

18U318

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Name:

Reg. No.....

THIRD SEMESTER B.Sc. DEGREE EXAMINATION, NOVEMBER 2019

(Regular/Supplementary/Improvement)

(CUCBCSS-UG)

CC15U CHE3 B03 - PHYSICAL CHEMISTRY-I

(Chemistry - Core Course)

(2015 Admission onwards)

Time: Three Hours

Maximum: 80 Marks

Section A

Answer *all* questions. Each question carries 1 mark.

1. For the gaseous equilibrium $N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$ the value of K_p and K_c are related at any temperature as -----
2. The observed molar refraction of an aliphatic conjugated polyenes is found to be greater than the calculated value. The phenomenon is called -----
3. The ratio of P/P_c for a gas is known as its -----
4. With decrease in temperature viscosity of a liquid will-----
5. $\ln N! =$ -----
6. How is K_c related to K_p ?
7. Calculate the RMS velocity of H_2 molecule at $100^\circ C$
8. Give one example for intensive property.
9. The SI unit of the van der Waal's constant 'b' is -----
10. State third law of thermodynamics.

(10 x 1 = 10 Marks)

Section B

Answer any *ten* questions. Each question carries 2 marks.

11. Calculate the temperature at which the RMS velocity of oxygen equals that of Nitrogen at 300 K
12. Give an expression for Joule Thomson coefficient.
13. Distinguish state and path functions.
14. Define inversion temperature.
15. Calculate the number of ways of distributing two indistinguishable objects in two boxes.
16. What is the effect of high pressure on the melting point of ice?
17. State Hess's law.

18. Define chemical potential.
19. The enthalpies of combustion of graphite and diamond are -393.5 and $-395.4 \text{ kJ mol}^{-1}$, respectively. Calculate the enthalpy of transition from diamond to graphite.
20. What is Kirchoff's equation?
21. What is heterogenous equilibria? Give an example.
22. Define compressibility factor.

(10 x 2 = 20 Marks)

Section C

Answer any *five* questions. Each question carries 6 marks.

23. What is meant by Parachor? How can it be determined? Explain how parachor measurements are useful in the structure determination of compounds.
24. Explain with example the surface tension and viscosity on the basis of intermolecular forces.
25. What is meant by thermodynamic probability? Derive the relation between entropy and probability of a system.
26. State and explain Le Chatelier's principle with a suitable example.
27. Derive an expression for Boyle temperature from van der Waal's equation in virial form.
28. Derive Gibbs-Duhem equation.
29. State and explain Nernst theorem. What is its significance?
30. Derive Gibbs-Helmholtz equation.

(5 x 6 = 30 Marks)

Section D

Answer any *two* questions. Each question carries 10 marks.

31. Calculate the collision number, frequency and the mean free path of a gas at 298 K and 1 bar. Collision diameter of the gas = 247 pm
32. Derive the van't Hoff equation showing the temperature –dependence of equilibrium constant and arrive at its integrated form.
33. a) Derive thermodynamically the relation between C_p and C_v for gaseous system.
b) Discuss the application of Joule Thomson effect in the liquefaction of gases.
34. a) Obtain the thermodynamic derivation of Law of chemical equilibrium.
b) Derive Vander Waal's equation for n moles of gas.

(2 x 10 = 20 Marks)
