**JC-003-1016008**     Seat No. _____

# B. Sc. (Sem. VI) (CBCS) Examination

### August – 2019

## Chemistry : C-603

### *(Physical & Analytical Chemistry)*

### *(New Course)*

**Faculty Code : 003**

**Subject Code : 1016008**

Time : $2\frac{1}{2}$ Hours]                    [Total Marks : **70**

**Instructions :**

(1) There are five questions.

(2) In each question subquestion (a) of 4 marks, all are compulsory.

(3) While subquestion (b), (c), (d) each with Internal options.

(4) Figures to the right indicate full marks.

**1** (a) Answer the following questions :                         **4**

    (1) Give equation for ionic strength.

    (2) The activity has been indicated for ideal gas by _____.

    (3) What will be the value of entropy for a pure crystalline solid at –273°C ?

    (4) In equation $a = fc$, $f$ is the _____.

  (b) Answer any one in brief of following :                         **2**

    (1) Define : Activity co-efficient.

    (2) Explain Nernst heat theorem.

(c) Answer any one in detail of following : **3**

    (1) Derive the mathematical form of third law of thermodynamics.

    (2) Calculate $V_{\pm}$ for the aqueous solution of 0.001 M $Na_2SO_4$ solution (A = 0.509).

(d) Answer any one of following : **5**

    (1) Discuss the solubility method for the determination of activity coefficient.

    (2) Discuss the determination of absolute entropies of solid, liquid and gas with related equation.

**2** (a) Answer the following questions : **4**

    (1) If Junction solution of cell contain $Ag^+$ ions, which solution is used in salt-bridge ?

    (2) In gaseous concentration cell, there is the difference in _____ of same electrode.

    (3) Give the full name of LJP.

    (4) Standard cell potential measure at _____ °C temperature.

(b) Answer any one in brief of following : **2**

    (1) $Zn \mid ZnSO_4 \underset{(0.1\ M)}{(aq)}$ ; $E^o_{Zn \mid Zn^{+2}} = 0.760$ V (oxi – pot)

    For the ionization of $ZnSO_4$ is 90% calculate potential of metal at 25°C.

    (2) Calculate emf of given cell at 25°C temperature

$$Pt \left| \begin{array}{c} H_{2(g)} \\ 640\ mm \end{array} \right| HCl \left| \begin{array}{c} H_{2(g)} \\ 425\ mm \end{array} \right| Pt$$

(c) Answer any one in detail of following : **3**

    (1) Derive the equation of emf for amalgam electrode concentration cell.

    (2) Write short note on Liquid Junction Potential.

(d) Answer any one of following : 5

(1) Derive an equation of emf for a concentration cell with transference with LJP.

(2) Describe the emf method to determine the solubility of sparingly soluble salt by using concentration cell.

3 (a) Answer the following questions : 4

(1) Partial molar property applicable to _____ system.

(2) Mechanical loss of material in various steps of analysis is _____ type error.

(3) 0.456 has _____ significant number.

(4) Chemical potential depends on which factors ?

(b) Answer any one in brief of following : 2

(1) Explain accuracy with suitable example.

(2) Derive Henry's Law of solubility using chemical potential.

(c) Answer any one in detail of following : 3

(1) Derive the Gibb's-Duham equation for chemical potential.

(2) Explain Q-test with example.

(d) Answer any one of following : 5

(1) Explain intercept method for the determination of partial molar properties.

(2) Explain methods for minimization of errors.

4 (a) Answer the following questions : 4

(1) In adsorption chromatography, stationary phase is _____.

(2) Give formula to calculate $R_f$ value.

(3) Which chromatography is used for softing of hard water ?

(4) Define : Mobile phase.

(b) Answer any one in brief of following :                              2

    (1) TLC is superior than paper chromatography, why ?

    (2) Give classification of chromatography.

(c) Answer any one in detail of following :                             3

    (1) Give uses of GLC.

    (2) Explain circular paper chromatography.

(d) Answer any one of following :                                       5

    (1) Explain adsorption column chromatography in detail.

    (2) Explain ion exchange chromatography.

5 (a) Answer the following questions :                                  4

    (1) Why saturated calomel electrode is more useful ?

    (2) Glass used in glass electrode should have _____.

    (3) Which substance is used to remove $I^-$ from the mixture of $Cl^-$, $Br^-$ and $I^-$ ?

    (4) Which electrode is used as indicator electrode in pH Metry titration ?

(b) Answer any one in brief of following :                              2

    (1) Explain principle of potentiometry method.

    (2) Explain role of KCN in the separation of $Cu^{+2}$ and $Cd^{+2}$.

(c) Answer any one in detail of following :                            3

    (1) Explain $FeSO_4 \rightarrow KMnO_4$ Redox titration by Potentiometry.

    (2) Explain separation of $CO_3^{-2}$, $SO_3^{-2}$ and $S^{-2}$ in qualitative analysis.

(d) Answer any one of following :                                       5

    (1) Explain pH metry method determine dissociation constant of weak electrolyte.

    (2) Discuss acid-base titration in detail by potentiometry.