THIRD SEMESTER B.A./B.Sc. DEGREE EXAMINATION NOVEMBER 2019

(CUCBCSS—UG)

Chemistry

CHE 3B 03—PHYSICAL CHEMISTRY—I

Time : Three Hours   Maximum : 80 Marks

Section A (One Word)

Answer all questions.
Each question carries 1 marks

1. Write Vander waals equation for n moles of a real gas and explain terms.

2. At critical temperature $V - V_c$ = ————.

3. Write an example of intensive property.

4. For a cyclic process ΔE = ————.

5. Efficiency of a Carnot engine working between temperature T_1 and T_2 is ————.

6. The unit of surface tension is ————.

7. Molar refraction R_M = ————.

8. At ———— $r_f = r_b$.

9. The relation between Kp and Kx is ————.

10. Entropy is a measure of ———— of the system.

$$(10 \times 1 = 10 \text{ marks})$$

Section B (Short Answers)

Answer an ten questions.
Each question carries 2 marks.

11. Define collision number and collision frequency.

12. Calculate RMS velocity of O_2 at 25°C.

13. Explain why internal energy is a state function while work not.

14. Define ensemble.

15. Define vapour pressure ot a liquid. How does it depend on temperature.

16. State and illustrate Hess's law.

17. Discuss and explain third law of thermodynamics.

18. Define co-efficient of viscosity.

19. Define parachor.

20. State and explain Le Chateleirs principle.

21. Why is Chemical equilibrium referred as dynamic equilibrium ?

22. What is optical exaltation ?

$(10 \times 2 = 20 \text{ marks})$

Section C (Paragraph)

Answer any five questions.
Each question carries 6 marks.

23. Explain the reasons for deviation of real gases from ideal behavior.

24. What is the effect of temperature and pressure on equilibrium $2SO_2 + O_2 \rightleftharpoons 2SO_3 + \text{heat}$.

25. For the formation of NH_3 the equilibrium constant at 673 K and 773 K are 1.58×10^{-4} and 1.39×10^{-5} respectively. Calculate the heat of reaction.

26. Explain Joule Thomson effect. How is it useful for liquefaction of gases by any *one* method.

27. (a) How are molar refraction measurements useful in the structural elucidation of molecules.

　　(b) Calculate the refractive index of a liquid having molar refraction $12.85 \text{ cm}^3 \text{mol}^{-1}$. the molecular mass is 60 gmol^{-1} and density is 1.046 gcm^{-3}.

28. Define term heat of formation and bond energy. Given the bond enthalpies of N – H, H – H and N = N bonds are 389.435 and 945.4 kJ mol^{-1} respectively, calculate the heat of formation of ammonia.

29. Derive an expression for relation between entropy and probability.

30. Derive expression for critical constants in terms of Vander-waals constant.

$(5 \times 6 = 30 \text{ marks})$

Section D (Essays)

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

31. (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.

32. Calculate the most probable velocity, average velocity and root mean square velocity for carbon monoxide at 298K.

33. What is Kirchoff's equation ? The enthalpy of reaction $N_2 + 3H_2 \rightleftharpoons 2 NH_3$ at 300 K was found to be $- 91.97$ KJ. What will be the enthalpy of reaction at 323 K ? The molar heat capacities at constant pressure and 300 K for nitrogen, hydrogen and ammonia are 28.46, 28.33 and 37.08 $JK^{-1} mol^{-1}$ respectively.

34. Derive Van't Hoff equation and show Variation of equilibrium constant with temperature.

                                                                $(2 \times 10 = 20$ marks$)$