1. For p-type and n-type Si... (2 points)
   a. What is a possible dopant atom?
      p-type: _____________
      n-type: _____________
   
   b. What are the charge carriers?
      p-type: _____________
      n-type: _____________
   
   c. How many bonds does the dopant atom form once it has donated its charge carriers?
      p-type: _____________
      n-type: _____________
   
   d. Label the structures below as p-type and n-type Si. Label conduction and valence bands, donor level, and acceptor level. (2 points)
Name_____________________

e. For 100g of Si, calculate the mass of As needed in order to have $3.091 \times 10^{17}$ carriers/cm$^3$. (2 points)

2. Lattice structures (You may want to use your pre-built FCC structure 😊)

a. The radius of a nickel atom is $r = 1.97\text{Å}$. What is the volume packing fraction of the FCC unit cell? (1 point)

b. What is the direction of closest packing? (1 point)

c. Consider one face of your FCC lattice. How many nearest neighbors does the central atom have in the same plane? (1 point)

d. Under sufficient pressure, some elemental metals transitions from BCC to another cubic structure. What is the cubic structure that it transitions to? (1 point)