

STELLA MARIS COLLEGE (AUTONOMOUS) CHENNAI-86
(For candidates admitted during the academic year 2009 – 10 & thereafter)
SUBJECT CODE: CH/PC/SI14
M.Sc. DEGREE EXAMINATION, NOVEMBER 2010
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:

- Which of the following has Frenkel defects?
a) sodium chloride b) graphite c) silver bromide d) diamond
- The number of atoms per unit cell is 2, the arrangement is
a) octahedral b) fcc c) bcc d) none of these
- With increase in temperature, the conductivity of metal
a) increases b) decreases c) remains unaffected d) may increase or decrease
- The $C - O$ bond order of the isoelectronic and isostructural species of $Ni(CO)_4, Co(CO)_4^-, [Fe(CO)_4]^{2-}$
a) $Ni(CO)_4 > [Fe(CO)_4]^{2-} > [Co(CO)_4]^-$
b) $[Fe(CO)_4]^{2-} > Ni(CO)_4 > [Co(CO)_4]^-$
c) $Ni(CO)_4 > [Co(CO)_4]^- > [Fe(CO)_4]^{2-}$
d) none of these
- Replacement of CO by NO^- in $Fe(CO)_5$ gives
a) $Fe(NO)_4$ b) $Fe(NO)_5$ c) $Fe(NO)_3$ d) none of these
- Ferrocene is diamagnetic and
a) 18 electron species b) 20 electron species
c) 16 electron species d) 24 electron species
- The number of $3e, 2e^-$ bridge bond in $Al_2(CH_3)_6$ is
a) 2 b) 0 c) 1 d) 3
- Organosilicon polymer is
a) pyrosilicate b) zeolite c) carborundum d) silicones
- A well known example of heteropoly tungstic acid is
a) Marshal's acid b) H_3PO_4 c) H_3WO_4 d) $H_3PO_4 \cdot 12WO_3$
- An example for saline carbide is
a) CaC_2 b) Fe_3C c) SiC d) none of these

Fill in the blanks:

11. As a result of Schottky defect, the density of the crystal _____.
12. *F* - centres are lattice sites containing _____.
13. Electricity produced on applying stress is called _____.
14. The magnetic nature of nickelocene ($20e^-$) is _____.
15. The structure of $[B_6H_6]^{2-}$ is _____.

Answer in a word or in a sentence:

16. What is lattice energy?
17. What is Bragg's law?
18. What is meant by hapticity of a ligand?
19. Give the names of B_4H_{10} and B_5H_9 .
20. Name any one organometallic compound used as a catalyst.

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TIME : 2½ HOURS

MAX.MARKS : 80

SECTION – B

(5x8=40)

ANSWER ANY FIVE QUESTIONS:

1. Discuss the structure of (a) Rutile b) $NaCl$
2. How does Born equation help in calculating the lattice energy theoretically? What conclusion can be drawn from the equation.
3. How does band theory explain the conducting behavior of metals, n-type and p-type semiconductors.
4. Explain the concept of back bonding in metal nitrosyl using molecular orbital theory.
5. Discuss the preparation, properties and industrial applications of organometallic compounds of magnesium.
6. Discuss the structure and different types of bonding in diborane.
7. What are silicates? Draw the structure of four different types of silicates and give the name and formula of one example of each type.

SECTION – C

ANSWER ANY TWO QUESTIONS:

(2 X 20 = 40)

8. a) What types of defects are commonly produced in crystals? Discuss in detail about.
(i) Schottky defect (ii) Frenkel defect (4+3+3)
b) Discuss the principles involved in the electron diffraction studies.
9. a) Discuss the bonding and explain the properties of aromaticity of ferrocene using MO theory.
b) What are organometallic compounds? How are they classified?
10. a) What are carbides? Describe the structure of silicon carbide. Give its important uses in industry.
b) Apply Wade's rule to interpret the structure of (i) B_4H_{10} (ii) $B_{10}C_2H_{12}$

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