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BAS-002

B.Tech. AEROSPACE ENGINEERING (BTAE)

Term-End Examination

00284

June, 2017

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) Calculate the energy to shift an electron from the first Bohr's orbit to the fifth orbit in a hydrogen atom. Also, determine the wavelength of emitted radiations if the electron returns to the initial orbit. 5

(b) What is the shape of *p*-orbitals ? Draw labelled diagrams. How many nodes are there in *3p*-orbitals ? 5

2. (a) What is Ionisation Energy (IE) ? Discuss the factors on which IE depends. 5

(b) What is lanthanide contraction ? How can the similarities in the chemical properties of the lanthanides be explained ? 5

3. (a) (i) "Of all the inert gases, only xenon forms compounds with fluorine." Explain. $2\frac{1}{2}$

(ii) Explain why gold and silver are generally found in nature in the native state. $2\frac{1}{2}$

(b) Predict the geometry of the complexes formed by transition metal ions using the following hybrid orbitals with the help of valence bond theory : 5

(i) sp^3

(ii) d^2sp^3

4. (a) (i) For the formation of SO_3 according to the equation

$2SO_2 + O_2 \rightleftharpoons 2SO_3$; $\Delta H = -ve$,

outline the conditions favourable for the formation of SO_3. 3

(ii) Give the equation for the manufacture of urea. 2

(b) (i) Explain why transition metal compounds are coloured. 2

(ii) Write the electronic configuration of the following elements :

$_6C$ and $_{15}P$. 3

5. (a) Write the structure of 4

(i) 2, 2, 4-trimethylhexane

(ii) 2, 3-dimethylbutane

(b) (i) What is petroleum ?

(ii) Explain the term "petroleum refining". 6

6. (a) (i) What are the important features of Galvanic cell ? 3

(ii) Give the representation of $Zn\text{-}CuSO_4$ cell. 2

(b) Predict whether the following reaction would occur spontaneously at 298 K : 5

$$Co\ (s) + Fe^{2+}\ (aq) \longrightarrow Co^{2+}\ (aq) + Fe\ (s)$$

Given $[Co^{2+}] = 1\ M$, $[Fe^{2+}] = 1\ M$

$$E^\circ_{Co^{2+}/Co} = -0{\cdot}28\ V$$

$$E^\circ_{Fe^{2+}/Fe} = -0{\cdot}44\ V$$

7. (a) (i) List any two factors which promote corrosion. 2

(ii) What is meant by barrier protection for prevention of corrosion ? 3

(b) What are fuel cells ? Explain $N_2 - O_2$ fuel cell with reactions occurring at cathode and anode. How is it difficult to construct fuel cells ? 5

8. (a) Derive a relationship between K_p and K_c. *4*

(b) Write K_c expressions for the following reactions : *3*

(i) $Cu^{2+}(aq) + 2\,Ag(s) \rightleftharpoons Cu(s) + 2\,Ag^{+}(aq)$

(ii) $4\,HCl(g) + O_2(g) \rightleftharpoons 2Cl_2(g) + 2H_2O(g)$

(c) What is the relationship between concentration quotient (Q) and equilibrium constant (K) ? *3*

9. (a) The value of equilibrium constant for the reaction $H_2(g) + I_2(g) \rightleftharpoons 2HI(g)$ at 720 K is 48. What is the value of equilibrium constant for the following reactions ? *5*

(i) $2HI(g) \rightleftharpoons H_2(g) + I_2(g)$

(ii) $\frac{1}{2}H_2(g) + \frac{1}{2}I_2(g) \rightleftharpoons HI(g)$

(iii) $HI(g) \rightleftharpoons \frac{1}{2}H_2(g) + \frac{1}{2}I_2(g)$

(b) What is the degree of dissociation ? Derive an expression for the degree of dissociation of weak monobasic acid having concentration of C moles/litre. *5*
