No. of Printed Pages : 4

BAS-002

B.Tech. AEROSPACE ENGINEERING (BTAE)

Term-End Examination

00313

December, 2018

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. Write short notes on any ***five*** of the following : *5×2=10*

(a) Division of elements in s, p, d and f blocks

(b) Hybridization

(c) Electronegativity

(d) Van der Waals radius

(e) Size of atoms and ions

(f) Chelating ligands and chelates

2. Write short notes on the following :

(a) Molecular orbital and basic difference between molecular orbital and atomic orbital. *6*

(b) Concept of electron charge cloud. *4*

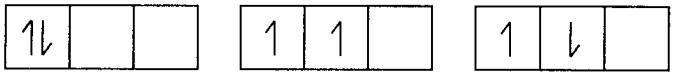
3. (a) Discuss the main rules for filling of the orbital in atoms. What is the limitation of Slater's rules ? *5*

(b) Account for the following trend in electron affinities of halogens : *5*

Cl (348·5 kJ mol^{-1}) Br (324·7 kJ mol^{-1}) and I (295·5 kJ mol^{-1})

4. (a) Describe briefly the periodicity of elements. Write the limitations of Bohr's theory of atomic structure. *6*

(b) Explain Hund's rule for arranging two electrons in the 3p orbitals. Which of the three arrangements is least stable ? *4*



(1) (2) (3)

5. (a) Define reversible reactions by giving two examples. Write the nature of chemical equilibrium and its characteristics. *5*

(b) At 500°C, the reaction between N_2 and H_2 to form ammonia has $K_c = 6{\cdot}0 \times 10^{-2}$. What is the numerical value of K_p for the reaction ? (Standard temperature used is 273 K (0°C) and R = 0·082). *5*

6. (a) What is the most important combined state of chromium ? Give stable and important oxidation states of chromium. Write industrial applications of chromium. *5*

(b) Write four names of combined states of iron in which it occurs. Also write their chemical formula. *5*

7. (a) Name any ***five*** of the following complexes : *5×1=5*

(i) $[Co(CO_3)(NH_3)_4]Cl$

(ii) $[Co(NH_3)_6]Cl_3$

(iii) $[PtCl_4(NH_3)_2]$

(iv) $K_4[Fe(CN)_6]$

(v) $Na_2[SiF_6]$

(vi) $K_4[Mo(CN)_8]$

(b) Explain the relative ionization of Fe(III) and Fe(II) compounds. Explain why solutions of Fe(III) fluoride do not give test for Fe(III) or F^- ion when dissolved in water. *5*

8. Give reasons for any ***five*** of the following : *5×2=10*

(a) Greater the electronegativity of central ion, greater the stability of its complexes.

(b) F^- ion gives more stable complexes than Cl^- ion.

(c) Complexes containing chelate rings are more stable.

(d) Iron(II) ions are not stable in air but Fe(III) compounds are stable.

(e) The larger the atomic size, the smaller is the ionization energy.

(f) Radius of cations is invariably smaller than that of corresponding atom, but nuclear charge per electron increases.

9. (a) For the manufacture of H_2SO_4 by Contact process, what important information is revealed by the reaction between SO_2 and O_2 ? How can maximum yield be worked out on the basis of Le Chatelier's principle ? *5*

(b) What is the equilibrium constant expression of the following reaction ? *5*

$$CH_4\,(g) + H_2O\,(g) \rightleftharpoons CO\,(g) + 3H_2\,(g)$$