STELLA MARIS COLLEGE (AUTONOMOUS) CHENNAI-86
(For candidates admitted during the academic year 2015-16& thereafter)

SUBJECT CODE: 15CH/PC/PC14

M.Sc. DEGREE EXAMINATION, NOVEMBER 2016
BRANCH IV- CHEMISTRY
FIRST SEMESTER

REG.NO ……..

COURSE: CORE
PAPER : ADVANCED PHYSICALCHEMISTRY
TIME : 30 MINUTES **MAX.MARKS : 20**

SECTION – A **(20x1=20)**
ANSWER ON THE QUESTION PAPER ITSELF
Answer all the questions.

I Choose the correct answer:

1. The translational partition function for $H_{2(g)}$ at 1000 K and 1 atm pressure is _____.
   a) 1.396×10^{30} (b) 1.4×10^{20} (c) 1.5×10^{10} (d) 2×10^{10}

2. The stirling's approximation is ___.
   a) $S = k \ln W$ (b) $k = S \ln W$ (c) $K = S$ (d) $K = W$

3. Bosons are _____ particles.
   (a) distinguishable (b) indistinguishable (c) macro (d) none of these

4. The rate law relates the rate of a chemical reaction to
   (a) The concentrations of reactants (b) the temperature
   (c) the activation energy (d) the reaction mechanism

II Fill in the blanks:

5. Equilibrium state is _____.
6. The E_a of a reaction whose rate constant is triples by 10^oC in temperature in the vicinity of 27^oC is _____.
7. In a galvanic cell the following reaction takes place:
   $2H_2O$ <-> $O_{2(g)} + 4H^+ + 4e^-$
   It occurs at the _____ electrode.
8. Free radical polymerization is carried out in an inert atmosphere because of _____ .

III State whether True or False:

9. In the Arrhenius equation A is activation energy.
10. The Lindemann mechanism was also suggested independently by Christiansen.
11. Dorn effect is an electro kinetic phenomenon.
12. Cracking process is a catalytic process.

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IV Match the following:

13.	E_a	(a)	Overvoltage
14.	H_2	(b)	Arrhenius parameter
15.	BET	(c)	Salt effect
16.	I	(d)	Adsorption

V Answer in one or two sentences:

17. What are microstates?

18. Explain chain reactions.

19. Define isotropic phases.

20. What are Tafel plots?

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TIME : 2½ HOURS **MAX.MARKS : 80**

SECTION – B **(5x8=40)**

Answer any five questions:

1. (a) Calculate the rotational partition function of hydrogen molecule at 273K. ($I = 0.459 \times 10^{-40} g\ cm^{-2}$).
   (b) Write partition functions for ideal gases.
2. Explain the Einstein's theory of heat capacity of solids.
3. Explain Phenomenological equations.
4. Explain Lindemann – Hinshelwood mechanism.
5. Discuss Eyring equation.
6. Evaluate the Arrhenius parameters of the reaction if the rate constant is $1.78 \times 10^{-4} L\ mol^{-1} s^{-1}$ at 19°Cand $1.38 \times 10^{-3} L\ mol^{-1} s^{-1}$ at 37°C.
7. Discuss the types of adsorption isotherms and explain determination of surface area.

SECTION – C

Answer any Two questions. **(2x20=40)**

8. Explain the following : (4 x 5 = 20)
   (a) Stirling Approximation
   (b) Onsager Reciprocity Relation
   (c) Explosion Reactions
   (d) What is the temperature of a 2 level system if energy separation equivalent to $400\ cm^{-1}$. When the population of upper state is $^1/_3$ rd of the lower state.

9. (a) Derive Butler-Volmer equation for one electron transfer. (8)
   (b) Describe over potential and electrodeposition. (5)
   (c) Write an account on H_2-O_2 fuel cells and diffuse charge model. (7)

10. Explain the following : (4 x 5 = 20)
    (a) Bose-Einstein statistics.
    (b) Transition state theory.
    (c) Lippmann equation.
    (d) Heterogeneous Catalysis.

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