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

October / November - 2018

Chemistry : C - 503

(Physical & Analytical Chemistry) (New Course)

Faculty Code : 003
Subject Code : 1015007

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

Instructions : (1) All questions are compulsory.

(2) In all questions; B, C, D have internal options.

(3) Each section (A, B, C, D) of a question should be written separately in the answer book.

1   (A) Answer the following questions :   4

(1) State two characteristics of natural process.

(2) If the temperature of the sink is O°K, then what is the efficiency of heat engine ?

(3) Which law of thermodynamics can not predict the direction of flow of heat ?

(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) Define :

(a) Perpetual motion machine of second kind.

(b) Cyclic process.

(2) 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.

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

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

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

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

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

    (2) Prove : $\eta = \dfrac{W_{max}}{Q_2} = \dfrac{Q_2 - Q_1}{Q_2} = \dfrac{T_2 - T_1}{T_2}$.

2   (A) Answer the following questions : 4

    (1) Write oxidation reaction take place on the following electrode. $Pt \left| Cl_{2(g)} \right| a_{Cl^-_{(aq)}}$

    (2) The emf. of the following electrode depends on whose concentration. $Hg \left| Hg_2 Cl_{2(s)} \right| KCl_{(aq)}$

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

    (4) What is the degree of freedom for "Oil + Petrol + Kerosome" System.

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

    (1) Define :

      (a) Electrode

      (b) Half cell

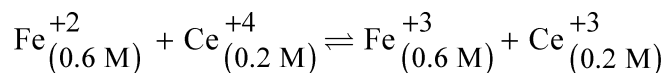   (2) Explain primary reference electrode in detail.

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

    (1) Explain Daniel cell with diagram.

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

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

    (1) Cell reaction is,

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

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

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

    (2) Explain phase diagram of "$CH_3COOH + CHCl_3 + H_2O$" system.

3 (A) Answer the following questions : 4
    (1) Give the Helmholtz equation for change at constant volume in reference of work function.
    (2) Define : Work Function (A).
    (3) _____ law relates intensity of radiation and thickness of absorbing medium.
    (4) What is percentage transmittance for transparent and colorless solution ?

   (B) Answer any **one** question : 2
    (1) Discuss the effect of pressure on melting point of paraffin wax.
    (2) Give the difference between thermochemical and photochemical reaction. (two points)

   (C) Answer any **one** question : 3
    (1) Derive Gibbs Helmholtz equation for change at constant pressure in reference of free energy. (Relation of G with P and T)
    (2) Calculate the value of Temperature (T) and state the criteria for reaction to be spontaneous for following reaction $Ag_2O_{(s)} \rightarrow 2Ag_{(s)} + \frac{1}{2}O_{2(s)}$ at 1 at m $\Delta H = 7.31$ K.Cal, $\Delta S = 0.0158$ K.Cal / degree .

   (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) Which substance is used as a masking agent in titration of the mixture of Pb^{+2} and Ni^{+2} by EDTA ?
    (2) Which salt of EDTA is used to prepare standard EDTA solution ?
    (3) When the distance between two plate is _____ and its cross section area is _____, then the observed conductance obtained is twice times more than the expected value.
    (4) What is the unit of equivalent conductance ?

   (B) Answer any **one** question : 2
    (1) What is conductivity water ? How will you prepare conductivity water ?
    (2) Explain principle of metal ion indicator.

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

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

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

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

    (1) Explain various methods of EDTA titration.

    (2) Explain replacement titration by conductometry.

5 (A) Answer the following questions : 4

    (1) Why Basic medium is required in Mohr method of precipitation titration ?

    (2) Why aqueous solution of sodium thiosulphate becomes milky ?

    (3) Normality of $1M\ H_2C_2O_4 \cdot 2H_2O$ solution is _____ N.

    (4) To prepare standard solution of iodine which ionic form of the iodine is soluble in water ?

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

    (1) How many gram of Na_2CO_3 is required for the preparation of 0.5 N, 250 ml Na_2CO_3 solution.

    (2) State the difference between iodimetry and iodometry titration. (two points)

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

    (1) Explain primary and secondary standard by giving appropriate example.

    (2) Explain principle of redox indicator and give its type.

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

    (1) Explain principle of neutralization indicator.

    (2) Describe Fajan method for determination of end point of precipitation titration.

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