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Register Number:

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

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

**SEMESTER EXAMINATION: APRIL-2017**

**CH 215 - Chemistry - II**

**Time: 2.5 hours** **Maximum Marks: 70**

**Note:** *The question paper has* **THREE** *printed pages and* **Twenty One** *questions.*

***Data :*** Atomic numbers of S=16, Chlorine 17; Uranium=92; R = 8.314 J K–1 mol–1; Atomic mass of Nitrogen=28.

**PART – A**

**Answer any SIX of the following questions [2 x 6 =12]**

1. i) Write the nuclear reaction for the following Bethe’s notation: 35Cl (n,p) 35S

ii) Write any one radioisotope and its’ application in the field of medicine.

1. Define critical volume.
2. Define intrinsic viscosity.
3. What is activation energy? Write Arrhenius empirical expression for calculating the energy of activation and explain the terms.
4. Define molar heat capacity at constant volume.

6) Explain square close packing. What is the coordination number in such type of packing?

7) Calculate the observed rotation of a solution containing 0.65 g/mL of an optically active compound as measured in a 30.0 cm tube using sodium D line. [α] = -380.

8) Draw the R & S forms of glyceraldehyde (2,3-dihydroxypropanal).

**PART – B**

**Answer any EIGHT of the following questions [6x8=48]**

9) a) A radioactive isotope decays at such a rate that after 68 minutes only ¼ th of its’ original amount remains. Calculate the value of decay constant and half life.

 b) In a particular sample of a polymer, 100 molecules have molecular weights 103 each, 200 molecules have molecular weights 104 each and another 200 molecules have molecular weights 105 each. Calculate the number average and weight average molecular weights. [3+3]

10) a) Derive Kirchoff’s equation for the variation of heat of a reaction over a narrow range of temperature.

 b) 280 g of Nitrogen assuming ideal behavior at a temperature of 0 0C and with a pressure of 1.013 x 105 Nm−2 undergoes isothermal reversible expansion to a final pressure of 1.013 x 104 Nm−2. Calculate the work done and the heat absorbed by the gas. [3+3]

11) a) Discuss Lindemann theory of unimolecular reactions at high pressures.

 b) Prove that the time for half change varies inversely as the initial concentration for a second order kinetics. [4+2]

12) a) Write the characteristic features of Maxwell distribution curves.

 b) At what temperature would ethane molecules have the same RMS velocity as methane molecules at 300 K? [3+3]

13) a) Give reasons for the following with the help of equations: (i) AgI2− complex is stable but AgF2− is not. (ii) BF3 readily combines with F− to form stable complex BF4–

 b) Write any two advantages of liquid ammonia as a solvent. [4+2]

14) a) Draw the unit cell of sodium chloride crystal.

 b) Briefly discuss zinc blende structure. [3+3]

15) a) i) M + $$ → $$ + 4$$ . Identify the mass number and atomic number of M. ii) Write the formula of the Neptunium series.

 b) Differentiate between isothermal and adiabatic processes. Discuss the variation of temperature of the system in the case of adiabatic process. [3+3]

16) a) i) What is a leveling solvent? Explain with an example.

 ii) Explain Pearson’s concept of hard and soft acids. Give examples.

 b) ) Draw the most stable conformation of the following molecules:

1. Butane ii) methylcyclohexane [4+2]

17) a) Applying sequence rules, show the order of priority of the groups and assign the configuration as R or S to each chiral centre in the following molecules:

 

 b) Explain the principle of diastereomeric method (chemical method) of resolution. [3+3]

18) a) Draw all possible stereoisomers of 2,3-dibromopentane, CH3CH2CH(Br)CH(Br)CH3 in the Fischer projection formula . Label the enantiomeric and diastereomeric pairs.

**PART - C**

**Answer any TWO of the following questions [2 x 5 =10]**

19) a) The following reaction is studied at 25 0C; 2A + B → C + D. If [B] is kept constant and [A] is varied; a plot of log$\frac{a}{a-x}$ vs time gave a straight line. i) What would be the order with respect to A? When [A] was kept constant and [B] was varied, the value of the rate constant was found to be 5.6 x 10−3 mol−1L s−1. What is the order with respect to B? How will the rate change when the concentration of B is halved?

 b)

One mole of an ideal gas is put through a series of changes as depicted in the adjacent figure in which A, B and C mark these stages of the system. The values of the variables are also marked in the plot. i) Calculate the pressure at A ii) Identify the processes during the following changes:

A→B ; C→ A [3+2]

20) a) The RMS velocity of a certain gas at 27 0C ‘y’ cm s−1. At what temperature its velocity will be ‘2y’?

 b)

A radioactive nuclide decays by emitting  particles. The graph shows how the rate of decay At of the source changes with time (in terms of disintegration).

Determine

(i) the half-life of the nuclide,

(ii) the decay constant,

(iii) rate of decay at the end of 400 s

 [2+3]

21) Convert the following perspective formula into a Fisher projection formula:



1. Draw the structure of an allene derivative containing a chiral axis.
2. Draw the three-dimensional formula of an optically inactive molecule containing chiral carbons.
3. Identify all the planes of symmetry (if any) present in *trans*-1,2-dichloroethene.
4. A compound with the S configuration is the enantiomer. True or False? [1 mark each]