

B.Sc. Semester - 5 (CBCS) Examination
December - 2020 (Old Course)
PHYSICAL AND ANALYTICAL CHEMISTRY(CORE)

Time: 1:30 Hours

Marks: 42

Instructions:

1. Figures to the right indicate marks.
2. There are five questions in the question paper.
3. Answer any three of the following questions.

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- Que-1 (a) Answer the following question. (04)
- (1) Which are the limitations of 1st law of thermodynamics?
 - (2) What mean by “perpetual motion machine of second kind”?
- (b) Answer any two questions out of three. (10)
- (1) What is Carnot theorem? Derive it's mathematical form.
 - (2) Discuss the effect of temperature, volume and pressure on entropy change.
 - (3) (i) If efficiency of a heat engine working in cyclic manner is 0.161. What amount of heat required to produce 1000 joule of work?
(ii) Calculate increase in entropy on mixing of 18.2848 gm of oxygen gas and 0.857 gm of hydrogen gas at NTP. Assuming oxygen and hydrogen gas act as ideal gas at NTP.
- Que-2 (a) Answer the following question. (04)
- (1) Derive criteria for a reaction to be spontaneous or at equilibrium state with respect to change in Gibb's free energy.
 - (2) Calculate degree of freedom for “oil+petrol+Kerosene” system.
- (b) Answer any two questions out of three (10)
- (1) Explain phase – diagram of “CH₃COOH+CHCl₃+H₂O” system.
 - (2) Derive equation “ $\Delta G^0 = -RT \ln K$ ” with the help of Vont Hoff's isothermal box.
 - (3) (i) Assuming CO₂ as an ideal gas, calculate free energy change, when 1 gm of CO₂ compressed up to 50 atm, from 5 atm at 57°C temperature. R = 1.987 Cal/mole.
(ii) Derive Vont Hoff's limiting intergrated equation from $d \ln K / dT = \Delta H / RT^2$.
- Que-3 (a) Answer the following question. (04)
- (1) Explain the deviation from Lambert-Beer's law.
 - (2) Write oxidation half cell reaction on following half cell.
Pt/Cl₂(g)/HCl(aq)
- (b) Answer any two questions out of three. (04)
- (1) Write a short note on primary reference electrode and secondary reference electrode.
 - (2) Explain applications of emf measurements.
 - (3) Explain the laws of photochemistry.
- Que-4 (a) Answer the following question. (04)
- (1) How can reduce polarization of electrode?
 - (2) Write Velcher's rules for EDTA titration.
- (b) Answer any two questions out of three (10)
- (1) Explain nature of plots of “conductance v/s volume of base” of different types of acid-base titrations.
 - (2) Discuss following use of conductometry titration.
(i) Determination of hydrolysis constant and degree of hydrolysis.
(ii) Determination of dissociation constant of a weak acid.
 - (3) Give short introduction of following terms: (a) Ligand, (b) Chelate, (c) Solubility of EDTA, (d) Masking agent, (e) Concept behind colour change; using metal ion indicator
- Que-5 (a) Answer the following question. (04)
- (1) What is basic difference between “equivalence point” and “end point”?
 - (2) If concentration of aqueous solution of ammonium hydroxide is 0.1M, what is pH of solution? (Dissociation constant of ammonium hydroxide is 1.8×10^{-5})
- (b) Answer any two questions out of three (10)
- (1) Explain Ostwald's indicator principle.
 - (2) Give a brief description on neutralization titration with graph of “poly protic acid v/s strong base” titration.
 - (3) Write a short note on iodometry titration and iodimetry titration.
