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SOLUTIONS MANUAL

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CHAPTER 2. NATURE OF MATERIALS

2.1. See Section 2.2.1.

2.2. See Section 2.1.

2.3. See Section 2.1.1.

2.4. See Section 2.1.1.

2.5. See Section 2.1.2.

2.6. See Section 2.2.1.

2.7. See Section 2.1.2.

2.8. See Section 2.2.1.

2.9. See Section 2.2.1.

2.10. If the atomic masses and radii are the same, then the material that crystallizes into a lattice with a higher APF will have a larger density. The FCC structure has a higher APF than the BCC structure.

2.1.1. For the face-center cubic crystal structure, number of equivalent whole atoms in each unit cell = 4

By inspection the diagonal of the face of FCC unit cell = $4r$

Using Pythagorean theory:

$$(4r)^2 = a^2 + a^2$$

$$16r^2 = 2a^2$$

$$8r^2 = a^2$$

$$a = 2\sqrt{2}r$$

2.1.2. a. Number of equivalent whole atoms in each unit cell in the BCC lattice structure = 2

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