Second Semester Back Examination – 2015

CHEMISTRY - I

BRANCH (S) : AEIE, AERO, AUTO, CHEM, CIVIL, CSE, EC, EEE, EIE, ELECTRICAL, ETC, IEE, IT, MANUFACT, MANUTECH, MECH, MINERAL, MINING, MME, TEXTILE

QUESTION CODE : M 231

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) Why electron can not exist inside the Nucleus according to Heisenberg's Uncerinity principle ?

   (b) What is the order of reaction if half-life period and units of K depend inversely on concentration ?

   (c) What is the value of ∂G for liquid water vaporizing at 337K and 1atm pressure ?

   (d) What do you mean by component ? What is the maximum no of phases that can be in equilibrium at one point for one component system (T & P Constant) ?

   (e) Define the Heat of combustion and Heat of Hydration.

   (f) What is difference between EMF and Cell potential ?

   (g) For one mole of an ideal Gas $T = f (P,V)$ show that ∂T is Perfects Differential.

   (h) A graph between $t_{0.5}$ and reciprocal of initial concentration of the reactant is straight line passing through the origin. What is the order of the reaction ?

(i) Explain that NH_4Cl in equilibrium with its dissociation product is a one component system.

(j) Which of the following is/are paramagnetic

$$O_2, O_2^+, O_2^-, O_2^{--}, O_2^{++}, H_2, H_2^+, H_2^-$$
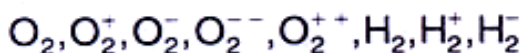
2. (a) What is the mathematical form of Gibb.s phase rule equation ? Explain the meaning of each one of them involved in it with example. 5

   (b) The first order reaction hass K=1.5 ×10-6 per second at 200 oc. If the reaction is allowed to run 10hrs, what percentage of the intial concentration would have changed in product ? What is the half life of reaction ? 5

3. (a) On basis of simple collision theory, obtain an expression for rate constant of a unimolecular reaction. 5

   (b) Consider the reaction, $H_2(g) + Cl_2(g) \rightarrow 2\,HCl(g)$
   How does the value of ΔG change when the pressures of the gases are altered as follows at 25 °C ? $H_2 = 0.45$ atm ; $Cl_2 = 0.45$ atm; $HCl = 0.50$ atm
   $\partial G°$ for $HCl = -95.27$Kj/mol. 5

4. (a) Write down the time independent –Schrödinger equation for a particle of mass m with a potential energy V. Discuss the Physical significance of ψ and ψ^2. 5

   (b) What do you mean by the vapor pressure ? Explain the vapour pressure curves in water and sulphur system with phase Diagram. 5

5. (a) Show that 5

   (i) $(\delta S / \delta P)_T = -(\delta V / \delta T)_P$

   (ii) $(\delta V / \delta S)_P = (\delta T / \delta P)_S$

   (b) How is fuel cell different from battery ? What are the advantages of fuel cells ? 5

BS 1103   2   Contd.

6.   (a)   On exposure of an electromagnetic radiation of frequency 7.5×10^{14} Hz on Cu surface. The velocity of emitted electrons is 5.75×10^5 m/s. Calculate Kinetic energy of the electron when an electromagnetic radiation of frequency 3.0×10^{14} Hz is exposed on this metal surface.   5

    (b)   Born–Haber cycle is a thermo chemical cycle that relates the lattice energy to the heat of formation. Explain.   5

7.   (a)   What do you mean by atomic packing factor ? Calculate atomic packing factor for simple cubic and face centered cubic lattice.   5

    (b)   Draw the molecular orbital configuration of O_2 O_2^- O_2^+. Compare between them in reference to magnetic behaviour and bond length.   5

8.   Write short notes on any **two** : 5×2

    (a)   Eigne value and Eigne function

    (b)   Metallic Bonding

    (c)   Bond energy

    (d)   Standard Hydrogen Electrode.

———————