

MSE 2001B Quiz #6, 10-2-2015

Your name (print) _____ Your major _____ Score _____/10

Please **ONLY** use the space of each question to provide your answer. You will have **10 minutes** to work on this quiz. Please sign to confirm that all work on this test is yours and yours only.

Signature KEY

1. Consider the FCC metal Cu, which has a lattice parameter a of 0.362 nm.

1.1. Calculate the length of the lowest-energy Burgers vector in this material. (2 pts)

$$\frac{1}{2}a_0 \langle 110 \rangle = \frac{1}{2} \times 0.362 \times \sqrt{2} = \frac{0.362}{\sqrt{2}} = 0.256 \text{ nm}$$

Handwritten notes: 1 pt for the first part, 1 pt for the final result.

1.2. Express this length in terms of the radius of a Cu atom. (2 pts)

$$2^{\frac{1}{2}} R_{\text{Cu}} \rightarrow 2 \text{ pts}$$

2. What type of dislocation has a Burgers vector, \mathbf{b} , and a tangent vector, \mathbf{t} , that are parallel to each other? (A) Edge; (B) Screw (1 pts)

3. Dislocation can glide on the $\{110\}$ family of planes in the $\langle 111 \rangle$ family of directions in a body-centered cubic (BCC) crystal structure. (2 pts)

Handwritten notes: 1 pt for the plane family, 1 pt for the direction family.

4. For a slip to occur in the particular slip system, a nonzero component of force must exist (A) parallel or (B) perpendicular to the slip direction. (1 pts)

5. When an FCC crystal is loaded (stressed) in the [101] direction, the resolved shear stress on this FCC slip system is τ_{fcc} . If the same load is applied to a BCC crystal in the [101] direction, what is the resolved shear stress on the BCC slip system, τ_{bcc} ? (2 pts)

- a) $\tau_{\text{fcc}} < \tau_{\text{bcc}}$
- b) $\tau_{\text{fcc}} = \tau_{\text{bcc}}$
- c) $\tau_{\text{fcc}} > \tau_{\text{bcc}}$
- d) can't be determined