THIRD SEMESTER B.Sc. DEGREE EXAMINATION, NOVEMBER 2016
(CUCBCSS - UG)
Chemistry - Core Course
CC15U CHE3 B03 - PHYSICAL CHEMISTRY- I
(2015 Admission)

Time: Three Hours   Maximum: 80 Marks

Section A
(Answer *all* questions, Each question carries 1 mark)

1. The rms velocity of N_2 is ……. than that of CO_2 at the same temperature.

2. The expression for Critical pressure Pc, in terms of Vander Waal's constants is………

3. Among energy, enthalpy, viscosity, surface area an intensive property of the system is……………….

4. Efficiency of Carnot's engine working between temperatures T_1, and T_2 is…………

5. The rate of change of internal energy of the system with temperature at constant volume is termed as……………

6. Entropy of CO at absolute zero is…………………………

7. For a process at equilibrium, the free energy change is…………………….

8. Viscosity of a liquid……..with increase in temperature

9. The relation between T and P in an adiabatic process is…………………………

10. In the reaction $2SO_{2\,(g)} + O_{2\,(g)} \leftrightarrows 2SO_3\,(g)$; formation of SO_3 is favored by………… of pressure.   **(10 x 1 = 10 Marks)**

Section B
(Answer *any ten* questions. Each question carries 2 marks)

11. At what temperature would the average velocity of methane molecules be the same as the rms velocity of ethane molecules at 127^0 C

12. Define critical volume and critical pressure of a gas.

13. Explain the causes for the deviation of real gases from ideal behavior.

14. Write Gibbs- Duhem equation and explain the terms.

15. Explain First law of thermodynamics.

16. Explain the physical significance of entropy.

17. State and explain third law of thermodynamics.

18. Define inversion temperature. How is it related to Joule – Thomason coefficient?

19. What is optical exaltation? Give an example.

20. How can surface tension of a liquid determined by capillary rise method?

21. State Le-Chatlier's principle
22. How is Kc related to Kp.

<div align="right">(10 x 2 = 20 Marks)</div>

Section C
(Answer *any five* questions. Each question carries 6 marks)

23. Derive the relationship connecting Vander Waals constants and critical constants.
24. What is meant by continuity of states, with the help of pressure- volume isothermals of CO_2 show that there is continuity of states?
25. Derive expression for work done in reversible isothermal expansion of an ideal gas.
26. Derive an expression for Joule-Thomson coefficient for an ideal gas
27. Explain the conditions for a process to be spontaneous based on ΔH and ΔS.
28. Calculate the free energy changes accompanying the expansion of 3 moles of an ideal gas at 27^0 C from 100L to 200L
29. Define the terms: a) Parachor b) Coefficient of Viscosity c) Molar refraction
30. Derive Vant Hoff's equation giving the temperature dependence of equilibrium constant Kp.

<div align="right">(5 x 6 = 30 Marks)</div>

Section D
(Answer *any two* questions. Each question carries 10 marks)

31. Derive the Vander Waals equation for n moles of real gas. Express Vander Waals equation in virial form.
32. Discuss the carnot cycle and derive the expression for the efficiency of a reversible engine. State the carnots theorem.
33. Derive Clapeyron- Claussius equation of liquid-vapour equilibrium. What are its applications?
34. How is equilibrium constant related to the standard free energy change of the reaction. Derive the relations between Kp, Kc, and Kx

<div align="right">(2 x 10 = 20 Marks)</div>

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