DBL-003-2015007 Seat No. _____

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

June - 2022

C-503 - Physical & Analytical Chemistry

(New Course)

Faculty Code : 003
Subject Code : 2015007

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

Instructions : (1) There are ten questions.
(2) Answer any five questions.
(3) All questions carry equal marks (14 marks for each question)
(4) Figure to the right indicate full marks.

1 (a) Answer the following questions : **4**
(1) Define : Heat of fusion.
(2) Give the mathematical form of second law of thermodynamics.
(3) For a cyclic process the change in internal energy of the system is _____.
(4) In an adiabatic process _____ cannot flow into or out of the system.

(b) Give the statement of Max-Plank for second law of thermodynamics. **2**

(c) Discuss the physical significance of entropy. **3**

(d) Explain Carnot's cycle in detail. **5**

2 (a) Answer the following questions : **4**
(1) Define : Cyclic process.
(2) How many steps are required for Carnot cycle operations ?
(3) What is Isothermal process ?
(4) In an adiabatic process for Carnot cycle _____ must change.

(b) Explain spontaneous process. **2**

(c) What is entropy ? Prove that it is a state function. **3**

(d) Calculate the entropy change involved in the isothermal reversible expansion of 5 moles of an ideal gas from a volume of 10 litre to a volume of 100 litres at 300 K ($R = 8.314\ JK^{-1}\ mol^{-1}$). **5**

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

(1) Define : Electrode.

(2) For a salt bridge in cell, which sign has been used ?

(3) Write down the general equation of phase rule.

(4) Zn, Cu are _____ electrodes.

(b) Explain : Degree of Freedom. **2**

(c) Describe Galvanic cell with figure in detail. **3**

(d) Derive the Nernst equation for the calculation of single electrode potential. **5**

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

(1) Define : Electrolyte solution.

(2) In reference of hydrogen electrode, the formation of series for different electrode is known as _____.

(3) Define : Component.

(4) Which scientist has discovered the phase rule ?

(b) Explain standard half cell. **2**

(c) Explain Calomel electrode. **3**

(d) Describe the phase diagram of one pair of partially miscible liquid system. **5**

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

(1) What is the value of ΔG at equilibrium ?

(2) With increase in pressure, melting point of ice _____.

(3) ΔH^{o} represent the enthalpy change at _____ ^{o}C and _____ atm pressure.

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

(b) Prove that the decrease in work function is equal to maximum work. **2**

(c) Derive Lambert's – Beer's law. **3**

(d) Derive Clausius – Clapeyron equation and its integration form. **5**

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

(1) Define : Optical density.

(2) The variation of free energy with pressure at constant temperature is given by _____

(3) With increase in pressure, melting point of paraffin wax _____

(4) In photo chemical reaction free energy _____.

(b) Explain Grothus – Draper law. **2**

(c) Derive Gibbs – Helmholtz equation. **3**

(d) Explain spectrophotometric estimation. **5**

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

(1) In Standard cell distance between two plate is _____ cm.

(2) Value of specific conductivity of N/50 Kcl solution is _____.

(3) In platinized electrode which chemical is used in the cell ?

(4) Give the structure formula and full name of EDTA.

(b) Explain principle of metal ion indicator. **2**

(c) Explain conductometric precipitation titration of NaCl against $AgNO_3$ with graph. **3**

(d) Describe the method to determine solubility and solubility product of sparingly soluble salt by conductance measurement. **5**

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

(1) What is the unit of specific conductance ?

(2) Conductance of electricity through electrolyte solution is due to the movement of _____.

(3) EDTA has _____ no. of coordination site.

(4) Resistance is directly proportional to _____.

(b) Give the importance of Kohlrausch law. **2**

(c) Explain Walcher's rule and $p^M \rightarrow$ EDTA curve for EDTA titration. **3**

(d) Describe the method to determine the degree of hydrolysis and hydrolysis constant by conductometry. **5**

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

(1) Give the example of self indicator.

(2) Normality of 1 M $KMnO_4$ solution is _____

(3) p^H of 1M HCl solution is_____

(4) Define mole fraction.

(b) Explain importance of starch indicator in iodimetry – iodometry titration. **2**

(c) Explain primary standard and secondary standard solution. **3**

(d) Explain precipitation titration of halide by Fazam adsorption method. **5**

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

(1) Name any two primary standard solution.

(2) Normality of 1M Na_2CO_3 solution is _____ N

(3) Define : Molarity.

(4) Which indicator is used in determination of halid by Mohr's method ?

(b) Calculate molarity of 2 litre solution containing 100 gm NaOH. **2**

(c) Write the principle of Redox indicator. **3**

(d) Explain titration curve for polyprotic acid and strong base in detail. **5**