

Name _____

3.91

Do yourself a solid.

3.091 Introduction to Solid State Chemistry

Fall Term 2018

Quiz 6 (A)

10/25/2018

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?

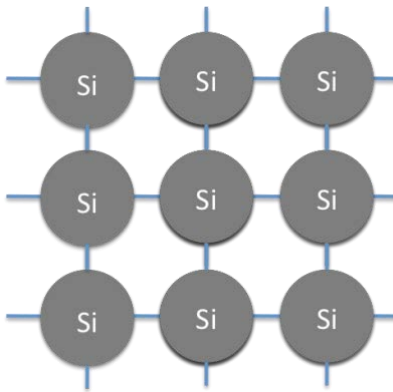
p-type: _____

n-type: _____

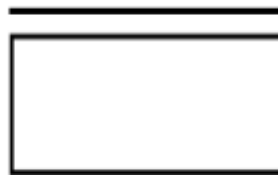
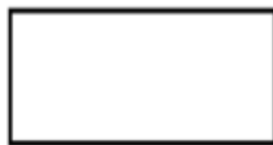
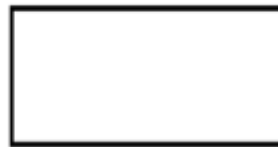
c. How many bonds does the dopant atom form once it has donated its charge carriers?

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)



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- e. For 100g of Si, calculate the mass of As needed in order to have 3.091×10^{17} carriers/cm³.
(2 points)

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

- a. The radius of a nickel atom is $r = 1.97 \text{ \AA}$ 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 transition from BCC to another cubic structure. What is the cubic structure that it transitions to? (1 point)

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