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DBL-003-1015007 Seat No. _____

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

June - 2022

Chemistry

Physical & Analytical Chemistry

(New Course)

Faculty Code : 003
Subject Code : 1015007

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

Instructions : (1) Attempt any five questions out of ten questions.
(2) In each question sub question (a), (b), (c) and (d) all are compulsory.
(3) Right side figure indicate marks.

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

(1) Which thermodynamic function is the measure of disorder ?

(2) Natural processes are irreversible and spontaneous (True/False)

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

(4) How many reversible cycles are there in Carnot cycle ?

(b) Answer in brief : **2**

Write any two statement of second law of thermodynamics.

(c) Answer in detail : **3**

Derive : $\Delta s = nC_v \ln\frac{T_2}{T_1} + nR\ln\frac{V_2}{V_1}$ for an ideal gas.

(d) Answer in detail : **5**

Prove $\eta = \frac{W_{max}}{Q_2} = \frac{Q_2 - Q_1}{Q_2} = \frac{T_2 - T_1}{T_2}$

2 (a) Answer the following questions : 4

(1) For reversible cyclic process ΔS is _____.

(2) Any process which occurs of its own accord without help of any external aid is known as _____ process.

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

(4) According to Carnot theorem, if all machine working reversibly at the same two temperature have _____ efficiency.

(b) Answer in brief : 2

Calculate the work efficiency of heat engine working between $27^{o}C$ and $127^{o}C$ temp.

(c) Answer in detail : 3

Explain entropy change in an irreversible process. Give the unit of entropy.

(d) Answer in detail : 5

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

3 (a) Answer the following questions : 4

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

(2) $Hg / Hg_2Cl_{2(s)} / KCl_{(aq)}$ is the representation of _____ electrode.

(3) Give the cell formation of Daniel cell.

(4) For three component system, if the degree of freedom is zero, then what is the number of phases ?

(b) Answer in brief : **2**

Give oxidation and reduction reaction of galvanic cell.

(c) Answer in detail : **3**

Explain reversible cell giving example.

(d) Answer in detail : **5**

Discuss ternary system for one pair of partially miscible liquid with phase diagram.

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

(1) Which electrode is used as a primary reference electrode ?

(2) Standard cell potential is measured at 30°C temperature (True or False)

(3) Write cell reaction of following cell

$$Zn_{(s)} \left| Zn^{+2}_{(aq)} \right\| Ag^{+}_{(aq)} \left| Ag(s) \right.$$

(4) Define quintuple point.

(b) Answer in brief : **2**

Define :

(i) Electrode

(ii) Standard half cell

(c) Answer in detail : **3**

Explain Galvanic cell (Daniel cell)

(d) Answer in detail : **5**

Discuss ternary system for three pair of partially miscible liquid with phase diagram.

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

(1) Write the equation to calculate free energy change from equilibrium constant.

(2) The equation $\frac{dP}{dT} = \frac{\Delta H}{T\left(V_2 - V_1\right)}$ is known as _____ equation.

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

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

(b) Answer in brief : **2**

Give any two uses of Gibbs–Helmholtz equation (only two application points)

(c) Answer in detail : **3**

Discuss the effect of pressure on the melting point of ice.

(d) Answer in detail : **5**

What is spectrophotometric titration ? Explain spectrophotometric estimation of (i) Lacking of absorbance by reaction product and estimating reagent (ii) Lacking of absorbance by reactant and product.

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

(1) Write mathematical form of work function.

(2) The equation $\Delta G = \Delta H + T\left[\frac{\partial(\Delta G)}{\partial T}\right]_p$ is known as _____ equation.

(3) With increase in pressure melting point of ice is _____.

(4) Define : Transmittance.

(b) Answer in brief : **2**

Give the difference between thermal and photochemical reaction (Two points)

(c) Answer in detail : **3**

Derive "Lambert-Beer's" Law.

(d) Answer in detail : **5**

Derive Clausius-Clayperon equation and write the form of equation for liquid-vapour and solid-liquid equilibrium.

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

(1) What is the effect of dilution on specific conductance ?

(2) When size of ion is increases, the mobility of ion in electrolyte solution is _____.

(3) What is conductivity water ?

(4) Which salt of EDTA is used to prepare standard EDTA solution ?

(b) Answer in brief : **2**

Give factors affecting conductance (any four)

(c) Answer in detail : **3**

Explain conductometric titration of strong acid against weak base.

(d) Answer in detail : **5**

Give the name of various methods of EDTA titration and explain any three method.

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

(1) Why should platinum electrode of conductometry cell is platinized before use ?

(2) The unit of specific conductance is _____.

(3) If λ_∞ is equivalent conductance at infinite dilution and λ_c is the equivalent conductance at any dilution, the degree of dissociation (α) is _____.

(4) _____

(b) Answer in brief : **2**

Give Welcher's rules for EDTA titration.

(c) Answer in detail : **3**

Explain principle of metal ion indicator.

(d) Answer in detail : **5**

Describe the method to determine solubility and solubility product of sparingly soluble salt by conductance measurement.

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

(1) Which compound is used as a primary standard in neutralization titration ?

(2) Give molecular formula of sodium thiosulphate.

(3) Normality of 2M H_2SO_4 solution is _____

(4) In Mohr's method, alkaline medium is required to determine end point of precipitation titration. (True or False)

(b) Answer in brief : **2**

Give any four characteristic of substance used as a primary standard.

(c) Answer in detail : **3**

Write usefulness of starch indicator in Iodimetry and Iodometry titration with its merits and demerits.

(d) Answer in detail : **5**

Explain neutralization titration of strong acid and strong base with diagram.

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

(1) Iodimetry is _____ type of volumetric titration.

(2) pH of 1 M HCl solution is _____

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

(4) Phenolphthalein shows _____ colour in acidic medium and _____ colour in basic medium.

(b) Answer in brief : **2**

Define :

(i) Standard solution

(ii) End point

(c) Answer in detail : **3**

Explain primary standard and secondary standard.

(d) Answer in detail : **5**

What is precipitation titration ? Explain Volhard method of precipitation titration.
