Unit 9 - Week 7

Assignment 7

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

Due on 2020-11-04, 23:59 IST.

1) In case of pairwise potential ($U(r_{ij})$) configurational integral can be written as *1 point*

(a) $Z_N = \prod_{i<j}^{N(N-1)/2} \exp\left(-\beta U(r_{ij})\right)$

(b) $Z_N = \int\int.....\int dr_1...dr_N \prod_{i<j}^{N(N-1)/2} \exp\left(-\beta U(r_{ij})\right)$

(c) $Z_N = \int\int.....\int dr_1...dr_N \sum_{i<j}^{N} \exp\left(-\beta U(r_{ij})\right)$

(d) $Z_N = \int\int.....\int dr_1...dr_N \sum_{i,j}^{N(N-1)/2} \exp\left(-\beta U(r_{ij})\right)$

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

No, the answer is incorrect.
Score: 0
Accepted Answers:
(b)

2) For the ideal gas the second virial coefficient is 0. *1 point*

- False
- True

No, the answer is incorrect.
Score: 0
Accepted Answers:
True

3) In case of van der Waals gas, second virial coefficient is *1 point*

(a) $a - \frac{b}{k_B T}$

(b) 0

(c) a

(d) $b - \frac{a}{k_B T}$

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

No, the answer is incorrect.
Score: 0
Accepted Answers:
(d)

4) Mayer's theory does not work *1 point*

- In liquid state
- In gaseous phase
- Both the cases
- Is satisfied in all the systems very well

No, the answer is incorrect.
Score: 0
Accepted Answers:
In liquid state

5) First Irreducible integral of Mayer (β_1) in case of van der Waals gas is *1 point*

(a) Temperature independent

(b) Temperature dependent

(c) 0

(d) At $T > \frac{a}{k_B b}$ it becomes negative.

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

No, the answer is incorrect.
Score: 0
Accepted Answers:
(b)

6) The second Virial coefficient for hard sphere system, where potential is defined by $u(r) = \begin{cases} \infty & \textbf{for } r < \sigma \\ 0 & \textbf{for } r > \sigma \end{cases}$ is *1 point*

(a) 2/3

(b) 0

(c) $\frac{2\pi\sigma^3}{3}$

(d) $\frac{2\sigma^3}{3}$

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

No, the answer is incorrect.
Score: 0
Accepted Answers:
(c)

7) Across a first order phase transition, which of the following is (are) true? *1 point*

- the free energy is a discontinuous function of the temperature
- the free energy is a continuous function of the temperature, but its first derivative is discontinuous
- the first derivative of free energy with respect to temperature is continuous
- None of the above

No, the answer is incorrect.
Score: 0
Accepted Answers:
the free energy is a continuous function of the temperature, but its first derivative is discontinuous

8) The equilibrium value of any unconstrained internal parameter in a system in contact with a thermal reservoir and pressure reservoir that minimizes the following quantity *1 point*

- Helmholtz free energy
- Enthalpy
- Temperature
- Gibbs potential

No, the answer is incorrect.
Score: 0
Accepted Answers:
Gibbs potential

9) Legendre transform of internal energy (U) with respect to entropy (S) gives *1 point*

- Helmholtz free energy
- Gibbs potential
- Temperature
- Enthalpy

No, the answer is incorrect.
Score: 0
Accepted Answers:
Helmholtz free energy

10) The free energy functional $A(t,m)$ has the following form: *1 point*

$A(t,m) = a_0 + a_2 t m^2 + a_4 m^4$

The value of order parameter (m) will be

(a) $m = 0 \; and \pm\sqrt{-\frac{a_2 t}{2a_4}}$

(b) $m = \pm\sqrt{\frac{2a_4}{a_2 t}}$

(c) $m = 0 \; and \pm\sqrt{a_0 - \frac{a_2 t}{2a_4}}$

(d) $m = \pm\sqrt{a_2 + \frac{a_2 t}{2a_4}}$

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

No, the answer is incorrect.
Score: 0
Accepted Answers:
(a)