

STELLA MARIS COLLEGE (AUTONOMOUS) CHENNAI-86
(For candidates admitted during the academic year 2008 – 09)

SUBJECT CODE: CH/PC/SI14

M.Sc. DEGREE EXAMINATION, NOVEMBER 2008
BRANCH IV- CHEMISTRY
FIRST SEMESTER

REG.NO

COURSE: MAJOR CORE

PAPER : STRUCTURAL INORGANIC CHEMISTRY

TIME : 30 MINUTES

MAX.MARKS : 100

SECTION – A

(20x1=20)

TO BE ANSWERED ON THE QUESTION PAPER ITSELF.

Answer all the questions:

Choose the correct answer:

- Crystal structure of NaCl is
a) fcc b) bcc c) both a and b d) none
- Which defect causes decrease in the density of the crystals?
a) Frenkel b) Schottky c) interstitial d) all the three
- Three centred bond is present in
a) NH₃ b) B₂H₆ c) BCl₃ d) AlCl₃
- On heating with carbon, which of the following elements do not form carbides.
a) B b) Al c) In d) Ga
- If the distance between Na⁺ and Cl⁻ ions in the NaCl crystal is 'a' pm, what is the length of the cell edge
a) 2a pm b) $\frac{2}{a}$ pm c) 4a pm d) $\frac{a}{4}$ pm
- The substance which possesses zero resistance at 0°K is called
a) conductor b) superconductor c) insulator d) semiconductor
- The sequence of ν_{CO} stretching of Cr(CO)₆, V(CO)₆⁻ and Cr(CO)₃ dien is
a) Cr(CO)₆ > V(CO)₆⁻ > Cr(CO)₃ dien
b) V(CO)₆⁻ > Cr(CO)₆ > Cr(CO)₃ dien
c) Cr(CO)₃ dien > Cr(CO)₆ > V(CO)₆⁻
d) Cr(CO)₃ dien > V(CO)₆⁻ > Cr(CO)₆
- (NH₄)₂MoO₄ is used to test
a) C₂O₄²⁻ b) PO₄³⁻ c) CH₃COO⁻ d) CrO₄²⁻

9. Boranes have the general formula
 a) $B_n H_{n+1}$ b) $B_n H_{2n+2}$ c) $B_{2n} H_{n+4}$ d) $B_n H_{n+6}$
10. Madelung constant depends on
 a) electronic charge b) charge of anions and cations in the crystal
 b) size of the ions d) geometry of the crystal

Fill in the blanks:

11. Germanium is an example of _____ type semiconductor.
12. Complete the reaction

$$\begin{array}{c} \text{CH}_3 \\ \diagdown \\ \text{C} \\ \diagup \\ \text{H} \end{array} = \begin{array}{c} \text{H} \\ \diagdown \\ \text{C} \\ \diagup \\ \text{CHO} \end{array} + \text{C}_2\text{H}_5\text{MgBr} \rightarrow$$
13. Complete the reaction

$$\text{Na}_2\text{MoO}_4 + \text{HCl} + \text{SnCl}_2 \rightarrow$$
14. Coordination number of Na^+ ions in the unit lattice of NaCl is _____.
15. EAN (effective atomic number) of metal in $\text{V}(\text{CO})_6$ is _____

Answer in one or two lines:

16. State Bragg's equation.
17. What are super conductors?
18. Why are the transition metal aryls more stable than transition metal alkyls?
19. Predict the value of n , using 18 e^- rule in $(\eta^5 - \text{C}_5\text{H}_5)\text{Co}(\text{CO})_n$
20. What is fluxional behaviour of organometallic compounds?



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TIME : 2½ HOURS

MAX.MARKS : 80

SECTION – B

(5x8=40)

ANSWER ANY FIVE QUESTIONS:

1. Describe the conduction behaviour metals using Band theory.
2. Explain the principles involved in electron and neutron diffraction studies. (4+4)
3. Explain the structure of CaF_2 .
4. What are organometallic compounds? How are they classified? Explain with examples.
5. Explain the 'synergic effect' in the bonding of carbonyl ligands with metals?
6. What are silicates? Draw the structure of four different types of silicate and give the name and formula of one of each type.
7. Briefly explain the preparation, properties and structure of iso & heteropolyacids of Mo.

SECTION – C

ANSWER ANY TWO QUESTIONS:

(2 X 20 = 40)

8. What is lattice energy? How is it determined theoretically and experimentally?
9. a) Discuss the bonding in ferrocene using molecular orbital energy level diagram.
b) Describe the various reactions of ferrocene indicating its aromatic characters.
10. a) What are Wade's rules? Discuss the applications of these rules in classifying carboranes into closo, nido and arachno carboranes. (12)
b) What are metal carbides? How are they classified? (6)
c) Write short notes on silicones.

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