Week 9 : Assignment 9

The due date for submitting this assignment has passed.

Due on 2021-09-29, 23:59 IST.

As per our records you have not submitted this assignment.

1) A positive temperature gradient during solidification of a pure metal will lead to: *1 point*

- (a) Columnar growth
- (b) Extremely convoluted dendrites leading to equiaxed type grains
- (c) Strong texture
- (d) Weak texture

No, the answer is incorrect.
Score: 0
Accepted Answers:
(a) Columnar growth
(c) Strong texture

2) During solidification: *1 point*

- (a) It is easier for the atoms in liquid state to adhere to the most closely packed plane.
- (b) It is easier for the atoms in liquid state to adhere to the least closely packed plane.
- (c) The favourable direction of the columnar growth is the closest packed direction.
- (d) The favourable direction of the columnar growth is the loosest packed direction.

No, the answer is incorrect.
Score: 0
Accepted Answers:
(b) It is easier for the atoms in liquid state to adhere to the least closely packed plane.
(d) The favourable direction of the columnar growth is the loosest packed direction.

3) Under steady state solidification of a single phase binary alloy: *1 point*

- (a) Undercooling occurs due to negative temperature
- (b) Constitutional supercooling occurs only due to negative temperature
- (c) Undercooling may occur during positive temperature gradient
- (d) Constitutional supercooling may occur during positive temperature gradient

No, the answer is incorrect.
Score: 0
Accepted Answers:
(d) Constitutional supercooling may occur during positive temperature gradient

4) Constitutional supercooling leads to: *1 point*

- (a) Columnar growth
- (b) Extremely convoluted dendrites leading to equiaxed type grains
- (c) Strong texture
- (d) Weak texture

No, the answer is incorrect.
Score: 0
Accepted Answers:
(b) Extremely convoluted dendrites leading to equiaxed type grains
(d) Weak texture

5) In the absence of undercooling or constitutional supercooling during solidification of FCC and BCC materials: *1 point*

- (a) Columnar grain growth occurs with 〈100〉 fiber axis.
- (b) Columnar grain growth occurs with 〈110〉 fiber axis.
- (c) Columnar grain growth occurs with 〈111〉 fiber axis.
- (d) Columnar growth does not occur.

No, the answer is incorrect.
Score: 0
Accepted Answers:
(a) Columnar grain growth occurs with 〈100〉 fiber axis.

6) **The columnar grain growth preference in HCP materials during positive temperature gradient:** *1 point*

(a) depends upon c/a ratio.

(b) is $[2\bar{1}\bar{1}0]$, if $\frac{c}{a} \approx 1.624$.

(c) is $[10\bar{1}0]$, if $\frac{c}{a} > 1.8$.

(d) doesn't depend on c/a ratio.

- a
- b
- c
- d

No, the answer is incorrect.
Score: 0
Accepted Answers:
a
b
c

7) Which of the following statement/s are correct? *1 point*

- (a) Phase transformation is a displacive transformation and does not need any diffusion.
- (b) Phase transformation is a displacive transformation and requires diffusion.
- (c) Phase transformation is a diffusive transformation but not displacive.
- (d) None of the above.

No, the answer is incorrect.
Score: 0
Accepted Answers:
(a) Phase transformation is a displacive transformation and does not need any diffusion.

8) The phase transformation from austenite to martensite occurs by satisfying the condition/s: *1 point*

1. Brain strain
2. Brain strain + rigid body rotation.
3. Inhomogeneous lattice invariant strain to form irrational habit plane and to obtain invariant plane strain at interface

- (a) All the above
- (b) 2
- (c) both 1 and 3.
- (d) both 2 and 3

No, the answer is incorrect.
Score: 0
Accepted Answers:
(d) both 2 and 3

9) *1 point*

Match the following

A. Kurdjumov-Sachs (***K–S***)	1. $(110)_\beta \parallel (0001)_\alpha$ and $\langle 111\rangle_\beta \parallel \langle 11\bar{2}0\rangle_\alpha$
B. Nishyama-Wassermann (***N–W***)	2. $\{111\}_\gamma \parallel (0001)_\varepsilon \parallel \{011\}_\alpha$ and $\langle 011\rangle_\gamma \parallel \langle 11\bar{2}0\rangle_\varepsilon \parallel \langle 111\rangle_\alpha$
C. Greninger - Troiano (***G–T***)	3. $\{111\}_\gamma \parallel \{011\}_\alpha$ and $\langle 112\rangle_\gamma \parallel \langle 111\rangle_\alpha$
D. Burger's Relationship	4. $\{111\}_\gamma \parallel \{011\}_\alpha$ and $\langle 011\rangle_\gamma \parallel \langle 111\rangle_\alpha$

- (a) A-1, B-4, C-3, D-2
- (b) A-2, B-1, C-4, D-3
- (c) A-3, B-2, C-1, D-4
- (d) A-4, B-3, C-2, D-1

No, the answer is incorrect.
Score: 0
Accepted Answers:
(d) A-4, B-3, C-2, D-1

10) Which of the statement/s are correct: *1 point*

- (a) Texture transformation during phase transformation is exact and independent of the parent and product phase crystal symmetry.
- (b) Repeated phase transformation by temperature cycling can produce random texture due to the presence of a number of crystallographic variants.
- (c) Intrinsic microstructural conditions such as the stress state due to previous processing history does not allow to select all possible variants randomly during phase transformation.
- (d) A textured parent phase, will always lead to a textured product phase during phase transformation via variant selection.

No, the answer is incorrect.
Score: 0
Accepted Answers:
(c) Intrinsic microstructural conditions such as the stress state due to previous processing history does not allow to select all possible variants randomly during phase transformation.
(d) A textured parent phase, will always lead to a textured product phase during phase transformation via variant selection.