a cubic unit cell the following plane:  $(\bar{2} 0 1)$ . **Label** x, y, and z axes, intercepts, and the origin. If direction extends out of the cubic unit cell, draw the adjacent unit cell with a dashed line and label “negative” axes. Be sure to mark all intercepts *on/near your drawing*. **(10 pts)**. You may construct a table to help you do this question but it is not required.