

THIRD SEMESTER (CUCBCSS-UG) DEGREE [SPECIAL] EXAMINATION  
NOVEMBER 2019

CHE 3B 03 PHYSICAL CHEMISTRY - I

Time: Three hours

Maximum : 80 Marks

Part A

Answer all questions.

Each question carries 1 mark.

1. The equilibrium constant is related to the standard free energy change of a reaction as .....
2. Entropy is a measure of .....of the system.
3. The unit of surface tension is.....
4. Give one example for a State function.
5. Give one example for an extensive property.
6. At critical temperature  $V - V_c = \dots\dots\dots$
7. The critical pressure  $P_c$  is related to Vander Waals constants by the relation .....
8. With increase in temperature, viscosity of a liquid will .....
9. Molar refraction  $R_M = \dots\dots\dots$
10. The relation between  $K_p$  and  $K_x$  is .....

(10 x 1 = 10 marks)

Part B

Answer any eight questions.

Each question carries 2 marks.

11. Define ensemble.
12. Define critical temperature.
13. State Zeroth law of thermodynamics.
14. Define parachor.
15. What is optical exaltation?

16. What is meant by chemical potential
17. Write Kirchhoff's equation.
18. State and illustrate Hess's Law.
19. What is meant by Heterogenous equilibria.
20. How the surface tension of liquid varies with temperature.

(8 x 2 = 16 marks)

### Part C

*Answer any six questions.*

*Each question carries 4 marks.*

21. Derive Vandder Waals equation for  $n$  moles of a gas.
22. Derive Clausius-Clapeyron equation.
23. Derive an expression for relation between entropy and probability.
24. Derive relation between equilibrium constants  $K_p$  and  $K_c$ .
25. Explain Joule Thomson effect. How is it useful for liquefaction of gases by any one method?
26. Calculate the enthalpy of formation of methane. Give that the standard enthalpy of formation of liquid water, carbondioxide gas are  $-285.9$  KJ/mol,  $-393.5$  KJ/mol respectively. Enthalpy of combustion of methane is  $-890.3$  KJ/mol.
27. State and explain Le Chateleirs principle.
28. Sketch the PV isotherms of  $\text{CH}_4$  gas and He gas.

(6 x 4 = 24 marks)

### Part D

*Answer any two questions.*

*Each question carries 15 marks.*

29. a) Explain Maxwell's distribution of molecular velocities. Illustrate the effect of temperature on this distribution.  
b) Calculate the temperature at which root mean square velocity of Hydrogen gas becomes equal to that of Oxygen gas.
30. a) Derive Gibbs-Helmholtz equation in terms of free energy and enthalpy at constant pressure.  
b) What is Chemical potential? Describe variation of chemical potential with respect to temperature.
31. Derive Van't Hoff equation and show Variation of equilibrium constant with temperature.