2nd sem

KIIT UNIVERSITY, BHUBANESWAR
SPRING MID SEMESTER EXAMINATION-2017 (Repeat)

Semester II (*Regular*) Chemistry/CH 1003

Full Marks: 25 Time: 2hrs.

Answer any FIVE questions including Question No. 1 which is compulsory
The figures in the margin indicate full marks.

1   1X5
- a Water freezes into ice. Is there any entropy change?-explain.
- b NO^+ is a mono positive molecular cation. Still it acts as a ligand-explain.
- c $\Delta G°$ for the reaction $N_2 + 3H_2 \Leftrightarrow 2NH_3$ is -33 kJ/mol ant 298 K. Find the K_p for the reaction.
- d Show that $(\frac{\delta G}{\delta T})_p = -S$
- e Why d^0 and d^{10} system always prefer tetrahedral geometry.

2   2.5X2
- a From MOT, prove that oxygen is paramagnetic.
- b What is spin selection and Laporte selection rule? Explain the origin of color in $[MnBr_4]^{2-}$.

3   2.5X2
- a $[NiCN_4]^{2-}$ is square planner and not tetrahedral-explain
- b Entropy of an irreversible reaction always tends to increase-explain.

4   2.5X2
- a Free energy of an open system depends thermodynamic parameters pressure and temperature. Prove that, at constant temperature and pressure,
$$n_1 d\mu_1 + n_2 d\mu_2 + n_3 d\mu_3 + ...\Sigma n_i d\mu_i = 0$$
The terms and symbols are as usual.
- b Calculate the entropy at NTP in mixing of 2.8 liters of O_2 (g) with 19.6 liters of H_2 (g), considering ideal behavior.

5   2.5X2
- a The equilibrium constants for a chemical reaction of $2SO_2 + O_2 \Leftrightarrow 2SO_3$ at 528°C is 98 and at 680°C is 10.5. Calculate the heat change of the reaction.
- b Prove that $[\frac{d}{dT}(G/T)]_p = -\frac{H}{T^2}$, Terms and Symbols having their usual meaning.

6   2.5X2
- a State the Le-Chatelier's principal. Apply the rule on the synthesis of Ammonia in the Haber's process to establish favourable conditions for better yield of ammonia.
$$N_2 + 3H_2 \Leftrightarrow 2NH_3 + Heat$$
- b The vapor pressure of water at 100°C is 760 mm. What will be vapor pressure at 91°C. The latent heat of vaporization in this temperature range is 41.27 kJ mol^{-1}.