

Roll No.

--	--	--	--	--	--	--	--	--	--

Total No. of Pages : 02

Total No. of Questions : 09

B.Sc. (Non Medical) (2018 Batch) (Sem.-3)

PHYSICAL CHEMISTRY-II

Subject Code : BSNM-302-18

M.Code : 76901

Time : 3 Hrs.

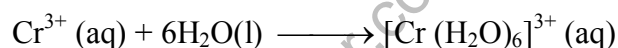
Max. Marks : 50

INSTRUCTIONS TO CANDIDATES :

1. SECTION-A is COMPULSORY consisting of TEN questions carrying ONE mark each.
2. SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.
3. SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.

SECTION-A**1. Write briefly :**

- a) What is the relation between C_p and C_v of an ideal gas?
- b) Consider the following Chemical reaction



Would this reaction have positive or negative entropy of formation ?

- c) What is the equation expressing the change in the Gibbs energy for a reaction occurring at constant temperature and pressure?
- d) State third law of Thermodynamics.
- e) Under what condition of ΔH and ΔS will a change be non-spontaneous regardless of the temperature?
- f) Which of the following processes is ΔS positive?
 - I. $2\text{NO}(\text{g}) + \text{Cl}_2(\text{g}) \longrightarrow 2\text{NOCl}(\text{g})$
 - II. $\text{NaCl}(\text{s}) \longrightarrow \text{NaCl}(\text{l})$
 - III. $3\text{O}_2(\text{g}) \longrightarrow 2\text{O}_3(\text{g})$
 - IV. $\text{C}_2\text{H}_4(\text{g}) + \text{H}_2(\text{g}) \longrightarrow \text{C}_2\text{H}_6(\text{g})$
- g) Can the pH of a solution have a negative value?
- h) What is the criteria of spontaneity for entropy and enthalpy?
- i) Define the terms : Phase, Components and degree of freedom.
- j) Express phase rule in terms of number of phases (P), components (C) and degrees of Freedom (F)?

SECTION-B

2. a) Derive the expression for molar heat capacities C_v and C_p in term of internal energy change and enthalpy change? (3)
b) Evaluate ΔU for 1 mole of oxygen, O_2 going from -20°C to 37°C at constant volume, It is an ideal gas with $C_v = 20.78\text{J/mol K}$. (2)
3. a) Distinguish between reversible and irreversible thermodynamic process. (2.5)
b) Differentiate between extensive and intensive properties with example. (2.5)
4. a) Starting from basic principle derive the relationship (2.5)

$$\Delta G^\circ = -RT \ln k_p$$

- b) Why ΔG° obtained from K_p and K_c has different values? When these values will be same? (2.5)
5. a) Explain the term 'Helmholtz function' and deduce its expression. (2.5)
b) Calculate the change in Helmholtz energy for a reversible isothermal compression of one mole of ideal gas from 100 L to 10L at 298 K. (2.5)
6. a) Show that for a thermodynamically irreversible process (2.5)

$$\Delta S_{\text{system}} + \Delta S_{\text{surrounding}} > 0$$

- b) Two ends of a rod are kept at 127°C and 227°C when 2000 Cal of heat flows in this rod, what will be the change in entropy in J/K? (2.5)

SECTION-C

7. a) State the Phase rule and give its derivations. (5)
b) Draw & discuss the phase diagram of Mg-Zn system. (5)
8. a) Describe 'Carnot Cycle'. Derive an expression for the efficiency of a reversible heat engine working between temperature T_1 & T_2 ($T_2 > T_1$). (6)
b) A heat pump working on Carnot cycle maintains the inside temperature of a house at 22°C by supplying 450 KJ/s. If the outside temperature is 0°C . Calculate the heat taken in KJ/s from the outside air? (4)
9. What is Nernst Heat Theorem? What result follow from it regarding entropy change and heat capacity change of system? How it leads to the definition of 'Third law of Thermodynamics'? (10)

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.