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Courses » Introduction to Materials Science and Engineering

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Unit 6 - Week 3 - Structure of Solids II

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Course outline

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Supplementary Materials

Week 1 - Crystallography I

Week 2 - Crystallography II + Structure of Solids I

Week 3 - Structure of Solids II

- Week 3 Overview
- Week 3 Reading List
- 3.1 Voids in close-packed structures
- 3.2 Solid solutions I
- 3.3 Solid solutions II
- 3.4 Hume-Rothery

Assignment 3

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

Due on 2019-02-20, 23:59 IST.

1) Which of the following stacking sequences of close-packed layers *A*, *B* and *C* will give rise to close-packed structures? ***1 point***

P: *ABABAB...*
Q: *ABCABCABC...*
R: *AABBAABB....*
S: *ACBACB...*
T: *ABACABAC...*

- P and Q
- P, Q and S
- P, Q, S and T
- P, Q, R and S

No, the answer is incorrect.
Score: 0

Accepted Answers:
P, Q, S and T

2) Which of the following will always exhibit complete solubility? ***1 point***

- interstitial solid solutions
- substitutional solid solutions
- both interstitial and substitutional solid solutions
- neither substitutional nor interstitial solid solution

No, the answer is incorrect.
Score: 0

Accepted Answers:

S
P, Q, R and S
P and R
P and S

No, the answer is incorrect.
Score: 0

Accepted Answers:
P and S

4) What is the effective number of octahedral voids in one unit cell of a CCP crystal? ***1 point***

2
4
6
8

No, the answer is incorrect.
Score: 0

Accepted Answers:
4

5) The combinations of which of the following elements are likely to have complete solid solubility based on the Hume-Rothery rules? ***1 point***
A (ccp, 1.3 Å radius); B (hcp, 1.3 Å radius); C (hcp, 1.4 Å radius)
Assume that the valencies and electronegativities are the same.

A and B
B and C
A and C
None of the above

No, the answer is incorrect.
Score: 0

Accepted Answers:
B and C

6) Identify the wrong statement. ***1 point***

β-brass is an intermediate solid solution
Ordered β-brass is a substitutional solid solution
Disordered β-brass is an interstitial solid solution
The lattice of ordered β-brass is cubic-*P*

No, the answer is incorrect.
Score: 0

Accepted Answers:
Disordered β-brass is an interstitial solid solution

7) The crystal structure of diamond is _____ and the lattice is _____. ***1 point***

cubic, cubic-*P*
cubic close packed, cubic-*F*
diamond cubic, diamond cubic
diamond cubic, cubic-*F*

No, the answer is incorrect.
Score: 0

Accepted Answers:
diamond cubic, cubic-F

8) Out of elements A, B and C, identify the ones that can fit inside the voids of a hexagonal close packed structure of a defect-free metal X? (r_X=1.28 Å, r_A=0.25 Å, r_B=0.66 Å, r_C=0.50 Å) ***1 point***

- A
- A, B and C
- A and C
- B and C

No, the answer is incorrect.
Score: 0

Accepted Answers:
A and C

9) Which of the following are the centres of octahedral voids in a CCP unit cell? P (1,1,1); Q (½,0,0); R (½, ½, ½); S (¼,¼,¼); T (½,½,0). ***1 point***

- Q, R and S
- P and T
- P, Q, R and T
- Q and R

No, the answer is incorrect.
Score: 0

Accepted Answers:
Q and R

10) A given CCP crystal has the stacking sequence *ABCABC...* Which of the following are the closest from the centre of a tetrahedral void located between the layers *A* and *B*? ***1 point***

P: The centre of a neighbouring tetrahedral void
Q: The centre of a neighbouring octahedral void
R: The centre of a neighbouring atom in the *A* layer
S: The centre of a neighbouring atom in the *B* layer
T: The centre of a neighbouring atom in the *C* layer

- P and Q
- R and S
- R, S and T
- Q, R and S

No, the answer is incorrect.
Score: 0

Accepted Answers:
Q, R and S

11) Let *a* be the shortest lattice translation and *b* be the *C-C bond length* in graphene. The relationship between *a* and *b* is given by _____. ***1 point***

- $a = b$

$a = \sqrt{3}b$

$a = \sqrt{2}b$

$a = \sqrt{3}b/2$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$a = \sqrt{3}b$

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