QP CODE: 19002498

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Reg No : .....

Name : .....

M.Sc. DEGREE (C.S.S) EXAMINATION, NOVEMBER 2019

First Semester

Faculty of Science

Core - CH500104 - THERMODYNAMICS, KINETIC THEORY AND STATISTICAL THERMODYNAMICS

(Common to all Branches of Chemistry)

2019 Admission Onwards

26B0C0DA

Time: 3 Hours Maximum Weight :30

Part A (Short Answer Questions)

*Answer any **eight** questions.*

*Weight **1** each.*

1. What is meant by partial molar property of a component in a system? Give the expression for chemical potential.
2. Define fugacity and explain its significance.
3. Write the expression for van't Hoff reaction isotherm and explain the terms.
4. Explain briefly the graphical representation of Maxwell's distribution of molecular velocities.
5. Differentiate average velocity and RMS velocity.
6. What is meant ensembles and explain the features of microcanonical ensemble.
7. Define partition function. The partition functions of systems A and B are QA and QB. The total energy of the system is EA+ EB. What is the partition function of the entire system?
8. Distinguish between Bosons and Fermions.
9. What is Fermi energy. Give its significance.
10. What are the limitations of Debye theory of solids.

(8×1=8 weightage)

Part B (Short Essay/Problems)

*Answer any **six** questions.*

*Weight **2** each.*

11. Discuss the criteria of equilibria using thermodynamic functions ΔG, ΔA and ΔS.
12. Calculate the free energy of mixing ΔG_{mix} and enthalpy of mixing ΔH_{mix} and entropy of mixing ΔS_{mix} at 25^0C and 1 atm when 10 moles of Hydrogen are mixed with 10 moles of Ne.
13. Discuss on the basis of phase rule the behaviour of a three component system of three liquids where two pairs are partially miscible and one pair is completely miscible.
14. The mean free path of the molecule of a certain gas at 300 K is 2.6×10^{-5}m.The collision diameter of the molecule is 0.26 nm. Calculate (a) number of molecules per unit volume of the gas and (b) pressure of the gas.
15. Calculate the number of ways of distributing distinguishable molecules a,b,c between three energy levels so as to obtain the following set of occupation number N_0=1, N_1=1, N_2=1. Also write the different configuration?
16. Calculate the rotational partition function for hydrogen bromide gas at 300 K if the moments of inertia of HBr is 3.31×10^{-40} gcm^2. (k= 1.381×10^{-16} erg.deg^{-1} and h= 6.626×10^{-27}erg.sec.)
17. Calculate the translational entropy of gaseous Iodine at 298 K and 1 atm.
18. Derive Sackur – Tetrode equation applicable to monoatomic gases.

(6×2=12 weightage)

Part C (Essay Type Questions)

*Answer any **two** questions.*

*Weight **5** each.*

19. (a) Describe Nernst heat theorem. (b) Explain a method for determining absolute entropies using third law.
20. (a)Derive general equation for transport phenomena. (b)Derive a relation for the transport phenomena viscosity.(c) Explain the influence of temperature and pressure on coefficient of viscosity
21. Derive Maxwell-Boltzmann distribution law.
22. Write a note on classical and quantum statistical approach to heat capacity of gases.

(2×5=10 weightage)