Chemistry
Assignment No: 1
(The Solid State)

Q1. Which point defect in crystal does not affect the density of the relevant solid?

Q2. What are F-centres?

Q3. What makes the crystal of KCl appear sometimes violet?

Q4. Which point defect decreases the density of solid?

Q5. How many octahedral voids are there in 1 mole of compound having cubic close packed structure?

Q6. How many Cs^+ ion occupy second nearest neighbour locations to a central Cs^+ ion in CsCl crystal?

Q7. What are the non-stoichiometry defect of a crystal?

Q8. What type of defect can arise when a solid is heated?

Q9. Classify each of the following as being either a P-type or N-type semi conductor:
1) Ge doped with In.
2) B doped with Si

Q10. Explain how much portion of an atom is located at the:
(i) corner and (ii) body centre of a cubic unit cell is part of its neighbouring unit cell.

Q11. Account for the following:
a) Zinc Oxide on heating becomes yellow.
b) Frenkel defect does not change the density of AgCl crystal.

Q12. With the help of suitable diagrams, on the basis of band theory, explain the difference between:
1) a conductor and an insulator.
2) a conductor and a semi-conductor.

Q13. Explain the following properties giving suitable examples:
1) Ferromagnetism
2) Para magnetism
3) Diamagnetism

Q14. An element X with atomic mass of 60 g/mol had density of 6.23 g $cm^{-3.}$ If the edge length of its cubic unit cell is 400pm, identify the type of cubic unit cell.

Calculate the radius of this element.

Q15. An element E crystallizes in bcc structure. If the edge length of the cell is 1.496 X 10^{-10}m and the density is 19.3gcm$^{-3.}$ Calculate the atomic mass of the element. Also calculate the radius of an atom of this element.

Q16. a) With reference to a crystal structure what is meant by coordination number.

b) What is the Co-ordination number of atoms?

1) In a cubic close packed structure?
2) In a body centred cubic structure?

Q17. Calculate the density of silver which crystallizes in the fcc structure. The distance between the nearest silver atoms in the structure is 287 pm. Molar mass of Ag =107.87 g/mol. (NA=6.02X 10^{23} mol^{-1}) .

Q18. Br^- ions form close pack structure. If the radius of Br^-ion is 195pm. Calculate the radius of cation that just fits in the tetrahedral hole.
Can a cation A^+ having radius of 82pm be slipped into the octahedral hole of the crystal A^+Br^-

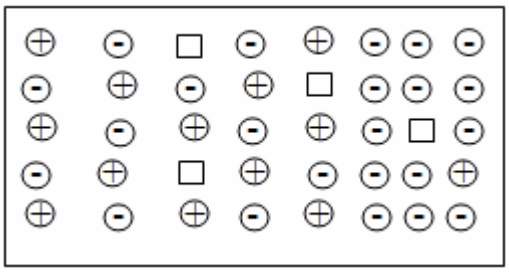
Q19. Account for the following:

a) Silicon is an insulator but Si doped with P acts as a semi conductor.

Q20. Give difference between tetrahedral and octahedral voids.

Q21. KCN has a density of 1.52 gcm^{-3} and crystallises in NaCl type structure. Calculate the distance between K^+ and CN^{--} (Atomic Mass of K=39, C=12, N=14)

Q22. Examine the illustration of a portion of defective crystal given below and answer the following questions:



i. What are these types of vacancy defects called?
ii. How is density and stoichiometry of the compound affected?
iii. Name an ionic compound which can show this type of defect in the crystalline state.