No. of Printed Pages : 5

**BAS-002**

# B.TECH. (AEROSPACE ENGINEERING) (BTAE)

01989

## Term-End Examination

## December, 2012

## 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**.*

**1.** Define ***any five*** of the following : **5x2=10**

(a) Second law of thermodynamics

(b) Le Chatelier principle

(c) Frenkal defect

(d) Specific conductance and its unit in SI.

(e) Raoult's law

(f) Condensation polymerisation with an example

(g) Electronic configuration of outermost shell for p-Block and d-block elements.

**2.** Answer ***any two*** of the following :

(a) Compare the basic strength of the following and arrange them in increasing strength : **5**

$NH_3$ $CH_2NH_2$, $(CH_3)_2NH$, $(CF_3)_3N$

(b) Draw and explain the nature of conductomeric titration curve that you will get when $AgNO_3$ is added to KCl solution. 5

(c) What do you understand by heterolytic and homolytic fission ? Explain with examples. 5

3. (a) A compound, has a molecule, superimposable on its mirror image inspite of containing chiral carbon atom. What type of compounds show such phenomena ? Explain with an example. 5

(b) What are inner transition elements ? Write down electronic configuration of the element with atomic number 61. 5

4. (a) Why $CuSO_4 . 5H_2O$ is blue whereas $ZnSO_4.H_2O$ is colourless ? Explain 2

(b) What transition in the H-spectrum would have the same wavelength as the Balmer transition, $n=4$ to $n=2$ of $He^+$ spectrum. 4

(c) Which one of the following will act as a strong base ? Arrange the following in their increasing order of basicity. 4

$(CH_3)_3COH$, $CH_3OH$, $CH_3CH_2OH$, $(CH_3)_2CHOH$

5. (a) In + ve electromeric effect, if an electrophile is added to the following compound then in which direction $\pi$ electron transfer will take place - 4

$C_3$ to $C_2$ or $C_2$ to $C_3$ ?

$CH_3 - CH = CH - CH_2 - CH_3$

(b) In the dehydration of the Compound, 3

$CH_3 - \underset{\underset{OH}{|}}{CH} - CH_2 - CH_3$, we get two products namely

(i) $CH_3 - CH = CH - CH_3$ and

(ii) $CH_2 = CH - CH_2 - CH_3$

Which one will be the major product according to Saytzeff rule ?

(c) How many resonating structures will you get for the carbonium ion, $(CH_3)_3C^+$ due to hyperconjugation ? 3

6. (a) What do you understand by 3

(i) Green vitriol

(ii) White vitriol

(iii) Rochell salt

(b) Explain the effect of 2

(i) pressure and

(ii) continuous removal of HI at constant temperature on the position of equilibrium for the following reaction

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

(c) What will be the effect on the equilibrium constant for the above reaction, 6(b) by use of a catalyst ? 2

(d) Match the column **X** with the column **Y** 3

| | X | | Y |
|---|---|---|---|
| (i) | $NO_2$ | (A) | Yellow |
| (ii) | $CHCl_3$ | (B) | Colourless |
| (iii) | $Pb_3O_4$ | (C) | Red |
| (iv) | $CuSO_4.5H_2O$ | (D) | Brown |
| (v) | $PbI_2$ | (E) | Blue |
| (vi) | $I_2$ | (F) | Violet |

7. (a) HX is a weak acid ($K_a = 1.0 \times 10^{-5}$). It forms a salt $Na \times (0.1M)$ on reacting with caustic soda. Find the degree of hydrolysis. 4

(b) State Hund's rule. Explain it with reference to electronic configuration of nitrogen atom. 2

(c) An element, M has atomic number 29. Give the electronic configuration of $M^+$ and $m^{2+}$ ions. 2

(d) What are the chief constituents of Portland cement ? 2

8. (a) The standard enthalpies of formation at 300 k for $CCl_4(l)$, $H_2O(g)$, $CO_2(g)$ and $HCl(g)$ are -107, -242, -394 and $-93$ kJ $mol^{-1}$ respectively. Calculate the value of $\Delta E°$ at 300k for the reaction 5

$CCl_4(l) + 2H_2O(g) \rightarrow CO_2(g) + 4HCl(g)$.

(b) Calculate the molar and equivalent conductivities at infinite dilution of potash alum $[K_2SO_4.Al_2(SO_4)_3.24H_2O]$ Neglect the conductance offered by $H_2O$. 5

Given : $\wedge_m^\infty$ for $K^+ = 73.5\ \Omega^{-1}cm^2\ mol^{-1}$

$\wedge_m^\infty$ for $Al^{3+} = 189.0\ \Omega^{-1}cm^2\ mol^{-1}$

$\wedge_m^\infty$ for $SO_4^{2-} = 160.0\ \Omega^{-1}cm^2\ mol^{-1}$

9. (a) Identify the compounds A, B, C and D in the following transformations : 5

$$A \xrightarrow[NH_3(l)]{Na} B \xrightarrow{CH_3l} C \xrightarrow[Ni]{H_2(1\,mol)} D \xrightarrow[Zn/H_2]{O_2} \downarrow$$

$$CH_3CHO + HCHO$$

(b) Give IUPAC names for the following : **2, 1, 2**

(i) $CH_3-\overset{\overset{O}{\|}}{C}-CH_2-\overset{\overset{O}{\|}}{C}-OH$

(ii) $\begin{matrix} CH_2-OH \\ | \\ CH_2-OH \end{matrix}$

(iii) $(CH_3)_2\ N-CH_2.CH_3$

---