SSC3473 Solid State Chemistry – Crystal Chemistry

1. Copper metal is face centred cubic with **a**=3.615 Å. Assuming the atoms touch along the face diagonal, calculate the metallic radius of copper.

2. The metallic radius of gold is 1.44 Å, and its structure is face-centred cubic. What is the unit cell parameter, ***a***, for gold?

3. The metallic radius of chromium is 1.25 Å and its structure is body centred cubic. What is the unit cell parameter, ***a***, for chromium?

4. NaCl is face centred cubic with ***a*** = 5.64 Å. Assuming the radius of the chloride ion is 1.80 Å, calculate the radius for Na^+. Are the chloride ions in contact in NaCl?

5. Calculate the d-spacing of the (1 2 3) planes in a cubic crystal with ***a***=***b***=***c***=8.00 Å. Calculate the d-spacing of the same planes in an orthorhombic crystal with ***a***=7.00 Å, ***b***=8.00 Å and ***c***=9.00 Å.

6. Li_2O has a cubic structure with unit cell edge 4.61 Å.
   The atomic coordinates are:

Li	¼ ¼ ¼	¾ ¾ ¾	¼ ¼ ¾	¼ ¾ ¾
	¼ ¾ ¼	¾ ¼ ¾	¾ ¼ ¼	¾ ¾ ¼
O	0 0 0	½ ½ 0	0 ½ ½	½ 0 ½

   Draw a projection of the structure onto the xy plane. Indicate the coordination environments of Li and O. Calculate the Li-O bond length. What is the name for this structure type?

7. CsCl is primitive cubic with unit cell ***a*** = 4.115 Å. Using the d-spacing equation, calculate the spacing of (a) the 110 planes and (b) the 111 planes.

8. X-rays of wavelength λ = 1.50 Å are reflected from the (2 2 2) planes of a cubic crystal with unit cell ***a*** = 5.00 Å. Calculate the Bragg angle, θ, for n=1.