Seat No. _____

HAL-003-1015007

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

June - 2023

C-503 : Chemistry

(Physical & Analytical Chemistry)

Faculty Code : 003

Subject Code : 1015007

Time : $2\frac{1}{2}$ / Total Marks : **70**

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

(1) Which law of thermodynamics cannot predict the direction of flow of heat ?

(2) State two characteristics of natural process.

(3) If the temperature of the sink is $0^{o}K$, then what is the efficiency of heat engine ?

(4) Calculate the amount of heat supplied to Carnot's cycle working between $600^{o}K$ and $200^{o}K$ temperature. The maximum work obtained is 890 J.

(b) Answer any one question : **2**

(1) If 473 gm of solid substance is converted into liquid at $200^{o}C$ temperature, then calculate the entropy change (ΔS). Latent heat of fusion is 0.73 cal/gram.

(2) Define :

(a) Cyclic process

(b) Perpetual motion machine of second kind

(c) Answer any one question : **3**

(1) What is entropy ? Prove that it is a state function.

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

(d) Answer any one question : **5**

(1) Prove : $\eta = \frac{Wmax}{Q_2} = \frac{Q_2 - Q_1}{Q_2} = \frac{T_2 - T_1}{T_2}$

(2) Derive the equation for the change of entropy with respect to temperature (T), Pressure (P), Volume (V) for ideal gas.

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

(1) In electrochemicl cell _____ energy is converted into _____ energy.

(2) What is the degree of freedom for "Oil+petrol+ Kerosene" system.

(3) The emf of the following electrode depends on whose concentration.

$Hg \mid Hg_2 Cl_{2(S)} \mid KCl\ (aq)$

(4) Write oxidation reaction which takes place on the following electrode.

$Pt \mid Cl_2\ (g) \mid a_{cl^-}\ (aq)$

(b) Answer any one question ; **2**

(1) Define : (a) Half cell (b) Electrode

(2) Explain primary reference electrode in detail.

(c) Answer any one question : **3**

(1) What is phase rule ? Define all the terms involved in phase rule.

(2) Explain Daniel cell with diagram.

(d) Answer any one question : **5**

(1) Explain phase diagram of Acetic acid + Chloroform + Water system.

(2) Cell reaction is,

$Fe^{+2}_{(0.6\ M)} + Ce^{+4}_{(0.2\ M)} \rightleftharpoons Fe^{+3}_{(0.6\ M)} + Ce^{+3}_{(0.2\ M)}$

$E^{\circ}_{Ce^{+4}/Ce^{+3}} = 1.44$ Volt, $E^{\circ}_{Fe^{+3}/Fe^{+2}} = 0.77$ Volt

Using above data construct chemical cell. Calculate Standard cell potential ΔE°_{Cell}, Cell potential ΔE_{Cell} and ΔG.

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

(1) Define : Work function.

(2) What is percentage transmittance for transparent and colorless solution ?

(3) Give the Helmholtz equation for change at constant volume in reference of work function.

(4) _____ law relates intensity of radiation and thickness of absorbing medium.

(b) Answer any one question : **2**

(1) Discuss Grothus Draper law.

(2) Discuss the effect of pressure on melting point of paraffin wax.

(c) Answer any one question : **3**

(1) Give the difference between thermal and photochemical reaction.

(2) Derive Gibbs Helmholtz equation for change at constant pressure in reference of free energy (Relation of G with P and T)

(d) Answer any one question : **5**

(1) Derive Clausius Clapeyron equation and its integration form.

(2) Explain Spectrophotometric estimation.

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

(1) Give the structure of EDTA.

(2) Give the unit of conductance.

(3) Which substance is used as a masking agent in titration of the mixture of Pb^{+2} and Ni^{+2} by EDTA?

(4) Disodium salt of EDTA is used for the preparation of standard EDTA solution. True or False.

(b) Answer any one question : **2**

(1) Explain principle of metal ion indicator.

(2) What is conductivity water ? How will you prepare conductivity water ?

(c) Answer any one question : **3**

(1) Explain conductometric titration of strong acid and weak acid mixture with strong base.

(2) What is polarization of electrode ? Explain platinization of platinum electrode of conductivity cell.

(d) Answer any one question : **5**

(1) Explain replacement titration by conductometric titration.

(2) Explain various methods of EDTA titration.

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

(1) Iodi and iodo metry are of _____ type titration.

(2) Define : Standard solution.

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

(4) Define : Normality.

(b) Answer any one question : **2**

(1) Write any four characteristics of primary standard.

(2) Name the types of volumetric analysis.

(c) Answer any one question : **3**

(1) Explain principle of redox indicator and give its types.

(2) Discuss uses of starch and give its merits and demerits.

(d) Answer any one question : **5**

(1) What is called precipitation titration ? Explain Fajan's method for titration of $AgNO_3$ with NaCl in detail.

(2) Explain neutralization titration of Strong acid and strong base with titration curve.
