DCC-003-001507 Seat No. _____

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

May/June – 2015

C - 503 : Physical Chemistry & Analytical Chemistry

Faculty Code : 003
Subject Code : 001507

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

Instructions: (1) Answer the MCQ in the Answer Book.

(2) Digits on right hand side indicate marks.

1 Multiple Choice Questions. **20**

(1) Natural Processes are _____

(A) spontaneous (C) reversible

(B) isothermal (D) adiabatic

(2) If the temperature of the sink is 0° K, the efficiency of heat engine is _____.

(A) less than one (B) one

(C) greater than one (D) zero

(3) For reversible cyclic process, ΔS is _____.

(A) less than one (C) zero

(B) greater than one (D) infinite

(4) If the values of ΔH is positive and ΔS is negative, the value of ΔG is _____.

(A) negative (C) infinite

(B) zero (D) positive

(5) Variation of work function with temperature at constant volume is

(A) V (C) P

(B) + S (D) – S

(6) If an ideal gas expands by reversible and isothermal process, ΔG _____

(A) zero (C) decreases

(B) increases (D) infinite

(7) Cubic crystal system has _____ Bravice lattices.

(A) zero (C) two

(B) three (D) none of these

(8) _____ radiation is used to determine the structure of crystal.

(A) x-rays (C) IR

(B) UV (D) Visible

(9) Generally, tie lines are _____ to each other.

(A) Parallel (C) not parallel

(B) perpendicular (D) none of these

(10) In case of phase diagram of three components partially miscible liquid system, any line parallel to side AB has constant concentration of _____ component.

(A) A (C) C

(B) B (D) both (A) and (B)

(11) _____ denotes the agreement among the given set of measurements.

(A) Precision (C) Error

(B) Accuracy (D) both (A) and (B)

(12) Precision can be expressed by

(A) range (C) standard deviation

(B) average deviation (D) all of these

(13) If true value of the measurement is 10.0 ml and measured value is 10.3 ml the relative error of measurement is .....

(A) 0.03 (C) – 0.3

(B) – 0.03 (D) 0.03

(14) _____ can be used for separation of Cl^{-1}, Br^{-1} and I^{-1} ions.

(A) Copper sulphate

(B) Potassium persulphate

(C) Potassium sulphite

(D) both (A) and (B)

(15) _____ is used for removal of NO_2^{-1} ions.

(A) $NH_4(S0)_2$ (C) NH_4NO_3

(B) NH_4Cl (D) None of these

(16) Logarithm of inverse of transmittance is _____.

(A) specific absorbance (C) absorbance

(B) molar absorbance (D) absorbance

(17) If transmittance of a solution is 20%, its absorbance is _____.

(A) –1.3010 (C) 0.3010

(B) 0.6990 (D) – 0.6990

(18) Iodine solution is titrated against standard solution of _____

(A) $Na_2S_2O_3$ (C) Na_2SO_4

(B) $Na_2S_2O_8$ (D) All of these

(19) Which of the following is acid-base indicator?

(A) phenolphthalene (C) methyl red

(B) methyl orange (D) all of these

(20) If 2 lit of solution cantains 100 gm NaOH, the molarity of the solution is _____ (molecular wt. of NaOH is 40 gm/lit)

(A) 1.25M (C) 0.25M

(B) 2.5M (D) 12.5M

2 (A) Answer **any three** questions. **6**

(1) Write two statements of Second Law of Thermodynamics.

(2) State the limitations of First Law of Thermodynamics.

(3) If 473 gm of solid substance is converted into liquid at 200° C temperatures, calculate ΔS (latent heat of solid is 0.73 cal / gm).

(4) Prove that decrease in free energy is net work or useful work.

(5) Prove that $dG = VdP - SdT$

(6) Draw the hexagonal unit cell.

(B) Answer **any three** questions. **9**

(1) Explain: Entropy is regarded as more probable state.

(2) Write the equation of ΔS_{mix} of gases and prove that it is always positive.

(3) Derive the law of active mass by chemical potential.

(4) If the equilibrium constant of a reaction at 127°C is 5×10^2 and at 27°C its value is 2.5×10^2. Calculate enthalpy change of the reaction.
($R = 1.987$ cal degree^{-1} mole^{-1})

(5) Explain the inter planner distance of simple cubic system.

(6) Prove that for three component partially miscible liquid system maximum number of phase is 5 and maximum degree of freedom is 4.

(C) Answer **any two** questions. **10**

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

(2) Derive the equation which relates effect of temperature on equilibrium constant of chemical reaction.

(3) Derive Clausius - Clapeyron equation.

(4) Discuss various type of liquid crystals.

(5) Describe phase diagram of one pair of partially miscible three component liquid system.

3 (A) Answer **any Three** out of Six questions. **6**

(1) Determine median of the burette readings

12.7 ml, 12.1 ml, 12.6 ml, 12.1 ml, 12.5 ml and 12.3 ml.

(2) Explain standard deviation.

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

(4) Derive Lambert's law.

(5) Explain with chemical equation the function of KI in the preparation of iodine solution.

(6) Draw the graph of pH of H_3PO_4solution against the added volume of base.

(B) Answer **any three** out of Six questions, **9**

(1) Discuss Normal Distribution Curve.

(2) State only classification of the error.

(3) Describe the separation of Cu^{+2} and Cd^{+2} ions from the inorganic mixture.

(4) Explain deviation of Beer's law.

(5) State the characteristic of the substance which is used to prepare primary standard solution.

(6) Describe Volhard method of precipitation titration.

(C) Answer **any two** out of Five questions. **10**

(1) Describe the methods to eliminate the errors.

(2) Discuss the separation of CO_3^{-2}, SO_3^{-2} and S^{-2} ions.

(3) Describe spectrophotometric titrations.

(4) Describe various types of redox indicator.

(5) Explain the principle of acidic type of indicator of acid-base titration.
