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NPTEL

Courses » Heat Treatment and Surface Hardening-I

Announcements   **Course**   Ask a Question   Progress

Unit 4 - Week-3

Course outline

How to access the portal ?

Week-1

Week-2

Week-3

○ Solved Problem on Nucleation rate and How to determine the value of γsl Physical Concept & Interfacial Energy

○ How to determine the value of γsl (Physical Concept and Interfacial Energy)

○ Interfacial Energy-I

○ Interfacial Energy-II

○ Heterogeneous Nucleation-I

○ Quiz : Assignment-3

○ Week 3 Feedback

○ Assignment-3 solution

Week-4

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Assignment-3

The due date for submitting this assignment has passed.
As per our records you have not submitted this assignment.   **Due on 2018-02-28, 23:59 IST**

1) The critical homogeneous nucleation rate of 10^6 m^{-3}s^{-1} occurs at 300   *1 point*
K during liquid to solid phase transformation when the nucleation energy for
critical sized nucleus is 1×10^{-19} J. The interfacial energy between the liquid-
solid interface is 0.08 J m^{-2}. If the interfacial energy is increased by 10%, the
nucleation rate (m^{-3}s^{-1}) will be:

○ (a) 445.6
○ (b) 486.2
○ (c) 532.0
○ (d) 345.4

No, the answer is incorrect.
Score: 0

Accepted Answers:
(d) 345.4

2)   *1 point*

○

○

○

○

No, the answer is incorrect.
Score: 0

Accepted Answers:

3)   *1 point*

○

○

○

○

No, the answer is incorrect.
Score: 0

Accepted Answers:

4) Q4 Which of the following conclusion can be drawn from the solution of question no. 3 *1 point*

○ (a) The activation energy (barrier for nucleation) for homogeneous nucleation is less
compared to heterogeneous nucleation and hence the homogenous nucleation is difficult.

(b)The activation energy for heterogeneous nucleation is less compared to homogenous nucleation and hence the homogenous nucleation is difficult.

(c) The activation energy for homogeneous nucleation is greater compared to heterogeneous nucleation and hence the heterogeneous nucleation is difficult.

(d) None of these

No, the answer is incorrect.
Score: 0

Accepted Answers:
(b)The activation energy for heterogeneous nucleation is less compared to homogenous nucleation and hence the homogenous nucleation is difficult.

5) Q5 The number of unit cells in 1 m^3 of FCC nickel (r_{Ni}=1.243Å) will be: **1 point**

(a) 2.3 ´10^{28}

(b) 4.2 ´10^{28}

(c) 6.5 ´10^{28}

(d) 20 ´10^{28}

No, the answer is incorrect.
Score: 0

Accepted Answers:
(a) 2.3 ´10^{28}

6)   **0 points**

No, the answer is incorrect.
Score: 0

Accepted Answers:

7) Q7 The surface energy of iron (BCC) when the external surface is of {100} type is given by: (Given: a $_{Fe}$ = 2.87 Å, bond energy of Fe (per bond) = 21 KJ/mole of bond).   **1 point**

(a) 0.9470 J/m^2

(b) 0.8465 J/m^2

(c) 0.2540 J/m^2

(d) 0.6687 J/m^2

No, the answer is incorrect.
Score: 0

Accepted Answers:
(b) 0.8465 J/m^2

8) Q8 In liquid to solid transformation, an interface has been formed between solid nuclei and surrounding liquid. The three plots shown below depicts the scenario corresponding to the variation of H, S and G with distance. Identify the correct statement for plots.   **1 point**

(a) Plot (a) corresponds to H vs. distance plot, plot (b) corresponds to G vs. distance plot and plot (c) corresponds to -T$_m$S vs. distance plot.

(b) Plot (b) corresponds to H vs. distance plot, plot (a) corresponds to G vs. distance plot and plot (c) corresponds to -T$_m$S vs. distance plot.

(c) Plot (c) corresponds to H vs. distance plot, plot (a) corresponds to G vs. distance plot and plot (b) corresponds to -T$_m$S vs. distance plot

(d) None of these.

No, the answer is incorrect.
Score: 0

Accepted Answers:

(a) Plot (a) corresponds to H vs. distance plot, plot (b)
corresponds to G vs. distance plot and plot (c) corresponds to -
T_mS vs. distance plot.

9) Q9 Aluminium has an FCC crystal structure. Its density is 2700 kg/m^3. The unit cell   **1 point**
dimensions (a) and the atomic diameter (d=2r) are: (Given: molar mass of aluminium=26.98
g/mol). Mark the closest matching answer.

- ○ (a) 3.05 Å and 3.86 Å, respectively.
- ○ (b) 2.05 Å and 2.86 Å, respectively.
- ○ (c) 4.05 Å and 2.86 Å, respectively.
- ○ (d) 2.05 Å and 1.86 Å, respectively.

No, the answer is incorrect.
Score: 0

Accepted Answers:
(c) 4.05 Å and 2.86 Å, respectively.

10) Q10 In FCC unit cell, the number of atoms per unit area of the (110)   **1 p**
plane are given by:

- ○

- ○

- ○

- ○

No, the answer is incorrect.
Score: 0

Accepted Answers:

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