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BAS-002

01444

B.TECH. (AEROSPACE ENGINEERING) (BTAE)

Term-End Examination

December, 2010

BAS-002 : APPLIED CHEMISTRY

Time : 3 hours *Maximum Marks : 70*

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

Use the following data :

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

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

$\varepsilon_0 = 8.85 \times 10^{-12}$ C^2 N^{-1} m^{-2}

$e = 1.6 \times 10^{-19}$ 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 6.6×10^7 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

$$2Fe_2O_3(s) = 4Fe(s) + 3O_2(g)$$

using the following data at 1393 k.

$$Fe_2O_3(s) + 3CO(g) \rightarrow 2Fe(s) + 3CO_2(g)$$
$$k = 0.0467$$

$$2CO_2(g) \rightarrow 2CO(g) + O_2(g) \quad k = 1.4 \times 10^{-12}$$

(b) What do you understand by the rusting of iron ? How would you demonstrate the formation of Fe^{++} and OH^- ions in the process of rusting ? 5

4. For the cell

$Zn(s)/Zn^{2+}(aq, 1.0M) \,||\, Cl^{-}(aq, 1.0M)/$
$Ag\,Cl(s)/Ag(s)$

(a) Write the cell reaction. 3

(b) Compute cell potential (Given $E^{o}Cl^{-}/Ag\,Cl(s)/Ag = 0.222$ V $E^{o}Zn^{2+}/Zn = 0.763$ 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) H_3PO_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 ? Give an example each of any two classes. **2, 2, 1**

(b) Dichromate ion is a good oxidising agent in acidic medium. **2, 3**

(i) What is the oxidation state of chromium in $Cr_2O_7^{2-}$ ion ?

(ii) Give the reaction for the oxidation of 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
