B. Sc. (Pass Course) 4th Semester

Examination – May, 2019

CHEMISTRY - II (Physical Chemistry)

Paper : CH-402

Time : Three hours]   *[Maximum Marks : 30*

Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.

Note : Attempt *five* questions in all, including Question No. **1** which is *compulsory*. Select *one* question from each Section. All questions carry equal marks.

1. *Compulsory Questions :*   1,1, 1, 1, 1, 1

    (a) State second law of thermodynamics.

    (b) Define residual entropy.

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    (b) Derive an expression for calculating mean ionic activity coefficient.   2

SECTION – D

8. Explain Concentration Cell (a) with transference

    (b) without transference.   3, 3

9. (a) Discuss the application of EMF measurement in potentiometric titrations.   4

    (b) Calculate the EMF of the following concentration cells T25°C. $Ag|0.001N\ AgNO_3\|0.1\ N\ AgNO_3$; assuming the activities of silver ions to be equal to the concentrations.   2

(4)

(c) What are reversible and irreversible cells ? Give examples.

(d) Under what conditions ΔG becomes equal to ΔA.

(e) What are the limitations of quinhydrone electrode ?

(f) Why the efficiency of heat engine cannot be greater than one ?

SECTION – A

2. (a) Describe Carnot cycle and derive an expression for the efficiency of a heat engine working between temperatures T_1 and T_2.   4

(b) What is the criterion of spontaneity in terms of entropy ?   2

3. (a) Derive an expression for entropy as a function of V & T and P & T where V, P, T are volume, pressure and temperature respectively.   5

(b) What is the criterion of spontaneity in terms of entropy ?   1

SECTION – B

4. (a) State third law of thermodynamics. How does it help in the determination of absolute entropies of chemical compounds at desire temperature ?   2

(b) The free energy change (ΔG) accompanying a given process is −85.77 KJ at 25°C and −83.68 K. at 35°C. Calculate the change in enthalpy (ΔH) for the process at 30°C.   4

5. (a) Derive Gibb's Helmholtz equation.   5

(b) What is the difference between Helmholtz function and Gibb's function ? Under what conditions ΔG becomes equal to ΔA.   1

SECTION – C

6. (a) Derive the Nernst equation for EMF of a complete electrochemical cell.   4

(b) Write a short note on single electrode potential.   2

7. (a) Calculate the EMF of a Zinc-silver cell at 30°C when the activity of Zn^{2+} ions is 0.5 and the activity of Ag^+ ions is 10. Standard reduction potential at 30°C is (i) $Ag^+/Ag = 0.799$ V (ii) $Zn^{2+}/Zn = -00.76$ V.   4