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BAS-002

B.Tech. AEROSPACE ENGINEERING (BTAE)

Term-End Examination

00125

December, 2016

BAS-002 : APPLIED CHEMISTRY

Time : 3 hours *Maximum Marks : 70*

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

1. (a) Which ligand is termed as a chelating ligand ? Give an example. *4*

(b) Which one — $[Ni(en)_3]^{2+}$ or $[Ni(NH_3)_6]^{2+}$ will be more stable ? ('en' stands for diethylenetriamine) *2*

(c) Which one —$[Ni(en)_3]^{2+}$ or $[Ni(NH_3)_6]^{2+}$ 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,

$Sc^{3+} + 3e^- \rightarrow Sc$; $E^\circ = -2{\cdot}10$ V

$Y^{3+} + 3e^- \rightarrow Y$; $E^\circ = -2{\cdot}37$ V

$La^{3+} + 3e^- \rightarrow La$; $E^\circ = -2{\cdot}50$ V

(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 Sc^{3+} oxidise Y ? If yes, what will be the voltage change, when 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 H_2SO_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) $H_2C = CH_2$

(ii) $CH_2 = CCl_2$

(iii) $H_2CCl - CH_2Cl$

(iv) $CH_2 = CHCl$

(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

$SO_2 + \frac{1}{2} O_2 \rightleftharpoons SO_3$ and $2SO_3 \rightleftharpoons 2SO_2 + O_2$

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

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

(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