



**RZ-003-1016008**      Seat No. \_\_\_\_\_

**Third Year B. Sc. (Sem. VI) (CBCS) Examination**

**March - 2019**

**Chemistry : C - 603**

*(Physical Chemistry & Analytical Chemistry)*

*(New Course)*

Time :  $2\frac{1}{2}$  Hours]

[Total Marks : 70

- Instructions :** (1) All questions are compulsory.  
(2) Figures on right hand side indicates marks.

- 1 (A) Answer following objective questions : 4
- (1) Define : Activity coefficient.
  - (2) Define : Perfect Crystal.
  - (3) Write mathematical form of Debye Huckel limiting law.
  - (4) Write any one statement of 3<sup>rd</sup> law of thermodynamics.
- (B) Answer in brief : (any **one**) 2
- (1) Prove  $f_{\pm} = \sqrt{Ka_{2/c}}$  for monovalent compound.
  - (2) Calculate change in entropy for the equation given below :  
$$Na_{(s)} + \frac{1}{2} Cl_{2(g)} \rightarrow NaCl_{(s)} \quad E^{\circ} Na = 12.2 \text{ Cal/mol}$$
$$E^{\circ} Cl_2 = 53.28 \text{ Cal/mol} \quad E^{\circ} NaCl = 17.3 \text{ Cal/mol}$$
- (C) Answer in detail : (any **one**) 3
- (1) Write note on Residual entropy.
  - (2) Calculate ionic strength of 0.1 M KI and 0.02 M KBr solution (Ionization has been completed)
- (D) Write a note on Any **One** : 5
- (1) Write a method to determine absolute entropy of solid, liquid and gas using 3<sup>rd</sup> law of thermodynamics.
  - (2) Write solubility method to determine activity coefficient.

- 2 (A) Answer following objective questions : 4
- (1) Define : Electrode.
  - (2) Give name of salt used in salt bridge.
  - (3) Quinhydrone powder is a mixture of \_\_\_\_\_.
  - (4) Write cell construction to determine ionic product of water.
- (B) Answer in brief : (Any **one**) 2
- (1) Calculate  $E_{cell}$  for the following cell at  $25^{\circ}C$  :
 
$$Cu \left| Cu^{+2} \right|_{0.1 M} \parallel \left| Cu^{+2} \right|_{0.5 M} \left| Cu \right. \quad (R = 8.314 \text{ Jule})$$
  - (2)  $Pt - H_{2(g)} \left| H^{+}_{aq} \right| \parallel \left| Hg_2Cl_2 \right|_{1N KCl} \left| Hg \right.$ , cell potential is  $0.5164V$  at  $25^{\circ}C$ . Calculate pH of the solution  
 $[E_{Cal} = 0.280 \text{ V}]$
- (C) Answer in detail (Any **one**) : 3
- (1) Write note on glass electrode.
  - (2) Derive an equation to determine emf of amalgam concentration cell.
- (D) Write a note on Any one : 5
- (1) Derive an equation to determine emf of concentration cell considering LJP end with transference.
  - (2) Explain determination of dissociation constant of weak acid by emf measurement.
- 3 (A) Answer following objective questions : 4
- (1) Define Partial molal property.
  - (2) Give statement of Raoult's law.
  - (3) How many significant numbers are present in 0.4050 ?
  - (4) Define : Precision.

- (B) Answer in brief : (Any **one**) 2
- (1) Define Mean deviation and Mistake.
  - (2) Describe Nernst's law with its equation.
- (C) Answer in detail : (Any **one**) 3
- (1) Prove  $\overline{\frac{d\mu_i}{dT}} = -\overline{S_i}$  .
  - (2) Write note on student – T test.
- (D) Write a note on : (Any **one**) 5
- (1) What is called error? Write steps to minimize error.
  - (2) Derive Gibbs Deuham equation with reference to chemical potential.
- 4 (A) Answer following objective questions 4
- (1) Who have separated the extraction of green leaves by chromatography ?
  - (2) Define stationary phase.
  - (3) What is called developer ?
  - (4) What is  $R_x$  Value ?
- (B) Answer in brief : (Any **one**) 2
- (1) Write factors affecting  $R_f$  value.
  - (2) Write uses of GLC.
- (C) Answer in detail : (Any **one**) 3
- (1) Write method of preparation of TLC plate.
  - (2) What is called ion exchange chromatography ?  
Write note on Anion exchange resins.
- (D) Write a note on : (Any **one**) 5
- (1) Write note on paper chromatography.
  - (2) Write note on column chromatography.

- 5 (A) Answer following objective questions : 4
- (1) What happens when sodium nitroprusside is added to the aqueous solution containing a mixture of  $CO_3^{-2}$ ,  $SO_3^{-2}$  and  $S^{-2}$  ions.
  - (2) Write the method of preparation of milk of magnesia.
  - (3) Define : pH.
  - (4) What is called potentiometric titration.
- (B) Answer in brief : (Any one) 2
- (1) Explain the separation of  $Cu^{+2}$  and  $Cd^{+2}$  ions using KCN.
  - (2) Draw only the potentiometric titration curve of Oxalic acid  $\rightarrow$  NaOH
- (C) Answer in detail : (Any one) 3
- (1) Discuss acid – base titration by pH metry.
  - (2) Explain the separation of  $NO_3^-$ ,  $NO_2^-$  and  $Br^-$  ions.
- (D) Write a note on : (Any one) 5
- (1) What is called redox titration? Discuss redox titration of  $FeSO_4 \rightarrow K_2Cr_2O_7$  by potentiometry.
  - (2) Discuss various methods of separation of  $Cl^-$ ,  $Br^-$  and  $I^-$  ions.
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