RP-003-001507 Seat No. _____

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

February - 2019

C - 503 : Chemistry

(Physical Chemistry & Analytical Chemistry) (Old Course)

Faculty Code : 003

Subject Code : 001507

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

Instruction : All questions are compulsory.

1 Answer the following questions : **20**

(1) What are Miller indices of the plane with intercepts 2, 3, α on three co-ordinates ?

(2) Which type of thermodynamic properties remains unchanged after completion of number of cyclic processes ?

(3) Give criteria for a reaction to be spontaneous or at equilibrium in terms of ΔS.

(4) Which matter represents the corner of the ternary phase diagram ?

(5) Give the expression, which represents the change of Gibbs free energy with respect to change in pressure at constant temperature.

(6) Which type of liquid crystals exhibit thread like structure ?

(7) What is degree of freedom for the three component system "sand + oil + $H_2O_{(I)}$ + $H_2O_{(S)}$ + $H_2O_{(g)}$" ?

(8) If equilibrium constant is 10 at O° C, then change in standard Gibb's free energy of the reaction would be positive, negative or zero ?

(9) State the limitations of the first law of thermodynamics.

(10) Which is the spacing ratio; for the three planes in KCl lattice vary ?

(11) What is molarity of 0.1 N sulphuric acid solution ?

(12) 'Methyl red' gives _____ colour in 0.002 M HNO_3 solution.

(13) Which property represents by "$\ln(I_0/I_t)$" ?

(14) "$NH_4OH + HNO_3 \rightarrow NH_4NO_3 + H_2O$" reaction is an example of _____ reaction. Is it thermal, photochemical or light reaction ?

(15) Which negative ion gives yellow precipitates with $CdCO_3$?

(16) Which of the halide ions has maximum reactivity towards potassium per sulphate ?

(17) Define : sparingly soluble salt.

(18) Which effect is observed for the normal distribution when larger value of standard deviation occurs ?

(19) The normal distribution is also classified as _____.

(20) In a class of 100, the mean on a certain exam was 50, and the standard deviation is 0. What does mean it ?

2 (a) Answer any **three** questions : **6**

(1) If molar latent heat of vapourization of water is 9720 cal, what is it's specific latent heat of vapourization ? (H = 1 gm/mole, O = 16 gm/mole)

(2) Calculate degree of freedom for "oil + petrol + Kerosene" system.

(3) What is Carnot theorem ?

(4) How does Gibbs Helmholtz equation being useful to calculate entropy change at constant pressure ?

(5) What would be 'the effect on melting point of ice' on the surface of moon ?

(6) Define terms :

(i) Anisotropic property

(ii) Mesomorphic substance

(b) Answer any **three** questions : **9**

(1) 2.8 grms of $N_{2(g)}$ is allow to expand into vaccume at 100° K temperature reversibly from 1 atm. Pressure. Calculate W, dH, dq, dE. (Assuming $N_{2(g)}$ act as an ideal gas, M. Wt of N_2 gas = 28 gm/mole)

(2) Show that net work done at the cost of decrease in Gibbs free energy.

(3) Derive Vont Hoff's limiting integrated equation from $d\ln K / dT = \Delta H / RT^2$.

(4) Why does X-rays are preferable to determine the structure of crystals ?

(5) Discuss "entropy as a function of temperature and pressure".

(6) Explain the effect of temperature on nature of phase diagram of 3-components system, which form "two pairs of partially miscible liquids".

(c) Answer any **two** questions : **10**

(1) Calculate "entropy of mixing", when 32 grams of oxygen gas mixed up with 44.8 liter of hydrogen gas, assuming both of them chemically inert and ideal gases. (22.4 liter = 1 mole, Universal gas constant is 1.987 cal/mole K).

(2) Derive equation "$\Delta G^\circ = -RT \ln K$" with the help of Vont Hoff's isothermal box.

(3) (i) Give comparisons between perfect crystal and Smectic liquid crystal.

(ii) Write "the law of constancy of interfacial angles".

(4) Explain phase-diagram of "$CH_3COOH + CHCl_3 + H_2O$" system.

(5) Define :

(i) Heterogeneous system

(ii) Soap like liquid crystal

(iii) Adiabatic process

(iv) Spontaneous process

(v) $(dE/dT)_p$, Where E = potential of galvanic cell

3 (a) Answer any **three** questions : **6**

(1) How many significant figure/s are in the following numbers ?

(a) 409.10

(b) 0.00056030

(c) 0.004

(d) 7050

(2) Why basic medium is required in Mohr's method of precipitation titration ?

(3) How can remove nitrite ion from mixture of "NO_3^-, NO_2^- and bromide" (salts of Na)".

(4) State any two basic applications of colorimetric experiments.

(5) Define :

(i) Standard solution

(ii) Saturated solution

(6) Give demerits of starch indicator.

(b) Answer any **three** questions : **9**

(1) The density of a material during a lab test is 1.29, 1.33, 1.34, 1.35, 1.32, 1.36, 1.30 and 1.33. What is relative mean deviation ?

(2) Write a short note on "Student T test".

(3) Explain any one method for the separation of Cl^-, Br^- and I^-.

(4) Explain the nature of the graph of 'pH v/s volume of base' for 'weak acid and strong base' titration.

(5) Explain the deviation of Lambert-Beer's law.

(6) Explain the differences between iodometry and iodimetry titration.

(c) Answer any **two** questions : **10**

(1) (i) Calculate the molarity of 0.06 N solution of;

(a) $KMnO_{4,(acidic\ medium)}$

(b) H_3PO_4. (Mole. wt of (a) $KMnO_4$ is 158 gm/mole and (b) H_3PO_4 is 98 gm/mole)

(ii) What is meaning of 10% W/W NaOH solution ?

(2) Explain "Ostwald's indicator principle".

(3) Describe methods to eliminate errors.

(4) Explain separation of PO_4^{-3}, AsO_4^{-3} and AsO_3^{-3}

(5) (i) Explain the graph of spectrophotometric graph; if there is lacking of absorbance by reactants and reagents.

(ii) What is difference between accuracy and precision ?
