Unit 5 - Week 3

Assignment 3

The due date for submitting this assignment has passed.
As per our records you have not submitted this assignment.

Due on 2020-10-07, 23:59 IST.

1) Identify all the favourable conditions for the formation of a substitutional solid-solution. *1 point*

- [ ] Difference in the atomic radii between the solute and the solvent atoms is less than 15 %.
- [ ] Same crystal structure for the solute and solvent atoms.
- [ ] Greater difference in the electronegativity of the solute and solvent atoms.
- [ ] Negligible difference in the electronegativity of the solute and solvent atoms.

No, the answer is incorrect.
Score: 0
Accepted Answers:
Difference in the atomic radii between the solute and the solvent atoms is less than 15 %.
Same crystal structure for the solute and solvent atoms.
Negligible difference in the electronegativity of the solute and solvent atoms.

2) The coordination number of tetrahedral interstitial sites in a BCC crystal structure is

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Numeric) 4

1 point

3) The coordination number of octahedral interstitial sites in an FCC crystal structure is

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Numeric) 6

1 point

4) The octahedral interstitial site in an FCC crystal structure is located at the center of each edge of the unit cell. The radius of an impurity atom that just fits into the octahedral interstitial site, in terms of the radius of the host atom is _____ .

Hint

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Range) 0.41,0.42

1 point

5) The tetrahedral interstitial site in a BCC crystal structure is located at the $0 \quad \frac{1}{2} \quad \frac{1}{4}$ position. The radius of an impurity atom that just fits into the tetrahedral interstitial site, in terms of the radius of the host atom is _____ .

Hint

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Range) 0.27,0.31

1 point

6) The magnitude of the Schmid factor for an FCC single crystal oriented with its [100] direction parallel to the loading axis is _____ .

Hint

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Range) 0.407,0.409

2 points

7) Identify all the correct statements *2 points*

- [ ] In a screw dislocation, the atoms distort along along a dislocation line.
- [ ] In a screw dislocation, the dislocation line moves in the direction perpendicular to the applied shear stress.
- [ ] Screw dislocations impart shear, tensile and compressive strains in their vicinity.
- [ ] A screw dislocation qualifies as an interfacial defect.

No, the answer is incorrect.
Score: 0
Accepted Answers:
In a screw dislocation, the atoms distort along along a dislocation line.
In a screw dislocation, the dislocation line moves in the direction perpendicular to the applied shear stress.

8) Identify all the correct statements *2 points*

- [ ] The magnitude of the grain boundary energy decreases with the orientation misalignment between neighbouring grains.
- [ ] Grain boundaries are more chemically reactive than the grains.
- [ ] The total interfacial energy is lower in coarse-grained materials than in fine grained materials.
- [ ] All of the above.

No, the answer is incorrect.
Score: 0
Accepted Answers:
Grain boundaries are more chemically reactive than the grains.
The total interfacial energy is lower in coarse-grained materials than in fine grained materials.

9) Identify all the correct statements *2 points*

- [ ] Dislocation movement is favourable on planes with highest planar density, along the directions with highest linear density.
- [ ] HCP metals are less brittle than FCC or BCC crystals as they have fewer active slip systems.
- [ ] Deformation by twinning is usually accompanied by crystallographic reorientations.
- [ ] All of the above.

No, the answer is incorrect.
Score: 0
Accepted Answers:
Dislocation movement is favourable on planes with highest planar density, along the directions with highest linear density.
Deformation by twinning is usually accompanied by crystallographic reorientations.

10) Identify all the correct statements *2 points*

- ( ) Hall-Petch effect refers to strengthening by grain size reduction.
- ( ) The presence of lattice strain interaction between dislocations and impurity atoms increases the resistance to dislocation movement.
- ( ) The resistance to dislocation movement by other dislocations increases with the dislocation density.
- ( ) All of the above.

No, the answer is incorrect.
Score: 0
Accepted Answers:
All of the above.