MM-003-001507-NN Seat No. _____

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

October / November – 2016

C-503 : Chemistry

(Physical Chem. & Analytical Chem.) (New Course)

Faculty Code : 003
Subject Code : 001507

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

Instructions : (1) All the questions are compulsory.
(2) Figures on right hand side indicate marks.

1 Answer the following short questions : **20**

(1) Write any one criterion of spontaneous process.

(2) Which thermodynamic function is the measure of disorder ?

(3) How many reversible cycles are there in Carnot cycle ?

(4) The volume of 1 mole of ideal gas is doubled at 27°C. Calculate change in free energy of the gas.

($R = 1.987$ cal K^{-1} mol^{-1})

(5) Write the integrated form of Gibbs. Helmholtz equation.

(6) Which equation (name only) is applied to calculate the effect of pressure upon (transition) temperature, when two phases of a substance are in equilibrium ?

(7) Which radiation is used to determine the crystal structure ?

(8) How many Bravais lattices are possible in case of cubic crystal system ?

(9) Which part of triangle represents single (pure) component in phase diagram of partially miscible liquid system ?

(10) Whose concentration will remain constant on any line parallel to side BC of triangle in case of phase diagram of three component partially miscible liquid system ?

(11) Accuracy is expressed by absolute and _____ error.

(12) Why modulus is applied in calculation of average deviation ?

(13) Explain : Precise results are not always accurate.

(14) Magnesia mixture is used for the separation of _____ ions.

(15) Which substance is used for the separation of Cl^{-1}, Br^{-1} and I^{-1} ions ?

(16) Define molar absorptivity.

(17) What is the percentage transmittance of transparent and colourless solution ?

(18) Which solution can be used as self indicator in redox titration ?

(19) Which indicator is used in Mohr method of precipitation titration ?

(20) Iodometry and iodimetry are _____ type of titration.

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

(1) Prove that the change of entropy of reversible cyclic process is zero.

(2) Explain : Heat efficiency of heat engine is less than one.

(3) For liquid - vapour equilibrium, the slope of graph of ln P vs. (1 / T) was 5.48×10^3. Calculate change of enthalpy of vaporization of the liquid. ($R = 8.314\ JK^{-1}\ mol^{-1}$)

(4) Prove that $-\Delta G = W_{net}$.

(5) Draw the unit cell of NaCl.

(6) Explain tie lines of phase diagram.

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

(1) Write three statements of second law of thermodynamics.

(2) Explain physical significance of entropy.

(3) At the melting point of a substance 840 J/mol heat is required and its change of entropy is 1.2 J $mole^{-1}$ K^{-1}. Calculate the melting point of the substance in Celcius.

(4) Derive Vant - Hoff equation (isochore).

(5) Explain Miller Indices.

(6) Explain : For three component partially miscible liquid system, degree of freedom is two.

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

(1) Derive the equations of change of entropy in ideal gas.

(2) If 1 mole of nitrogen gas is mixed with 1 mole of hydrogen gas at 25°C temperature, calculate the entropy change of mixture of the gases (R = 1.987 cal. K^{-1} mol^{-1}).

(3) Derive Vant - Hoff isotherm equation by equilibrium box method.

(4) Describe liquid crystals.

(5) Describe the phase diagram of two pairs of partially miscible liquid system.

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

(1) Express 1.55 gm in kg. and mg according to rule of significant figures.

(2) State only method (steps) of Q-test.

(3) How nitrite ion is removed from the mixture of NO_2^{-1}, NO_3^{-1} and Br^{-1} ions ?

(4) If percentage transmittance of the solution is 20%, calculate its absorbance.

(5) Name the types of volumetric analysis.

(6) Explain the principle of redox indicator.

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

(1) Write a short note on standard deviation.

(2) Simplify 3.145 + 10.08 +15.4, according to significant figure rule.

(3) Explain the separation of the mixture of S^{-2}, SO_3^{-2} and SO_4^{-2} ions with chemical reactions.

(4) Describe spectrophotometric titration when (1) only product absorbs and (2) only reactant absorbs the radiation.

(5) Describe the elimination of errors in iodometry and iodimetry titrations.

(6) Write advantages of starch as an indicator.

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

(1) Describe the types of error.

(2) Discuss the separation of Cu^{+2} and Cd^{+2} ions.

(3) Describe the laws of crystallography.

(4) Explain Volhard method of precipitation titration.

(5) Describe the principle of acid indicator in acid-base titration.
