RZ-003-001608 Seat No. _____

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

March - 2019

C-603 : Chemistry

(Physical Chemistry & Analytical Chemistry)

Faculty Code : 003

Subject Code : 001608

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

Instructions : (1)   All questions are compulsory.

(2)   Planck's constant $(h) = 6.626 \times 10^{-27} \ cm^2 \ gs^{-1}$,

(3)   Speed of light $(c) = 3 \times 10^{10} cm \ s^{-1}$

1   Answer following questions :   **20**

(1)   Fill in the blank :- The 3rd law of thermodynamics can't apply to _____ substances. (Perfect crystalline or amorphous)

(2)   Define residual entropy.

(3)   For which type of system concept of `partial malar property' is employed?

(4)   Write mathematical form of "Rault's law.

(5)   Neutralization of HCl by NaOH is photochemical reaction or dark reaction?

(6)   If 1 photon absorbed, 2 molecules of HBr dissociated; what is quantum yield?

(7)   Why does ΔE^0_{cell} for concentration cells is zero?

(8)   For $Pt / Hg_{(I)} / Hg_2Cl_{2(s)} / KCl_{(saturated)}$,

$E^0_{Hg2Cl_2} / Hg_{(I)} =$ _____ volt ?

(9)   What is relation between transport number of $+ve$ and $-ve$ ions in concentration cells?

(10) What is ionic product of water at $20^\circ C$?

(11) Draw the nature of the conductometry titration of "weak acid versus strong base"?

(12) Why should platinum electrode of conductometry cell platinised before use?

(13) in thin layer chromatography stationary phase usually made up of (i) _____ and (ii) _____

(14) Write principle of chromatography.

(15) In chromatography, what is meaning of resolution?

(16) How many dented legend EDTA is?

(17) Complete the reaction; $Zn^{+2} + H_4Y(EDTA) \rightarrow$

(18) In complexometry titration of metal-EDTA, if liberated H^+ ions titrated against standard NaOH solution, which type of titration, is this?

(19) Which colour gives phenolphthalein in 0.5 M HCl solution?

(20) Draw the schematic graph of "pH v/s Volume of strong base" for the titration of "strong acid versus strong base".

2 **(A)** Answer any **three** out of six :   6

    (1) Define absolute zero temperature with respect to third law of thermodynamics.

    (2) Define : (a) Closed system (b) Extensive property

    (3) Arrange following radiations in increasing order with respect to their wave-length ?
        X-ray, UV, Visible, IR

    (4) What is one Einstein energy?

    (5) Give chemical formula of mercurous ion.

    (6) Define : (a) Sparingly soluble salt (b) Salt bridge

  (B) Answer any **three** out of six :   9

    (1) Write any one test to check the validity of 3rd law of thermodynamics.

    (2) Discuss effect of temperature on chemical potential.

(3) In the photochemical combination of hydrogen and chlorine quantum efficiency of 1×10^6 is obtained with wavelength of 4800 A^0. How many moles of hydrogen chloride would be produced under these conditions per calorie of radiation energy absorbed?

(4) Give a list of reasons for low quantum yield.

(5) Give comparison between "electro chemical (Galvanic) cell" and "concentration cell".

(6) Derive equation to calculate cell potential of "Gas electrode concentration cell".

(C) Answer any **two** out of five : 10

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

 (2) (a) Write Gibbs-Duhem equation. 1

   (b) Discuss method of intercept to determine partial molar property. 4

 (3) Write a short note on LJP. Explain; "how can reduce or eliminate LJP"?

 (4) Derive equation to calculate ΔE_{cell} for "electrolyte concentration cell without transference".

 (5) Explain experimental procedure to determine quantum efficiency, with detail discuss of the detectors (i) the thermopile and (ii) the chemical actinometer.

3 (A) Answer any **three** out of six : 6

 (1) Define :- "equivalent conductance" and "specific conductance"

 (2) Which factor/s affects the conducting power of electrolyte?

 (3) What is difference between "Rx and R_f value"?

 (4) Write Nernst equation to calculate cell potential.

 (5) What is reason for hardness of water? What is ppm?

 (6) If components of the mixture having very close R_f values, which chromatography should be use to separate the components?

(B) Answer any **three** out of six :   9

   (1) Which factors affect ion-exchange chromatography?

   (2) Which advantages of TLC over other chromatographic techniques?

   (3) Define : (a) cell constant (b) Kohlrausch's law (c) conductivity water

   (4) Explain : (a) Indicator electrode (b) Reference electrode

   (5) (a) What is role of masking agent? (b) Define; Back Titration.

   (6) Which type of titrations carried out conductometrically?

(C) Answer any **two** out of five :   10

   (1) Explain following conductometry titrations.
       (a) Strong acid v/s weak base
       (b) weak acid v/s strong base

   (2) Explain "Column chromatography".

   (3) Explain; how can determine the dissociation constant of weak acid by pH metry method.

   (4) Give a brief idea about;
       (a) Conditions required for complexometry titration,
       (b) Structure and solubility of EDTA and
       (c) How to prepare 250 ml, 0.01 M EDTA solution. (M.Wt of Na-salt of EDTA is 372.25 gm/mole)

   (5) Explain the principle, applications and factors affecting on Gas-Liquid chromatography.

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