SEAT No._____ SARDAR PATEL UNIVERSITY No. of Printed Pages : 2
[1123]
T.Y.B.Sc. Fifth Semester(CBSC)] Examination 2020
29-12-2020 Tuesday [December-NC]
Session: Evening Time:02:00 pm to 04:00 pm
Subject Code: US05CPHY04
Subject Title: Thermodynamics and Statistical Physics

Max Marks: 70

Write correct answer for each of the following MCQs.

[10]

Q: 1

1   If disorder of the system decreases, the entropy of the system _____.
   a) becomes zero
   b) decreases
   c) remains constant
   d) Increases

2   In which of the following process temperature remains constant.
   a) An isochoric
   b) An adiabatic
   c) An isobaric
   d) An isothermal

3   Thermo dynamical potential Gibbs function G is given by ___.
   a) $U - PS + TS$
   b) $U - TS + PV$
   c) $U + PS - TS$
   d) $U + TS + PV$

4   An ensemble for which (q, p, t) remains constant along the path in the phase space is known as _____.
   a) Stationary ensemble
   b) Dynamic ensemble
   c) Micro canonical ensemble
   d) None of these

5   In case of reversible isothermal isobaric process _____ thermo dynamical quantities remains constant.
   a) (T,V)
   b) (T,P)
   c) (P,U)
   d) (T,S)

6   Stirling formula ln n! = _____
   a) NLN - E
   b) $N \ln \left(\frac{N}{e}\right)$
   c) NlnN - e
   d) $N \ln \left(\frac{E}{N}\right)$

7   In which of the following ensemble both particles exchange between system and reservoir
   a) Canonical ensemble
   b) Grand Canonical ensemble
   c) Micro Canonical ensemble
   d) Gibbs Canonical ensemble

8   The mean kinetic energy of a particle per degree of freedom is ___
   a) KT
   b) $\frac{KT}{2}$
   c) $\frac{3}{2}$ KT
   d) $(KT)^2$

9   In F-D system, the mean separation between the particles is smaller than the ____
   a) Wave length
   b) Thermal length
   c) De – Broglie length
   d) Debye length

10 The spin quantum number of deuteron is ___.
   a) 0
   b) $\frac{1}{2}$
   c) 1
   (d)2

Q-2   **Do as Directed (fill in the blanks and True or False)**   **(08)**

1   First law of thermodynamics which gives the law of conservation of momentum. (TRUE/FALSE)

2   In _____ order phase transition no transfer of heat and change of volume

3   A measure of the disorder of the system is called_____.

4   In a reversible an adiabatic process temperature remains constant. (TRUE/FALSE)

5   The Grand canonical ensemble is also called a open system. (TRUE/FALSE)

6   The expression for the partition function is dimensionless quantity in classical statics. (TRUE/FALSE)

7   When the mean distance between the particles is larger than the de Broglie wave length we apply quantum distribution. . (TRUE/FALSE)

8   In M-B system the particles obey the Pauli exclusion principle. (TRUE/FALSE)

Q-3   **Write answers of any ten questions in brief**   **(20)**

1   Write third law for thermodynamics.

2   Obtain second T.dS equation.

3   State zeroth law of thermodynamics.

4   Write additive property of entropy.

5   Deduce equal a priori probability.

6   Define μ space and Phase path.

7   What is chemical potential?

8   Write expression for Canonical Partition function in classical and quantum statics.

9   Define and discuss in brief about Grand Canonical Ensemble.

10   Write Maxwell – Boltzmann velocity distribution law and obtain its expression.

11   Define Fermi- Dirac system with proper example.

12   Define most probable energy E_p and velocity V_p ?

Q- 4   **Answer the following questions (Attempt any 4 out of 8)**   **(32)**

1   Derive Maxwell's four thermo dynamical relations using alternative method.

2   Define first order phase transition. Obtain Clausius – Clapeyron latent heat equation in case of first order phase transition.

3   State Liouville's theorem and prove that $\frac{d\rho}{dt} = 0$ with proper diagram.

4*   Define Micro Canonical Ensemble. Obtain Gibbs Micro Canonical distribution function.

5   Write a note on Canonical partition function.

6   Discuss and derive all thermo dynamical quantity in a Grand canonical ensemble.

7   Define Bose- Einstein system? Obtain expression for the B-E distribution of the particles among various states.

8   Define Maxwell - Boltzmann system? Obtain expression for the M-B distribution of the particles among various states.

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