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Registered Number:

DATE: **19** **-04-2018 (9AM)**

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

**B.Sc., CHEMISTRY-II SEMESTER**

**SEMESTER EXAMINATION, APRIL,2018**

**CH-215: Chemistry - II**

**Time:** 2½ hours **Max.Marks:**70

This question paper contains **TWO**pages and **THREE** parts **A**,**B** and **C**

**PART-A**

Answer any **SIX** of the following: 6 x 2 = 12 marks

1. With respect to the solvent system define an acid and a base.
2. What are the advantages of using liquid NH3 as a solvent?
3. Equal number of molecules with M1 = 10,000 and M2 = 1,00,000 are mixed. Calculate the number average molecular weight of the polymer.
4. Draw the unit cell of CsCl crystal.
5. What are stereoisomers? Give example.
6. Define specific rotation and write theexpression for it.
7. What is ameso compound? Which of the following compounds has a stereoisomer that is a meso compound?

i) 2,3-dimethylbutane ii) 3,4-dimethylpentane

1. Complete the following nuclear reactions:

a)$$ + $\rightarrow $ + ?

b)$$+ ?$\rightarrow $+ $$

**PART-B**

Answer any **EIGHT** of the following:8 x 6 = 48 marks

1. a) Derive an expression for the variation of enthalpy of a reaction with temperature.

b) From the information provided in each of the following cases, determine whether there is mechanical work done by the system, work done on the system or no work is done:

i) A balloon expands as crystals of iodine inside the balloon sublimes (consider the balloon as the system).

Ii) Gaseous CHF2Cl, a refrigerant, is compressed in the compressor of an air conditioner (consider refrigerant as the system).

Iii) A spray paint contained in a metal container is completely removed (consider the metal container as the system) (3+3)

1. a) Calculate the temperature at which the average velocity of oxygen is equal to that of hydrogen at 20K.

b) Derive an expression for the half-life period of an nth order reaction. (3+3)

1. a)Derive the expression for the reaction rate of the reaction A → Products. The mechanism of the reaction is as given below:

A + A $→A^{\*} + A$

$A^{\*} + A→$A + A

$A^{\*}→$Products

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b) Define the term intrinsic viscosity. Write the expression to indicate the relationship between intrinsic viscosity and molecular weight of a polymer. (3+3)

1. a) Describe the structure of CaF2. (No need to draw the unit cell. Mention the coordination numbers of ions and radius ratio).

b) What are the assumptions of limiting radius ratio method? (3+3)

1. a) Explain the levelling effect of ammonia.

b) Complete the following reactions:

 i) NH4Cl + KNH2$→$

ii) SOCl2 + K2SO3$→$

iii) AgCl + KNO3$→$ (3+3)

1. a) How do you predict the feasibility of a reaction based on HSAB principle? Explain with an example.

b) Arrange the following oxyacids of chlorine in the decreasing order of their acid strength. Give reason.

HClO3, HClO, HClO4, HClO2 (3+3)

1. Describe Andrew’s experiment on isotherms of carbon dioxide and explain critical constants of carbon dioxide gas based on this experiment.
2. a) 1.0 mole of an ideal gas at 300K expands adiabatically and reversibly against a constant external pressure of 151.95 kPa from a volume of 4.0 dm3 to 16 dm3. Calculate the work done and change in internal energy.

b) Derive the relationship between the heat capacities, Cp and Cv. (3+3)

1. a) How do you resolve enantiomers using amines as resolving agent?

b) Distinguish between enantiomers and diastereomers with suitable examples. (3+3)

1. Draw the potential energy diagram for the various conformations of cyclohexane and explain their relative stability. Why is the chair conformation of cyclohexane more stable than the boat conformation?

**PART-C**

Answer any **TWO** of the following:2 x 5 = 10 marks

1. The rate constant of a second order reaction is 5.7x10-5 dm3mol-1s-1 at 25°C and 1.64x10-4 dm3mol-1s-1 at 40°C. Calculate Arrhenius pre-exponential factor at 25°C.
2. An old chair made of wood shows $$activity which is 80% of the activity today. Calculate the age of the old chair. Half life period of $$is 5770 years.
3. a) Draw perspective formula for (R)-2-butanol.

b) Draw the Fischer projection of (2S,3R)-3-bromo-2-butanol.

c) Write the structure of (Z)-2-butene. (2+2+1)

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