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

SUBJECT CODE: 15CH/MC/PC34

B.Sc. DEGREE EXAMINATION, NOVEMBER 2016
BRANCH IV- CHEMISTRY
THIRD SEMESTER

REG.NO ……..

COURSE : MAJOR CORE
PAPER : PHYSICAL CHEMISTRY-I
TIME : 30 MINUTES **MAX.MARKS : 30**

SECTION – A (30x1=30)
ANSWER ON THE QUESTION PAPER ITSELF.
Answer all the questions.

I. Choose the Correct Answer:

1. Which of the following functions is acceptable
   a) $\Psi=x$ b) $\Psi=x^2$ c) $\Psi=\sin x$ d) $\Psi=e^{-x}$

2. The Eigen value of $d^2/dx^2=(\sin 2x)$ is
   a) 4 b) -4 c) 2 d) -2

3. The number of Bravais lattice possible are
   a) 14 b) 32 c) 7 d) 230

4. The name given to ABC, ABC, ABC type of arrangement
   a) Cubic closed packed arrangement b) Hexagonal packed arrangement
   c) Tetrahedral arrangement d) Octahedral arrangement

5. A crystalline solid does not have one of the following properties. It is
   a) Anisotropy b) sharp melting point c) Isotropy d) definite and regular geometry

6. The coordination number of body centered cubic lattice is
   a) 2 b) 4 c) 6 d) 8

7. Chemisorption generally ---------- with temperature.
   a) increases b) decreases c) remains the same d) none of these

8. The process of adsorption is
   a) endothermic b) exothermic
   c) sometimes exothermic, sometimes endothermic d) none of the above

9. For any chemical reaction at equilibrium, the rate of the forward reaction is
   a) less than the rate of the reverse reaction b) greater than the rate of the reverse reaction
   c) equal to the rate of the reverse reaction d) unrelated to the rate of the reverse reaction

10. Which of the following processes does not involve the use of a catalyst
    a) contact process b) Ostwald process
    c) Lead chamber process d) Thermite process

..2

II. Fill in the blanks:

11. Photoelectric effect was discovered by _____.
12. The condition for normalization of wave function is _____ .
13. A regular array of species in 3 dimensions is called a _____.
14. _____ Law governs X – ray diffraction in a crystal.
15. If there are 4 atoms in unit cell in a cubic centered cell, it is an example of _____.
16. _____ have the fluidity of a liquid and optical properties of a solid.
17. The adsorption of gases on metal surfaces is called _____.
18. _____ is defined as the energy liberated when 1 g mole of gas is adsorbed on the solid surface.
19. The minimum amount of energy required to start a chemical reaction is called _____.
20. _____ are catalysts found in organisms.

III. State whether true or false:

21. Black body radiation is explained by Classical mechanics.
22. Tetra ethyl lead, when added to petrol acts as an auto catalyst.
23. The Miller indices (hkl) represent the ratio of the intercepts caused by the crystal planes on the chosen axis.
24. In a cubic close packing pattern of a metallic crystal the co-ordination number is 4.
25. Freundlich isotherm is not applicable at higher pressure.

IV. Answer in a line or two:

26. Give the Schrodinger wave equation.

27. What determines the value of the crystal coordination number of a cation in an ionic lattice?

28. Define unit cell.

29. Mention any one of the assumptions of Langmuir adsorption isotherm.

30. What is a promoter?

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TIME : 2½ HOURS **MAX.MARKS : 70**

SECTION – B **(5x6=30)**

Answer any FIVE questions:

1. Explain deBroglie's relationship.
2. State and derive the Bragg's equation.
3. Discuss the symmetry elements.
4. a) Calculate the number of atoms per unit cell in a) FCC b) BCC. (3)
   b) CaO crystallises to one of the cubic systems having edge of 4.08 A^o. Calculate the number of Ca^{2+} and O^{2-} ions that belong to each unit cell. If density of CaO is 3.35 g/cm^3, also calculate the type of cubic system present. (3)
5. Discuss the common crystal defects.
6. Distinguish between physical and chemical adsorption.
7. Derive the Michaelis - Menten Equation for enzyme based catalysts.

SECTION-C

Answer any TWO questions: **(2X20=40)**

8. a) Explain the postulates of quantum mechanics. (8)
   b) Write a note on black body radiation. (5)
   c) Explain the properties of operators. (3)
   d) If A is $4x^2$, B is $\frac{d}{dx}$ and $f(x)$ is ax^3. Find whether $A + B$ commute with each other. (4)

9. a) Draw the unit cell of CaF_2 and explain its structure. (5)
   b) Write notes on liquid crystals. (5)
   c) Explain the powder method of determining the structure of a crystal. (7)
   d) Find the Miller indices for the given Weiss indices of a crystal system $2a, -3b, -3c$. (3)

10. a) Derive Langmuir adsorption isotherm. (5)
    b) Discuss acid base catalysis with an example. (5)
    c) Give the equation of BET adsorption isotherm and discuss its postulates. (6)
    d) Discuss the effect of temperature and pH on enzyme catalyzed reactions. (4)