BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(MID SEMESTER EXAMINATION SP2023)

CLASS: IMSc **SEMESTER:**
BRANCH: CHEMISTRY **SESSION: SP2023**

SUBJECT: CH114 PHYSICAL CHEMISTRY II

TIME: 02 Hours **FULL MARKS: 25**

INSTRUCTIONS:
1. The question paper contains 5 questions each of 5 marks and total 25 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
4. Tables/Data handbook/Graph paper etc., if applicable, will be supplied to the candidates

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Q.1(a)	Are the following statements, correct? Justify. a. Heat absorbed in an isothermal expansion is zero. b. Reversible work is always larger than the irreversible work.	[2]	1	1
Q.1(b)	Determine the total work done in a cyclic process where one mole of an ideal gas first expanded from V_1 (pressure P1) to V_2 (pressure P2) reversibly and then compressed back from V_2 to V_1 in a single step at isothermal condition (temperature maintained at T_1).	[3]	1	2
Q.2(a)	Show that there is no change in internal energy during volume changes for an ideal gas.	[2]	2	1
Q.2(b)	Calculate D*U* and D*H* for the process: 2.0 mole ideal gas (monoatomic) at (1.5 atm, 400 K) $\longrightarrow$ 2.0 mole ideal gas (monoatomic) at (3 atm, 600 K) [C_V = 1.5 R]	[3]	2	2
Q.3(a)	Using 1st law of thermodynamics, determine the internal energy changes during the following processes a. constant volume heating to increase the temperature from T_1 to T_2 of an ideal gas having heat capacity C_V. b. Adiabatic single step expansion from V_1 to V_2 at final pressure P_2	[2]	2	2
Q.3(b)	Show that $C_P - C_v = nR$ where the symbols have their usual significance.	[3]	2	2
Q.4(a)	Define Chemical Potential and discuss its physical significance,	[2]	2	1
Q.4(b)	Discuss the Le Chatelier principle from quantitative thermodynamic arguments.	[3]	2	1
Q.5(a)	Derive and show the relationship between K_p and K_c, where the symbols have their usual significance	[2]	1	2
Q.5(b)	Quantitative discuss about the temperature dependence of K_p by taking help from appropriate thermodynamic formalism.	[3]	1	1

::::::25/05/2023::::::M