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**B.Tech Degree I & II Semester (Combined) Examination**  
**June 2014**

**IT/CS/CE/ME/SE/EE/EB/EC/El/FT 1103 ENGINEERING CHEMISTRY**  
( 2012 Scheme)

Time: 3 Hours

Maximum Marks: 100

**PART – A**  
(Answer ALL questions)

(8 x 5 = 40)

- I (a) Diamonds and graphite both are allotropes of carbon. Still their properties are different. Interpret this statement considering 5 relevant points.
- (b) Reason the following statements
- (i) X-Ray Photo Emission Spectroscopy (XPS) is often known as Core electron spectroscopy.
- (ii) XPS is also known as ESCA.
- (c) Discuss the principle behind the functioning of a P-V Cell with labeled figure.
- (d) Illustrate the sacrificial anodic protection method with a neat labeled diagram
- (e) State Trouton's rule. Give any two deviations from Trouton's rule with reason for deviation.
- (f) Many of the biological reactions including protein synthesis are non-spontaneous in nature. Still they occur. Apply thermodynamics to reason this.
- (g) Define refractories and classify them into 3 with at least one example each.
- (h) Discuss the chemistry of vulcanization of rubber stating how it improves the quality of rubber.

**PART – B**

(4 x 15 = 60)

- II. (a) Discuss Band theory, specifying various steps involved in band formation when metal atoms combine considering any one example. (3)
- (b) Apply Band theory to compare the conductivity of conductors, insulators and semiconductors. (3)
- (c) Differentiate between intrinsic and extrinsic semi conductors on the basis of band theory relevant figures. (6)
- (d) Illustrate the shifting of fermi level in them with fig. (3)
- OR**
- III. (a) Discuss in detail the principle behind NMR spectroscopy. (6)
- (b) Interpret NMR fine spectrum of any one compound, with a neat drawing. (6)
- (c) List any 3 reasons why TMS is preferred as a standard reference in NMR spectroscopy. (3)
- IV. (a) Derive the Nernst for a concentration cell. (5)
- (b) Apply the above (10)
- (i) To calculate the emf of the following concentration cell at 25°C  
 $Cu_{(s)}/Cu^{2+} (0.08M) // Cu^{2+} (1.6M) / Cu_{(s)}$
- (ii) To find the solubility of the sparingly soluble salt AgCl
- OR**
- V. (a) Compare the buffer actions of acidic and basic buffers with one example each. (6)
- (b) Derive an expression for finding the pH of (6)
- (i) Acidic buffer
- (ii) Basic buffer
- (c) Apply the same to calculate the pH of one liter solution containing 0.1 mole of acetic acid and 0.2 moles of sodium acetate.  $K_a$  of acetic acid is  $1.0 \times 10^{-5}$ . (3)

(P.T.O)

- VI. (a) Establish a relation showing the dependence of free energy change on pressure at constant temperature and apply the same to prove that  $\Delta G^0 = -RT \ln K$ , for the equilibrium  $A + B \rightleftharpoons C + D$ , where K- equilibrium constant. (7)
- (b) Derive (8)
- (i) Kirchoff's law at constant pressure
  - (ii) Gibbs – Helmholtz equation
- OR**
- VII. (a) State phase rule. (2)
- (b) Draw a neat labeled phase diagram of one-component WATER system and interpret the same in detail using phase rule. (9)
- (c) Interpret the term eutectic mixture considering any one example. (4)
- VIII. (a) Compare the characteristics of thermoplastics and thermosetting plastics considering any 5 points. (5)
- (b) Discuss the mechanism of free radical addition polymerization, considering any one example. (5)
- (c) You want to prepare PVC pipes. Discuss the polymer processing technique that you would adapt. (5)
- OR**
- IX. (a) List any 5 characteristics of lubricants. (5)
- (b) Illustrate any two mechanisms of lubrication with labeled fig. (10)

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