Registration No : | | | | | | | | | | |

Total Number of Pages : 01 **M.Sc.I**
FCYC702

7th Semester Regular / Back Examination 2019-20
PHYSICAL CHEMISTRY-V
BRANCH : M.Sc.I(AC)
Time : 3 Hours
Max Marks : 70
Q.CODE : HRB179
Answer Question No.1 which is compulsory and any FIVE from the rest.
The figures in the right hand margin indicate marks.

Q1 **Answer the following questions :** **(2 x 10)**

a) Define thermodynamic excess functions?
b) Maximum how many phases exist in equilibrium in a 3 component system?
c) Write the significance of partition function?
d) What is the residual molar entropy of CO at T = 0 K?
e) Calculate the ratio of the translation partition functions of D_2 and H_2 at the same temperature and pressure.
f) Explain IHP and OHP at the electrode–electrolyte interface.
g) How is the capacitance related to the thickness of double layer in Helmholtz-Perrin model?
h) What is meant by Lippmann potential? How does it arise?
i) The exchange current density of Pt/Fe^{3+}, Fe^{2+}_{aq} is 2.5 mA cm^{-2}. Calculate the current density across the electrode at 25 ˚C maintained at 1V when $[Fe^{2+}]$ = 0.1 M and $[Fe^{3+}]$= 0.2 M (SRP = 0.771 V, β = 0.58)
j) Compare the rates of the reaction: $Ag^{+} + e^{-} \rightarrow Ag$ at η = - 0.2V and η = 0.2 V.

Q2 **a)** Write a brief account of the methods for the determination of activity coefficient of electrolytes. **(5)**
b) Illustrate Debye-Huckel limiting law. **(5)**

Q3 **a)** Derive phase rule thermodynamically and explain the terms involved in it. **(5)**
b) With the help of phase diagram briefly discuss the $NaCl\text{-}Na_2SO_4\text{-}H_2O$ system. **(5)**

Q4 **a)** Derive an expression for molecular vibration partition function of an ideal diatomic gas. **(6)**
b) The rotational constant of gaseous HCl, determined from microwave spectroscopy, is 10.59 cm^{-1}. Calculate the rotational partition function of HCl at 100 K and 500 K. **(4)**

Q5 **a)** Calculate the weight of configuration in which 20 objects are distributed in arrangement 1, 0, 3, 5, 10, 1. **(2)**
b) State the postulates of Maxwell – Boltzmann statistics and hence derive an expression for the most probable distribution. **(8)**

Q6 Discuss the Stern model for the electrode–electrolyte interface. **(10)**

Q7 Discuss the Butler -Volmer equation for different values of over potentials. **(10)**

Q8 **Write short answer on any TWO :** **(5 x 2)**

a) Principle of equipartition of energy.
b) Electrokinetic Phenomena
c) $H_2\text{-}O_2$ fuel cell