No. of Printed Pages : 5

BAS-002

B.TECH. (AEROSPACE ENGINEERING) (BTAE)

Term-End Examination

June, 2012

00239

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) Hess's Law
   - (b) Hund's rule
   - (c) Schottky defect
   - (d) Kohlraush law
   - (e) Free radical with an example
   - (f) Vulcanisation of isoprene
   - (g) Fuel cell

2. Answer *any two* of the following :
   - (a) An alkane has molecular weight of 72 and monochlorination produces one compound only. What is the structure ? **5**
   - (b) Draw and explain the nature of conductomeric titration curve that you will get when NaOH is added to acetic acid. **5**

(c) What is the difference between thermosetting and thermoplastic polymers ? Give one example for each. 5

3. (a) The reaction 5

$$NH_2CN\ (s) + \frac{3}{2}O_2(g) \rightarrow N_2(g) + CO_2(g)\ + H_2O\ (l)$$

was carried out in a bomb calorimeter. The heat released was 743 $kJmol^{-1}$. Calculate the value of ΔH for the reaction at 300 K.

$(R = 8.314 \times 10^{-3}\ kJ\ K^{-1}\ mol^{-1})$

(b) $\overset{+}{Cu}$ is not stable and undergoes disproportionation reaction. Calculate $\overset{\circ}{E}$ for the disproportionation of Cu^+. 5

$$\left(E^{\circ}_{Cu^{2+}/Cu^{+}} = 0.163\ V\ ; E^{\circ}_{Cu^{+}/Cu} = 0.53\ V\right)$$

4. (a) The addition of 3g of a substance to 100 g CCl_4 raiser the boiling point of CCl_4 by 0.6°C. If K_b for CCl_4 is 5.03 K kg mol^{-1}. 5

(i) Calculate the freezing point depression

(ii) Calculate the relative lowering of vapour pressure

(At. wt. : $Cl = 35.5$; $C = 12$)

(b) Chromium metal crystallises with a BCC lattice. The length of the unit cell edge is found to be 287 pm. Calculate : 5

(i) the atomic radius and

(ii) density of chromium in g/cm^3.

(At.wt. : $Cr = 51.99$ Av. No. $= 6.023 \times 10^{23}$ mol^{-1})

5. (a) How will you account for the ortho and para influence of CH_3 group in toluene ? 5

(b) Arrange the following carbonium ions in their decreasing order of stability. 3

(i) $CH_3 - C^+H_2$ (ii) $(CH_3)_2C^+H$

(iii) $(CH_3)_3C^+$ (iv) C^+H_3

(c) Teflon is an example of : 2

(i) fiber

(ii) elastomers

(iii) thermoplastic polymer

(iv) thermosetting polymer

6. (a) Draw PV Vs. P curve for a fixed mass of an ideal gas at two different temperatures, T_1 and T_2 $(T_2 > T_1)$. 4

(b) 3.26 g of zinc on being treated with acid produces 1.12 lit. of hydrogen gas at N.T.P. Find out the relative equivalent weight of zinc. 4

(c) Why ammonia is not dried by calcium chloride but is dried by quick lime ? 2

7. (a) Calculate the equivalent and molar conductance of aqueous $BaSO_4$ solution at infinite dilution. 5

Given : $\wedge^{\infty}_{equ.}$ for $\frac{1}{2}$ $Ba(NO_3)_2 = 135.04 \times 10^{-4} \Omega^{-1} m^2 eq.^{-1}$

$\wedge^{\infty}_{equ.}$ for $\frac{1}{2}$ $H_2SO_4 = 429.6 \times 10^{-4} \Omega^{-1} m^2 eq.^{-1}$

and $\wedge^{\infty}_{equ.}$ for $HNO_3 = 421.24 \times 10^{-4} \Omega^{-1} m^2 eq.^{-1}$

(b) The bond enthalpies of H – H, Cl – Cl and H – Cl are 435, 243 and 431 kJ mol^{-1} respectively. Calculate the enthalpy of formation of HCl (g). 5

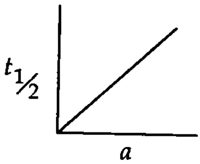
8. (a) Subtance A reacts according to first order rate law with $k = 5.0 \times 10^{-5} s^{-1}$. 4

(i) If initial concentration of A is 1.0 M, What is the initial rate and

(ii) rate after 1.0 hour ?

(b) Which curve represents a first order reaction ? 3

(i)



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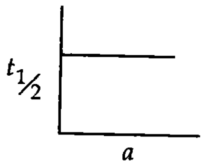

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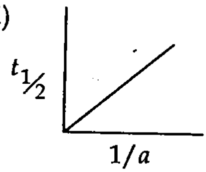

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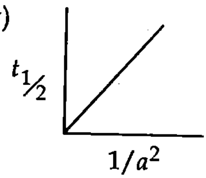

(c) What are the differences between molecularity and order of a reaction ? Mention atleast three differences. 3

9. (a) What is Nernst equation ? How it helps in determining the equilibrium constant for a reaction : $aA + bB \rightleftharpoons cC + dD$. 4

(b) Calculate $\Delta \overset{\circ}{E}$ and K for the reaction : 4

$2\,Fe^{3+} + 3I^- = 2\,Fe^{2+} + I_3^-$

Given : (i) $Fe^{3+} + e^- = Fe^{2+}$; $E^\circ = 0.77/V$

(ii) $I_3^- + 2\,e^- = 3I^-$; $E^\circ = 0.536$ V

(c) For endothermic reaction where ΔH represents the enthalpy of the reaction in kJ mol^{-1}, the minimum, value for the energy of activation will be : 2

(i) less than ΔH (ii) zero

(iii) greater than ΔH (iv) equal to ΔH