



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°K , then what is the efficiency of heat engine ?
 - (4) Calculate the amount of heat supplied to Carnot's cycle working between 600°K and 200°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°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 : $\eta = \frac{W_{\max}}{Q_2} = \frac{Q_2 - Q_1}{Q_2} = \frac{T_2 - T_1}{T_2}$

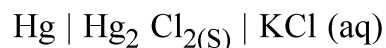
(2) Derive the equation for the change of entropy with respect to temperature (T), Pressure (P), Volume (V) for ideal gas.

2 (a) Answer the following questions : 4

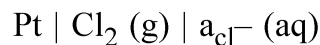
(1) In electrochemical cell _____ energy is converted into _____ energy.

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

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



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



(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

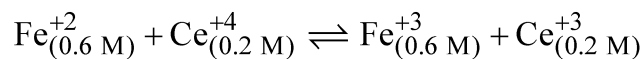
(1) What is phase rule ? Define all the terms involved in phase rule.

(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,



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

Using above data construct chemical cell. Calculate

Standard cell potential $\Delta E_{\text{Cell}}^{\circ}$, 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.
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