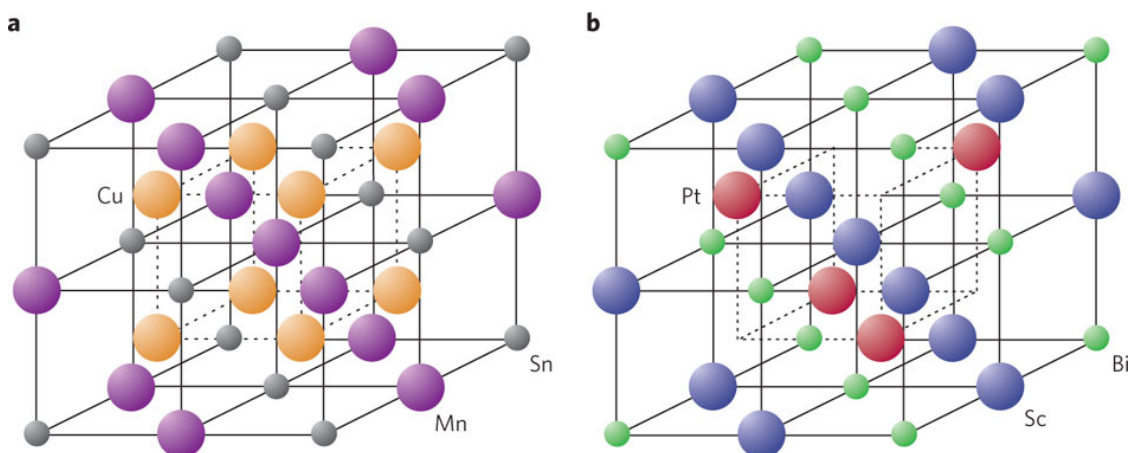


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| HW 1 | Inorganic Materials Chemistry | Name: | |
| Points: | C7780 | Due date: | 29.10.2019 |
| Max. 100 points | Fall 2019 | A | |

1. (20 pts) In the crystalline Cu_2O , oxygen atoms possess coordination number 4. What is the coordination number of Cu? Show how you arrived to the answer.

2. (10 pts) A unit cell has in general shape of a) cube b) tetrahedron c) parallelepiped

3. (20 pts) Give stoichiometric formulas for the cubic structures in the picture below. **a** = Heusler compound, **b** = Half-Heusler compound. Show how you arrived to the answer.



4. (25 pts) An octahedral structural unit CoO_6 possesses following Co–O bond distances (in Å). Use Pauling Rules to establish whether the cobalt cation is in oxidation state 2+ or 3+. Use parameters $R_0 = 1.692 \text{ Å}$ and $B = 0.30$.

2x Co1–O1 2.1033(12)

2x Co1–O2 2.0703(12)

2x Co1–O3 2.1204(12)

5. (25 pts) Use the Born-Landé equation and the appropriate Shannon-Prewitt radii (provided below) to calculate lattice energies (L_0) for the following structures. Comment on results.

NaCl having the NaCl structure: $r_{\text{Na}^+}(\text{CN}6) = 1.16 \text{ Å}$; $r_{\text{Cl}^-}(\text{CN}6) = 1.67 \text{ Å}$

NaCl having the CsCl structure: $r_{\text{Na}^+}(\text{CN}8) = 1.32 \text{ Å}$; $r_{\text{Cl}^-}(\text{CN}6) = 1.67 \text{ Å}$ (CN8 not avail.)