STELLA MARIS COLLEGE (AUTONOMOUS) CHENNAI-86
(For candidates admitted during the academic year 2019-20)

SUBJECT CODE: 19CH/PC/PC14

M.Sc. DEGREE EXAMINATION, NOVEMBER 2019
BRANCH IV- CHEMISTRY
FIRST SEMESTER

COURSE: CORE
PAPER : ADVANCED PHYSICALCHEMISTRY
TIME : 3 HOURS **MAX.MARKS :100**

Section- A

Answer all the questions **20x 1 =20**

Choose the correct answer:

1. Symmetry number for methane is
   (a) 2 (b) 4 (c) 8 (d) 12.
2. Rotational temperature is
   (a) $h/8\pi^2$ Ik (b) $h^2/8\pi^2$ Ik (c) $h^2/8\pi$Ik (d) h /8π Ik..
3. The variation of electrode potential with current density is given by
   (a) Pourbaix diagram (b) Electro capillary curve
   (c) Evan's diagram (d) Stern model
4. Parallel plate condenser model is also called as
   (a) Helmholtz Perrin model (b) Guoy Chapmann model
   (c) Stern model (d) None
5. The unit of adsorption coefficient is
   (a) K^{-1} (b) atm (c) atm^{-1} (d) None of these.

Fill in the blanks:

6. Tafel equation is ----------.
7. ---------- is a fermion.
8. Ionic strength of a solution depends on ---------- of solution.
   (a) molality (b) normality (c) molarity (d) both molarity and molality.
9. Lipmann potential is also called as _____.
10. The ratio of the rate of adsorption to rate of desorption is called _____.

State –True or False:

11. Partition function has dimension of energy.
12. A non- polarisable electrode always changes its potential value when small current density is applied.
13. Increase in dielectric constant causes an increase in the rate of a reaction when the transition state is more polar than the reactants.
14. The plot of amount of gas adsorbed versus temperature is called as adsorption isotherm.
15. Electrons in metals is explained by Maxwell- Boltzman statistics.

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Short answer questions:

16. What is saddle point?
17. Define – exchange current density.
18. Write BET adsorption isotherm and explain the terms involved.
19. Determine ln 10!
20. Give the significance of Lagrange multiplier β.

Section – B

Answer any five questions: **5x8 = 40**

21. (a) Calculate the rotational partition function of CO molecule if the inter nuclear distance is 1.2×10^{-10}m.
    (b) Define the terms- microstate, macrostate, ensemble and occupation number. (4+4)
22. Derive Sackur- Tetrode equation.
23. Explain the kinetics of consecutive reactions.
24. Explain Helmholtz Perrin model of electrical double layer and its limitations.
25. Derive the expressions for thermodynamic properties-free energy and enthalpy of a mono atomic gas.
26. Discuss potential energy surfaces.
27. Describe Onsager reciprocity relation.

Section – C

Answer any two questions: **2x20 = 40**

28. (a) Discuss Einstein model of heat capacity of solids. (10)
    (b) Derive Plank's radiation law and explain. (10)

29. (a) Discuss the effect of ionic strength on rates of chemical reactions., (10)
    (b) Explain the mechanism of H_2 and O_2 evolution reaction. (10)

30. (a) Derive Butler- Volmer equation for one electron transfer. (10)
    (b) Discuss any one mechanism of catalysis. (10)

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