

Unit 10 - Week 8

Course outline

How does an NPTEL online course work?

Practice Assignment

Week 1

Week 2

Week 3

Week 4

Week 5

Week 6

Week 7

Week 8

● Lecture 36: Phase Transition and Landau Theory Part 3

○ Lecture 37: Comments on some important Concepts of Statistical Mechanics

○ Lecture 38: Nucleation Part 1: Introduction, Thermodynamics of Nucleation

○ Lecture 39: Nucleation Part 2 : Kinetics of Nucleation

○ Lecture 40: Nucleation Part 3: Kinetics of Nucleation, Classical Nucleation Theory, Heterogeneous Nucleation

○ Quiz : Assignment 8

○ Assignment 8 solution file

○ Weekly Feedback

○ Download Videos

Week 9

Week 10

Week 11

Week 12

Live Session

Text Transcripts

Assignment 8

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

Due on 2020-11-11, 23:59 IST.

1) Consider the free energy curve, $F = a(T)m^2 + b(T)m^4 + c(T)m^6$, where $b(T) < 0$ and for stability, $c(T) > 0$ for all T . The order parameter (m) will be 1 point

(a) $m = 0$ and $\pm \sqrt{\frac{b(T)}{3c(T)} + \frac{\sqrt{b^2(T) - 3c(T)a(T)}}{3c(T)}}$

(b) $m = \pm \sqrt{\frac{b(T)}{15c(T)} + \frac{\sqrt{4b^2(T) - 12c(T)a(T)}}{15c(T)}}$

(c) $m = \pm \sqrt{\frac{b(T)}{15c(T)} - \frac{\sqrt{4b^2(T) - 12c(T)a(T)}}{15c(T)}}$

(d) $m = 0$ and $\pm \sqrt{\frac{b(T)}{3c(T)} + \frac{\sqrt{4b^2(T) - 12c(T)a(T)}}{3c(T)}}$

- (a)
 (b)
 (c)
 (d)

No, the answer is incorrect.
Score: 0

Accepted Answers:
(a)

2) If P_i represents the canonical probability, then the entropy of a system in terms of P_i can be expressed as 1 point

(a) $S = k_B \sum_i \ln P_i$

(b) $S = -k_B \sum_i \ln P_i$

(c) $S = -k_B \sum_i P_i \ln P_i$

(d) $S = 2k_B \sum_i P_i^2 \ln P_i$

- (a)
 (b)
 (c)
 (d)

No, the answer is incorrect.
Score: 0

Accepted Answers:
(c)

3) It is easily verified that a rubber band heats up when it is stretched adiabatically. Given this fact, what would happen when a rubber band is cooled at constant tension 1 point

- It will contract
 It will expand
 It remains same
 Initially contracts then starts expanding

No, the answer is incorrect.
Score: 0

Accepted Answers:
It will expand

4) The beginning of the formation of a new phase is known as 1 point

- Nucleation
 Growth
 Segregation
 Coring

No, the answer is incorrect.
Score: 0

Accepted Answers:
Nucleation

5) In case of homogeneous nucleation, below the critical radius the tiny particles are _____ and are called _____. 1 point

- unstable, embryo
 stable, grains
 stable, embryo
 unstable, grains

No, the answer is incorrect.
Score: 0

Accepted Answers:
unstable, embryo

6) In case of nucleation, the radius of the critical nucleus is 1 point

- proportional to free energy.
 proportional to surface tension.
 not related to free energy.
 proportional to scattering vector.

No, the answer is incorrect.
Score: 0

Accepted Answers:
proportional to surface tension.

7) If the product phase does not wet all the parent phase, the contact angle between the two phases is 1 point

- 0°
 45°
 90°
 180°

No, the answer is incorrect.
Score: 0

Accepted Answers:
 180°

8) If the product phase completely wets a nucleating agent, the nucleation barrier as a fraction of homogeneous barrier is 1 point

- 1
 1/2
 1/4
 0

No, the answer is incorrect.
Score: 0

Accepted Answers:
0

9) When the contact angle is 60° , the heterogeneous nucleation barrier expressed as a fraction of the homogeneous barrier is 1 point

- 1/2
 1/4
 1/6
 1/8

No, the answer is incorrect.
Score: 0

Accepted Answers:
1/6

10) As compared to the nucleation-rate maximum, the growth-rate maximum is at 1 point

- a higher temperature
 a lower temperature
 the same temperature
 the temperature of maximum transformation rate

No, the answer is incorrect.
Score: 0

Accepted Answers:
a higher temperature