B. Sc. DEGREE END SEMESTER EXAMINATION MARCH 2019

SEMESTER – 6 : CHEMISTRY (CORE COURSE)

15U6CRCHE11 : PHYSICAL CHEMISTRY – III

(Common for Regular - 2016 Admission / Supplementary-Improvement 2015 admission)

Time: Three Hours   Max Marks: 60

Section - A

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

1. What is the difference between exact and inexact differential.
2. Point out a limitation of first law of thermodynamics?
3. Give an expression for free energy dependence on temperature.
4. Write the integrated form of Kirchoff's equation.
5. Express the Gibbs Duhem equation for a system of two components A and B.
6. Name the law of Thermodynamics which is useful in predicting the feasibility of a reaction.
7. For the reaction, A ⟶ B , write the rate equation if the order of reaction gets doubled when concentration of reactant doubled.
8. The number of components in a system for the decomposition of $CaCO_3$ is ………

(1 x 8 = 8)

Section - B

(Answer **any six** questions. Each question carries 2 marks)

9. State third law of thermodynamics. How it is used to calculate the entropy of a substance?
10. What is meant by inversion temperature? Give the value of Joule Thomson coefficient (μ_{JT}) of a gas at inversion temperature.
11. Endothermic reaction is not feasible at low temperature. Discuss on it using Gibbs Helmholtz equation.
12. Write the expression for the chemical potential of a component in an ideal and non-ideal gaseous mixture.
13. One mole of naphthalene was burnt in oxygen gas at constant volume to give carbon dioxide gas and liquid water at 25°C. The heat evolved was found to be 5138.8 KJ. Calculate the enthalpy of reaction at constant pressure. [R= 8.314 JK^{-1}mol^{-1}]
14. The enthalpy of solution of anhydrous $CuSO_4$ and $CuSO_4.5H_2O$ are -66.5 KJmol^{-1} and +11.7KJmol^{-1} respectively. Calculate the enthalpy of hydration.
15. How half life period is related to the initial concentration of reactant for first and second order reaction?

16. What are the phases that coexist in the sublimation curve and transition curve of sulphur system? (2 x 6 = 12)

Section - C

(Answer **any four** questions. Each question carries 5 marks)

17. Derive an expression for the work done and heat exchange for a reversible expansion of ideal gas.

18. Discuss on the following a) Work done on the surroundings by a system of ideal gas and real gas is different under same conditions b) C_p is larger than C_v

19. Draw a pressure – volume isotherm for a reversible expansion of ideal gas from a volume of $10m^3$ to $100m^3$ as the pressure decreases from $8Nm^{-2}$ to $4 Nm^{-2}$. How this graph can be used to calculate P-V work done.

20. a)Give the four stages involved in a carnot's cycle.

b) In an engine running in accord with carnot cycle, 100J of energy is withdrawn from the hot source (q_h= -100J) at 500K and some is used to do work with remainder deposited in the cold sink at 300K. Calculate the efficiency.

21. What is meant by cooling curve. Draw and point out the differences in the cooling curves of Pb-Ag system with different composition.

22. Explain activated complex theory of bimolecular reaction and write Eyring equation.

(5 x 4 = 20)

Section - D

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

23. a) What is van't Hoff reaction isotherm? Derive integrated form of van't Hoff equation.

b) The equilibrium constant of a reaction doubles on raising the temperature from 25° C to 35° C. Calculate ΔH^o for the reaction.

24. Explain the mechanism of enzyme catalyzed reaction and obtain the Michaelis-Menten equation. Discuss the change in the kinetics of enzyme catalysis with substrate concentration and temperature.

25. Draw the phase diagram of water system and explain.

26. Write notes on following a) autocatalysis b) consecutive reactions c) chain reactions d) pseudo order reactions e) Relation between rate constant and temperature.

(10 x 2 = 20)

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