

**B.Tech. AEROSPACE ENGINEERING  
(BTAE)**

**Term-End Examination**

00125

**December, 2016**

**BAS-002 : APPLIED CHEMISTRY**

*Time : 3 hours*

*Maximum Marks : 70*

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**Note :** *Attempt any seven questions. All questions carry equal marks. Use of scientific calculator is permitted.*

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1. (a) Which ligand is termed as a chelating ligand ? Give an example. 4
  
- (b) Which one —  $[\text{Ni}(\text{en})_3]^{2+}$  or  $[\text{Ni}(\text{NH}_3)_6]^{2+}$  will be more stable ? ('en' stands for diethylenetriamine) 2
  
- (c) Which one —  $[\text{Ni}(\text{en})_3]^{2+}$  or  $[\text{Ni}(\text{NH}_3)_6]^{2+}$  is a monodentate ligand ? 2
  
- (d) A ligand is a Lewis \_\_\_\_\_ . 2

2. (a) How is pig iron obtained in a blast furnace?  
Give the chemical reactions occurring in a blast furnace when hematite, limestone and coke are charged in the blast furnace and air or oxygen is blown from the bottom. 4
- (b) Draw the diagram of a blast furnace. 4
- (c) Which ore is called Fool's gold? 2

3. From the following three standard half reactions,



- (a) Which of the two half reactions will you choose to get maximum cell voltage? 4
- (b) Which one is the best oxidising agent and which one is the best reducing agent in the given three standard half reactions? 3
- (c) Can  $\text{Sc}^{3+}$  oxidise Y? If yes, what will be the voltage change, when  $\text{Sc}^{3+}$  and Y are allowed to react? 3

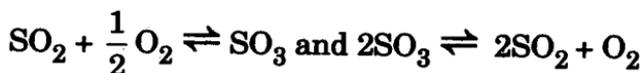
4. Answer the following in the context of contact process for the manufacture of sulphuric acid.
- (a) Write the reactions involved. 3
  - (b) Draw the flow chart to illustrate the manufacture of  $\text{H}_2\text{SO}_4$ . 3
  - (c) Write the temperature and pressure maintained during the process. 2
  - (d) Give the type of catalyst used. 2
5. Answer the following :
- (a) What is a Zwitter ion ? Give an example. 3
  - (b) Discuss the cleansing action of soap. 3
  - (c) What type of functional group is principally involved in a dye which causes the change in colour at a certain pH ? Explain. 4
6. Select the correct answer for the following questions :
- (a) Which of the following is a natural polymer ? 2
    - (i) Terylene
    - (ii) Orlon
    - (iii) Starch
    - (iv) Dacron

- (b) Starch is a polymer of 2
- (i) Glucose
  - (ii) Fructose
  - (iii) Sucrose
  - (iv) Ribose
- (c) PVC is a polymerised product of 2
- (i)  $\text{H}_2\text{C} = \text{CH}_2$
  - (ii)  $\text{CH}_2 = \text{CCl}_2$
  - (iii)  $\text{H}_2\text{CCl} - \text{CH}_2\text{Cl}$
  - (iv)  $\text{CH}_2 = \text{CHCl}$
- (d) Teflon, polystyrene and neoprene are all 2
- (i) Copolymers
  - (ii) Condensation polymers
  - (iii) Homopolymers
  - (iv) Monomers
- (e) Which of the following is/are addition polymers? 2
- (i) PVC
  - (ii) Nylon-6
  - (iii) Teflon
  - (iv) Terylene

7. (a) How does cross linkage take place in isoprene (2-methyl-1,3-butadiene) in the presence of oxygen or sulphur ? 5

(b) What is the difference between cis-isoprene and trans-isoprene ? Can cis-isoprene be transformed into trans-isoprene ? Explain. 5

8. (a) If the equilibrium constants of



are given by  $K_1$  and  $K_2$  respectively, which of the following relations is correct ? 3

(i)  $K_2 = [1/K_1]^2$

(ii)  $K_1 = [1/K_2]^3$

(iii)  $K_2 = 1/K_1$

(iv)  $K_2 = (K_1)^2$

(b) 1 gmole of ethyl alcohol and 1 gmole of acetic acid are mixed. At equilibrium, 0.666 gmole of ester is formed. The value of  $K_c$  is 3

(i)  $1/4$

(ii)  $1/2$

(iii) 2

(iv) 4

(c) 40% of a mixture of 0.2 mole of  $N_2$  and 0.6 mole of  $H_2$  react to give  $NH_3$  according to the equation  $N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$  at constant temperature and pressure. The ratio of the final volume to the initial volume of the gases is

4

(i) 4 : 5

(ii) 5 : 4

(iii) 7 : 10

(iv) 8 : 5

9. (a) What is petroleum (crude oil) ? Discuss the fractional distillation of crude oil and mention the important components that are obtained at various temperature ranges.

6

(b) What is octane number ?

2

(c) What is knocking ? How can it be prevented ?

2