E 3379 (Pages : 3) Reg. No.....

Name.....

B.Sc. DEGREE (C.B.C.S.S.) EXAMINATION, MARCH/APRIL 2012

Sixth Semester

Core Course—EQUILIBRIUM AND KINETICS

(Common for B.Sc. Chemistry Model I, Model II and B.Sc. Petrochemicals and B.Sc. Chemistry—Environment and Water Management)

Time : Three Hours Maximum Weight : 25

Section A

Answer **all** *questions.*
A bunch of **four** *questions carries a weight of* 1.

I. 1 Unit for a zero order reaction is

2 The First law of thermodynamics deal with ————.

3 When degree of freedom F is zero, the system is called ————.

4 C_p and C_v are related by the equation ————.

II. 5 Triple point of water system is at ———— temperature.

6 $t_{½}$ of a *n*th order reaction is related to concentration as ————.

7 For a process at equilibrium ΔG = ————.

8 An isothermal process is ————.

III. 9 Viscosity is an example for ———— extensity or intensive property.

10 An example for parallel reaction is ————.

11 One heterogeneous catalytic reaction is ————.

12 The reduced phase rule equation is ————

III. Match the following :

In the following bunch of four questions match the correct form :

13 Claussius Clapeyron equation. — $K = Ae^{-Ea/RT}$.

14 Van't Hoff's equation — $\sum n_i \, d\,\mu_i = 0$

15 Arrhenius equation — $\frac{dp}{dT} = \frac{q}{TCVB - VA}$

16 Gibb's Dühem equation — $\frac{d \ln kP}{dT} = \frac{\Delta H^*}{RT^2}$

(4 × 1 = 4)

Turn over

Section B

Answer any **five** *questions.*
Each question carries a weight of 1.

17 What do you mean by congruent melting point ? Explain.

18 Explain isolated and closed systems with examples.

19 What do you mean by pseudo order reaction ? Explain citing *one* example.

20 What is steady state approximation ? Explain.

21 Draw and sketch the phase diagram of water.

22 State Zeroth law of thermodynamics.

23 Who do you mean by explosive reactions ? Explain.

24 Explain the terms

(a) Partition function.

(b) Thermodynamic probability.

(5 × 1 = 5)

Section C

Answer any **four** *questions.*
Each question carries a weight of 2.

25 What are complex chemical reactions ? Discuss the various types.

26 Show that $\left(\frac{\partial G}{\partial T}\right)_p = -S$ and $\left(\frac{\partial G}{\partial p}\right)_T = V$.

27 Derive the rate equation for a Second order reaction. Show that for the second order reaction $2A \rightarrow$ product, the half life is inversely proportional to initial concentration of the reactant

28 5 moles of an ideal gas expand reversibly from a volume of 8 dm^3 80 dm^3 to at a temperature of 27°C. Calculate the change in entropy R = 8.314 J K^{-1} mol^{-1}.

29 Draw the phase diagram of lead-silver system and explain how this can be utilised for desilverisation of lead.

30 Explain the term chemical potential ? Derive the Gibb's Dühem-equation.

(4 × 2 = 8)

Section D

Answer any **two** *questions.*
Each question carries a weight of **4.**

31. (a) Describe Carnot's cycle and derive an expression for the efficiency of a heat engine.

    (b) Obtain the relation between pressure and volume of an ideal gas for adiabatic expansion.

32 Draw the phase diagrams of sodium sulphate-water system. Explain. What do you mean by incongruent -melting point ?

33 (a) Show that for a reversible reaction $\Delta G^\circ = -RT \ln kP$.

    (b) Discuss Collision theory of reaction rates.

$(2 \times 4 = 8)$