(i) Printed Pages : 4] Roll No. .....

(ii) Questions : 9] **Sub. Code : 0 0 5 1**

Exam. Code : 0 0 0 1

B.A./B.Sc. (General) 1st Semester Examination

1127

CHEMISTRY

(Same for B.Sc. Microbial & Food Tech.)

Paper : III Physical Chemistry–A

Time : 3 Hours] **[Max. Marks : 22**

Note :– You have to attempt *five* questions in all, selecting at least *one* question from each Section A, B, C, D and Section E is compulsory. Use of log tables and Si.

Section–A

1. (a) Prove that :

$$\log\frac{a^2}{bc}+\log\frac{b^2}{ca}+\log\frac{c^2}{ab}=0 \qquad 1$$

(b) Show that the line joining (–3, –3) and (–5, 1) is parallel to the line joining (2, –1) and (0, 3). 2

(c) Differentiate $(1 - x^2 + x^3)(3x + 6)$ w.r. to x. 1

2. (a) How can you improve accuracy of an analysis ? 1

(b) Explain least square method for curve fitting with example. 1

(c) Calculate mean and standard deviation for the following data :

mg/l of oxalic acid used 31, 27, 26, 35, 23, 31, 33 2

Section–B

3. (a) Derive various gas laws from Kinetic gas equation. 1

(b) Calculate the root mean square velocity of CO_2 at S.T.P. using S.I. Units. 2

(c) Derive Vander Waal's equation of Star for Real gases. What is the significance of this equation ? 1

4. (a) Prove that at Boyle's temperature, Vander Waals equation is reduced to ideal gas equation. 1

(b) What do you know about critical temperature, volume and pressure ? Derive the relationship between P_C, V_C and T_C & Vander Waals constants '*a*' and '*b*'. 1

(c) The Vander Waal's constants for CH_4 are :

$a = 2.25$ atm l^2 mol^{-2} $b = 0.043$ litre mol^{-1}

Calculate its critical constants. 2

Section–C

5. (a) Define and explain rate law and instantaneous rate of reaction. 1

   (b) Differentiate molecularity and order of a reaction. 1

   (c) Aqueous solution of Ammonium nitrite decomposes to evolve N_2. The volumes of N_2 evolved at different times were measured to give the result :

Time (min)	Vol. of N_2 (CC)
20	10
70	33
α	162

   Show that it is a Ist order reaction and calculate rate constt. 2

6. (a) Explain the fact that radioactive decay is a Ist order phenomenon. 1

   (b) Define the following :

   (i) Mean Life of a reaction

   (ii) Pseudoorder reaction 1

   (c) Describe in detail the factors influencing the rate of reaction. 2

Section–D

7. (a) Explain Transition state theory of reaction rates for bimolecular reactions. 1

   (b) Derive and explain the significance of Arrhenius equation. 1

   (c) The value of rate constant of a first order reaction gets tripled when the temperature is changed from 293 K to 313 K. Calculate the activation energy of the reaction. 2

8. (a) How substrate affects the order of enzyme catalysed reaction ? Name the equation if any. 1

   (b) Discuss kinetics of general acid base catalysed reaction with suitable example. 2

   (c) With the help of energy level diagram, explain the effect of catalyst on the rate of a chemical reaction. 1

Section–E

Compulsory Question

9. (i) What are Catalytic promoters and inhibitors ?

   (ii) What are units of rate constant for 2nd and 3rd order reaction ?

   (iii) Give the units of Vander Waal's constants 'a' and 'b'.

   (iv) Define Collision number.

   (v) What is Joule Thomson Effect ?

   (vi) Define mean, median and mode. 6×1=6