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6 SEM TDC CHM M 1 (N/O)

2017

(May)

CHEMISTRY

(Major)

Course : 601

(Physical Chemistry)

The figures in the margin indicate full marks for the questions

(New Course)

Full Marks : 48
Pass Marks : 14

Time : 2 hours

1. Choose the correct answer : 1×5=5

(a) Which one of the following is not true for a photochemical reaction?

(i) Photochemical reaction involves absorption of light

(ii) The free energy change (ΔG) of a photochemical reaction must be negative

(iii) Temperature has very little effect on the rate of photochemical reaction

(iv) The intensity of light has a marked effect on the rate of a photochemical reaction

(b) Which of the following polymers is formed by step reaction polymerization?

(i) PVC

(ii) Polyethylene

(iii) Nylon-6,6

(iv) Polyaniline

(c) Chemisorption plays an important role in

(i) heterogeneous catalysis

(ii) homogeneous catalysis

(iii) both homogeneous and heterogeneous catalyses

(iv) None of the above

(d) The maximum number of phases that can be in equilibrium for a two-component system at constant temperature and pressure is

(i) 1 (ii) 2

(iii) 3 (iv) 4

(e) A microcanonical ensemble consists of isolated systems each having

(i) same value of volume (V), total number of molecules (N) and energy (E)

(ii) same value of volume (V), total number of molecules (N) and chemical potential (μ)

(iii) same value of volume (V), temperature (T) and chemical potential (μ)

(iv) same value of volume (V), temperature (T) and energy (E)

2. Answer the following questions : 2×5=10

(a) What are the primary and secondary processes in a photochemical reaction? 2

(b) Define degree of polymerization. The molecular weight of a sample of polyvinylchloride is 625000. Calculate the degree of polymerization. 1+1=2

(c) What is autocatalysis? Give one example. 1+1=2

(d) Explain why fusion curve in water system has a negative slope whereas the sublimation curve has a positive slope. 2

(e) Define thermodynamic probability. What is the relation between thermodynamic probability and entropy? 1+1½

3. Answer any *two* questions from the following : 3½×2=7

(a) State and explain Beer-Lambert law. Define molar extinction coefficient. 3+½=3

(b) Discuss the kinetics of dimerization of anthracene. 3

(c) What do you mean by quenching of fluorescence? Describe chemiluminescence. 1½+2=3½

4. Answer any *one* question from the following :

(a) State the differences between addition polymerization and step-reaction polymerization. Discuss various steps involved in the polymerization mechanism of styrene initiated by benzoyl peroxide at 60 °C. 2+3

(b) (i) What is copolymerization? Define reactivity ratio of monomers. Mention different types of copolymer formed in terms of reactivity ratio. 1+1+2

(ii) What is Ziegler-Natta catalyst?

5. Answer any *one* question from the following : 5

(a) (i) Write the important steps of surface reaction. 2

(ii) What are enzyme catalyses? Discuss the effect of temperature on enzyme catalysis. 1+2=3

(b) What is acid-base catalysis? Explain the theories of acid-base catalysis with suitable example. 1+4=5

6. Answer any *two* questions from the following : 4½×2=9

(a) (i) Find the number of phases and number of components for the following equilibria : 1×2=2

(1) $H_2O(s) \rightleftharpoons H_2O(l) \rightleftharpoons H_2O(g)$

(2) $NH_4Cl(g) \rightleftharpoons NH_3(g) + Cl_2(g)$; $p_{NH_3} = p_{Cl_2}$

(ii) What is triple point? Explain why more than one triple points are observed in the phase diagram of sulphur. 1+1½=2½

(b) What do you mean by congruent melting point? Draw and explain the phase diagram of a two-component system with the formation of a congruently melting compound. Comment on the stability of such compounds. 1+2½+1=4½

(Turn Over)

(c) Define cryohydric point. Discuss the phase diagram of KI-H_2O system.

$1+3\frac{1}{2}=4\frac{1}{2}$

7. Answer any *two* questions from the following :

$3\frac{1}{2}\times 2=7$

(a) Define partition function. Write the mathematical expression for translational partition function. Calculate the translational partition function for benzene in a volume of 1 m^3 at 25 °C.

$1+1+1\frac{1}{2}=3\frac{1}{2}$

(b) Derive the equation for the calculation of the molar entropy of an ideal monatomic gas. $3\frac{1}{2}$

(c) From partition function of an ideal monatomic gas, show that molar heat capacity at constant volume, $C_V=\frac{3}{2}R$. $3\frac{1}{2}$

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