

**B.Sc. DEGREE (C.B.C.S.S.) EXAMINATION, APRIL 2013****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

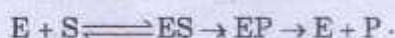
Maximum Weight : 25

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

- I. 1. Inversion temperature is the temperature at which \_\_\_\_\_.
2. An open system is a system which can change \_\_\_\_\_.
3. \_\_\_\_\_ an example for extensive reaction.
4. The Clausius Clapeyron equation is \_\_\_\_\_.
- II. 5. Criteria for a spontaneous reaction in  $\Delta G$  is \_\_\_\_\_.
6. Third law of thermodynamics states that at absolute zero of temperature \_\_\_\_\_.
7. One example for Parallel reaction is \_\_\_\_\_.
8. The state function is a property of a thermodynamic system which has \_\_\_\_\_.
- III. 9. Arrhenius equation is \_\_\_\_\_.
10.  $t_{1/2}$  of a second order relation is related to concentration as  $t_{1/2} =$  \_\_\_\_\_.
11. If a one component system has two phases with each other, the degree of freedom will be \_\_\_\_\_.
12. Polymorphism is \_\_\_\_\_.
- IV. Match the following :

*In the following Bunch of four questions match the correct form :***A****B**

13. Gibbs Helmholtz equation



14. Gibbs Duhem equation

$$\Delta G = \Delta H + T \left( \frac{\partial \Delta F}{\partial T} \right)_P$$

15. Michaelis-Menten equation

$$K_2 = \frac{h\nu}{h} e^{\Delta S^\ddagger/R} e^{-\Delta H^\ddagger/RT}$$

16. Eyring equation

$$\sum_i n_i d\mu_i = 0.$$

(4 × 1 = 4)

**Turn over**

**Section B**

*Answer any five questions.*

*Each question carries a weight of 1.*

17. Show that the time for half change in a third order reaction is inversely proportional to the square of initial concentration of reactants.
18. Give the Physical significance of Entropy.
19. Show that  $k_p = k_c(RT)^{\Delta n}$ .
20. Sketch and Label the phase diagram of sulphur system.
21. Explain the term partition function.
22. What are consecutive reaction ? Give *one* example.
23. What is meant by Triple Point ?
24. Show that maximum work is obtained from a reversible process.

(5 × 1 = 5)

**Section C**

*Answer any four questions.*

*Each question carries a weight of 2.*

25. Explain the theories of surface catalysis.
26. Calculate the change in entropy accompanying the isothermal expansion of 5 moles of an ideal gas at 330 K till the volume has increased six times.
27. A reversible Carnot engine produces  $3.36 \times 10^4$  J of work by taking up 41.84 kJ heat. If the temperature of the source is 527°C. What would be the temperature of the sink ?
28. Sketch the phase diagram of acetic acid-chloroform water system and explain.
29. Discuss the Thermodynamic criteria for equilibrium.
30. Derive Van't Hoff's equation. Giving quantitatively the effect of temperature on chemical equilibrium.

(4 × 2 = 8)



**Section D**

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

31. Briefly outline the absolute reaction rate theory.
32. Sketch the phase diagram of Ferric-Chloride-Water System and discuss. Also explain congruent and incongruent Melting point.
33. (a) Derive Gibbs Helmholtz equation.  
(b) How does the enthalpy of a reaction vary with temperature ? Derive Kirchhoff's equation.

(2 × 4 = 8)