Units 6 - Week 5

Week 5 Assignment 1

The due date for submitting this assignment has passed.

Due on 2017-09-04, 23:59 IST.

Submitted assignment

1) The Fermi-Dirac distribution function will approximate Boltzmann distribution when

- $E - \mu >> K_B T$
- $E - \mu = K_B T = 0$
- $E - \mu << K_B T$
- $E - \mu = K_B T$

No, the answer is incorrect.
Score: 0

Accepted Answers:
- $E - \mu >> K_B T$

2) Which of the following is a correct statement

- Maxwell-Boltzmann distribution is a classical distribution function
- As the temperature increases, the number distribution function of the phonons approaches maximum value for larger values of frequency
- For $\hbar \nu >> K_B T$, Bose-Einstein distribution function approximates Boltzmann distribution
- A distribution function gives the information of number of energy carriers which can occupy particular energy state

No, the answer is incorrect.
Score: 0

Accepted Answers:
- Maxwell-Boltzmann distribution is a classical distribution function
- For $\hbar \nu >> K_B T$, Bose-Einstein distribution function approximates Boltzmann distribution
- A distribution function gives the information of number of energy carriers which can occupy particular energy state

3) The probability of occupancy of the particles is much higher in

- Lower energy levels
- Higher energy levels
- Uniformly distributed among energy levels
- Equally in higher and lower energy levels

No, the answer is incorrect.
Score: 0

Accepted Answers:
- Lower energy levels

4) Bose-Einstein distribution function is applicable for

- Molecules
- Phonons
- Photons
- Electrons

No, the answer is incorrect.
Score: 0

Accepted Answers:
- Phonons

5) The distribution functions for distinguishing particles without any limit of number of particles occupying an energy level are

- Bose-Einstein
- Maxwell-Boltzmann
- Fermi-Dirac
- All the above

No, the answer is incorrect.
Score: 0

Accepted Answers:
- Maxwell-Boltzmann
6) Statistical thermodynamics deals with
- Distribution of the particles in energy levels
- Calculation of macro scale properties using micro states information
- Ensembles of particles in quantum space
- None of the above

No, the answer is incorrect.
Score: 0
Accepted Answers:
Distribution of the particles in energy levels
Calculation of macro scale properties using micro states information
Ensembles of particles in quantum space

7) Using Maxwell-Boltzmann approximation, identify the correct statements for ideal gas system

\[ U = 1.5 N K_B \]
\[ U = 1.5 N R_u T \]
\[ C_v = 1.5 R_u \]
\[ U = 1.5 N K_B T \]

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

8) For a diatomic ideal gas system, identify the wrong statements
- Only translational kinetic energy contributes to internal energy at lower temperatures
- Both rotational and vibrational energies contributes to internal energy at lower temperatures
- Rotational kinetic energy also contributes to internal energy at higher temperatures
- Translational energy also contributes to internal energy at higher temperatures

No, the answer is incorrect.
Score: 0
Accepted Answers:
Both rotational and vibrational energies contributes to internal energy at lower temperatures

9) While deriving expression for internal energy of phonon gas the following assumptions are considered
- Bose-Einstein distribution is used
- Fermi-Dirac distribution is used
- Monoatomic crystalline structure with three acoustic phonons
- Debye approximation

No, the answer is incorrect.
Score: 0
Accepted Answers:
Bose-Einstein distribution is used
Monoatomic crystalline structure with three acoustic phonons
Debye approximation

10) Calculate the number of arrangements (probability \( \Omega \)) of microstates when 4 carriers are distributed among 3 energy level in the order of 2 in lower energy and 1 each in other energy levels

- 4
- 8
- 12
- 16

No, the answer is incorrect.
Score: 0
Accepted Answers:
12

11) The distribution \( (n_i \text{ in energy level } 'i' \text{ with energy } \varepsilon_i) \) which maximises \( \Omega \) given as following (where \( \alpha \) and \( \beta \) are Lagrange multipliers)

\[ \exp(\alpha + \beta \varepsilon_i) \]
12/29/2017

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

Which of the following is true

- With increase in \( \varepsilon_i \), the number density of the state will decreases
- With increase in \( \varepsilon_i \), the number density of the state will increases
- With increase in \( \varepsilon_i \), the number density of the state will be uniform

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

Identify the correct pairs

- Micro canonical - isolated system
- Canonical - open system
- Grand canonical - closed system
- Canonical - closed system

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

Langrangian multipliers for canonical ensemble are

- \( \alpha = 0, \beta = 0 \)
- \( \alpha = k_B T, \beta = 0 \)
- \( \alpha = 0, \beta = k_B T \)
- \( \alpha = 0, \beta = (k_B T)^{-1} \)

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

Choose the correct statements

- Bose Einstein distribution – phonons
- Fermi Dirac distribution – electrons
- Maxwell Boltzmann distribution – ideal gas
- Fermi Dirac distribution – photons

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

- Bose Einstein distribution – phonons
- Fermi Dirac distribution – electrons
- Maxwell Boltzmann distribution – ideal gas

End