

**B.TECH. (AEROSPACE ENGINEERING)  
(BTAE)****Term-End Examination****December, 2010****BAS-002 : APPLIED CHEMISTRY***Time : 3 hours**Maximum Marks : 70*

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*Note : Answer seven questions in all. Question number 1 is compulsory. Use of calculator is allowed.*

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Use the following data :

$$h = 6.626 \times 10^{-34} \text{ Js}$$

$$m_e = 9.1 \times 10^{-31} \text{ kg.}$$

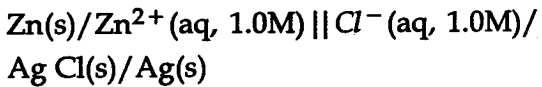
$$\epsilon_0 = 8.85 \times 10^{-12} \text{ C}^2 \text{ N}^{-1} \text{ m}^{-2}$$

$$e = 1.6 \times 10^{-19} \text{ C.}$$

1. Define *any five* of the following : 5x2=10
- (a) Photoelectric effect.
  - (b) Heisenberg's Uncertainty Principle
  - (c) Molecular Orbitals
  - (d) Standard hydrogen electrode
  - (e) Degree of dissociation
  - (f) Lattice energy
  - (g) Luminiscence

2. Answer *any two* of the following :
- (a) Calculate the energy required for the excitation of an electron from the ground state to the third excited state in hydrogen atom. 5
- (b) Calculate the de Broglie wavelength associated with an electron moving with a velocity of  $6.6 \times 10^7 \text{ ms}^{-1}$ . 5
- (c) Discuss the bonding in water molecule invoking appropriate hybridisation scheme for the oxygen atom. 5
3. (a) Calculate the equilibrium constant for the reaction : 5
- $$2\text{Fe}_2\text{O}_3(\text{s}) = 4\text{Fe}(\text{s}) + 3\text{O}_2(\text{g})$$
- using the following data at 1393 k.
- $$\text{Fe}_2\text{O}_3(\text{s}) + 3\text{CO}(\text{g}) \rightarrow 2\text{Fe}(\text{s}) + 3\text{CO}_2(\text{g})$$
- $$k = 0.0467$$
- $$2\text{CO}_2(\text{g}) \rightarrow 2\text{CO}(\text{g}) + \text{O}_2(\text{g}) \quad k = 1.4 \times 10^{-12}$$
- (b) What do you understand by the rusting of iron ? How would you demonstrate the formation of  $\text{Fe}^{++}$  and  $\text{OH}^-$  ions in the process of rusting ? 5

4. For the cell



- (a) Write the cell reaction. 3
- (b) Compute cell potential (Given  $E^{\circ}\text{Cl}^{-}/\text{AgCl(s)}/\text{Ag} = 0.222\text{ V}$   $E^{\circ}\text{Zn}^{2+}/\text{Zn} = 0.763\text{ V}$ ) 2
- (c) Predict whether the cell reaction is spontaneous or not. 2
- (d) Compute the equilibrium constant for the cell reaction. 3
5. Give reasons for *any five* of the following : 5x2=10
- (a) Oxygen is paramagnetic in nature.
- (b) Fluorine has lower electron affinity as compared to chlorine.
- (c)  $\text{H}_3\text{PO}_3$  has only two ionisable hydrogens.
- (d) Ag and Au are found in native state in nature.
- (e) Solution of alkali metals in liquid ammonia have high electrical conductivity.
- (f) Presence of calcium and magnesium in water make it hard.

6. (a) What are ligands ? How are these classified ? 2, 2, 1  
Give an example each of any two classes.
- (b) Dichromate ion is a good oxidising agent in acidic medium. 2, 3
- (i) What is the oxidation state of chromium in  $\text{Cr}_2\text{O}_7^{2-}$  ion ?
- (ii) Give the reaction for the oxidation of  $\text{Fe}^{++}$  ions by dichromate ion in acidic medium.
7. (a) What is petroleum refining ? What is the role of catalytic cracking in petroleum refining ? 2x5=10
- (b) Describe the activated sludge method for treating waste-water.
8. (a) Describe the process of obtaining nitrogen from air. 2x5=10
- (b) Explain the mechanism of addition polymerisation taking suitable example.
9. Write short notes on *any two* of the following : 2x5=10
- (a) Effects of industrial pollution
- (b) Lead storage batteries
- (c) Bohr's atomic model
- (d) Thermo setting plastics
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