

Registration No. :

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Total number of printed pages – 3

B. Tech
BS 1103

First Semester Examination – 2013

CHEMISTRY – I

QUESTION CODE : C- 612

Full Marks – 70

Time : 3 Hours

Answer Question No. 1 which is compulsory and any **five** from the rest.
The figures in the right-hand margin indicate marks.

1. Answer the following questions : 2×10
- (a) Two bodies A and B move with same speed. If the mass of A is twice that of mass of B, what is the relationship between the wavelengths associated with them ?
- (b) Indicate the number of phases and components in the following :
- (i) Brass
 - (ii) Oil and water mixture
 - (iii) KCl-NaBr-H₂O system
 - (iv) Mixture of Benzene and chloroform
- (c) What is the coordination number of both the ions in CsCl structure ?
- (d) The half-life period of a chemical reaction doesn't change when the concentration of the reactant becomes double. What is the order of the reaction ?
- (e) For the reaction $A + B \rightarrow C + D$ rate = $k[A][B]$.
What is the order of the reaction when B is present in excess ?



P.T.O.

- (f) Calculate the change in molar entropy when a sample of oxygen gas expands isothermally to twice its initial volume.
- (g) Which is the reference state of carbon at 298 K ?
- (h) Calculate the standard potential of the cell $\text{Pt(s)} \mid \text{H}_2(\text{g}) \mid \text{H}^+(\text{aq}) \parallel \text{Ag}^+(\text{aq}) \mid \text{Ag(s)}$.
- Given: $E^0_{\text{Ag}^+/\text{Ag}} = +0.8\text{V}$
- (i) Which crystal system has/have primitive and body centered crystal lattice only ?
- (j) Can a promoter alone act as a catalyst ? Justify your answer.
2. (a) By the help of molecular orbital theory, explain why He_2 does not exist. 5
- (b) Describe the electron sea model of metallic structure. Explain the common properties of metals with the help of this model. 5
3. (a) Predict the spontaneity of the reaction $\text{Ce}^{3+} + \text{Fe}^{3+} \rightarrow \text{Ce}^{4+} + \text{Fe}^{2+}$
- Given : $E^0_{\text{Fe}^{3+}/\text{Fe}^{2+}} = +0.76\text{V}$ and $E^0_{\text{Ce}^{4+}/\text{Ce}^{3+}} = +1.60\text{V}$ 4
- (b) How pH of an unknown solution can be determined by using quinhydrone electrode ? 6
4. (a) Draw and discuss the phase diagram for the sulphur system. 6
- (b) What is reduced phase rule ? When is it applied ? 4
5. (a) A compound containing three elements X, Y and Z, where X has CCP arrangement, Y and Z are present in all the octahedral and tetrahedral voids respectively. What is the formula of the compound ? 3
- (b) How many Na^+ and Cl^- ions are there in its unit cell ? 2
- (c) Discuss briefly the various defects observed in crystals. 5
6. (a) Derive the kinetic expression of a second order reaction when two different reactants are given. 5

- (b) Discuss the collision theory of reaction rates. 5
7. (a) Show that $C_p - C_v = \left(\frac{\partial V}{\partial T}\right)_P \left[\left(\frac{\partial E}{\partial V}\right)_T + P \right]$ 4
- (b) State and explain Hess's law. 3
- (c) Show that: $\left(\frac{\partial S}{\partial P}\right)_T = -\left(\frac{\partial V}{\partial T}\right)_P$ 3
8. (a) Write the cell reaction of lead-acid storage cell during discharging. 2
- (b) Show that for a first order reaction, the time requires for 99.9% completion of the reaction is ten times that requires for half the reaction. 4
- (c) Distinguish between eutectic reaction and peritectic reaction. 4

