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Date: 24.04.2019

**ST. JOSEPH’S COLLEGE (AUTONOMOUS), BANGALORE-27**

**B.Sc. Chemistry - II SEMESTER**

**SEMESTER EXAMINATION: APRIL 2019**

**CH218 – Chemistry**

**Time - 2 ½ Hours Max Marks - 70**

**Supplementary candidates only.**

**FOR BATCH OF 2014,2013,2012**

**Attach the question paper with the answer booklet**

**This paper contains 2 printed pages and three parts**

**Part A**

Answer any **six** of the following:  **[ 6 X 2 = 12 ]**

1. What is meant by standard entropy change of a reaction?
2. Define Joule –Thomson effect.
3. Write the rate equation and half-life period equation for the second order reaction with equal initial concentrations of the reactants.
4. Write an expression for zero-point energy and explain the terms.
5. List any two advantages and two disadvantages of using liquid NH3 as solvent.
6. Give the mathematical expression for Raoult’s law and explain the terms.
7. Give any two statement of second law of thermodynamics.
8. Mention any two limitations of collision theory.

**Part B**

Answer any **eight** of the following: **[ 8 X 6 = 48 ]**

1. Derive an equation for variation of free energy with temperature and pressure for one mole of an ideal gas.
2. What is Carnot engine? Name the working substance used in Carnot engine. Derive an expression for efficiency in terms of temperature by using the concept of entropy.
3. a) Describe the Andrew’s experiment on isotherms of CO2.

b) Calculate the vibrational frequency of CO molecule.The force constant of CO is1840 Nm-1.The atomic masses are 12C =19.9 X 10-27 kg; 16O =26.6 X10-27 kg. (3+3)

1. Derive the expression for the rate constant of a second order reaction when

a ≠b, where a and b are initial concentrations of reactants.

1. Using relevant mathematical expressions and selection rule for the rotational energy of a rigid diatomic molecule, depict the rotational transitions in the form of energy level diagram and also show that the spectral lines are equally spaced.
2. Explain Raman Effect and discuss the origin of stokes and antistokes lines. Write the expressions for the Raman shift.
3. a) Discuss thecritical solution temperature of a pair of partially miscible binary liquids taking phenol- water system as an example.

b) What is symbiosis? Give two examples. (3+ 3)

1. a) What is meant by levelling effect? Explain with an example.

b) Complete the following reactions.

1. H2SO4 + HF Liq NH3

ii) SOCl2 + Cs2SO3Liq SO2

iii) NH4Cl + NaNH2 Liq NH3(3+3)

1. a) Consider a polymer sample comprising of 5 polymer molecules having molecular weight of 40000 and 15 polymer molecules having the molecular weight of 30000. Calculate the number average molar mass and the weight average molar massof that polymer sample.
2. Explain the experimental determination of molecular weight of polymers by viscosity method. (3+3)
3. Draw the vapour pressure-composition and boiling point composition diagrams for solution of type 2. Give an example. Discuss the fractional distillation of this liquid mixture.

**Part C**

Answer any **two** of the following:  **[ 2 X 5 =10 ]**

1. a)A Carnot engine converts one sixth of heat absorbed into work. When the temperature of the sink is reduced by 62K, its efficiency is doubled. Find the temperature of the source and sink

b) An aqueous solution has a vapour pressure of 2329 Nm-2 at 20°C. What is the boiling point of the solution? The molar heat of vaporization as 40670 J.The boiling point is the temperature at which the vapour pressure of the solution is 101300 Nm-2

(3+ 2)

1. a) A living plant acquires a definite fraction of 14C6 nuclei in its carbon contact. If a freshly cut piece of wood gives 16.1 counts per minute per gram and an old wooden bowl gives 9.6 counts per minute per gram of carbon, calculate the age of the wooden bowl. The half- life of 14C6 is 5770 years.

b) Calculate the number of alpha particles and beta particles emitted when one atom of 232Th90 undergoes disintegration to form 208Pb82.(3+2)

1. a) Arrange the following in the order of increasing spacing in the rotational spectra

HF, HCl, HI, HBr

b) Which of the following molecules will show IR spectrum?Justify

Cl2 (g)

N2O (g)

CO2 (g)

SO2 (g)(2+3)

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