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Class:-XII (Sci.)

Name of Student.....

Subject:- Chemistry

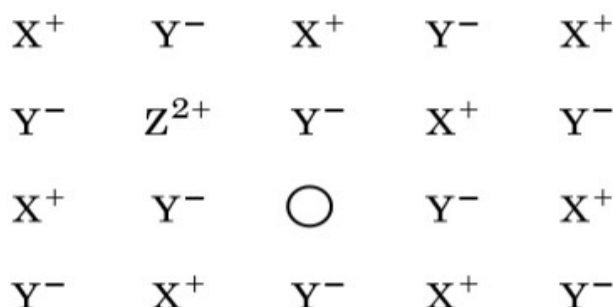
**Chapter-1: SOLID STATE**  
**(10 YEAR Questions)**

1. (i) (a) Following is the schematic alignment of magnetic moments :



What type of magnetism is shown by this substance?


- (b) What type of stoichiometric defect is shown by (i)  $KCl$  (ii)  $AgCl$ ?  
(ii) An element with density  $11.2 \text{ g cm}^{-3}$  forms a fcc lattice with edge length of  $4 \times 10^{-8} \text{ cm}$ . Calculate the atomic mass of the element. ( $N_A = 6.02 \times 10^{23} \text{ mol}^{-1}$ )
2. Silver metal crystallizes with a face centered cubic lattice. The length of the unit cell is found to be  $3.0 \times 10^{-8} \text{ cm}$ . Calculate atomic radius and density of silver. (Molar mass of  $Ag = 108 \text{ g mol}^{-1}$ ,  $N_A = 6.02 \times 10^{23} \text{ mol}^{-1}$ ).
3. (a) What is the radius of sodium atom if it crystallizes in bcc structure with the cell edge of  $400 \text{ pm}$ ?  
(b) Examine the given defective crystal:



- (i) Write the term used for this type of defect.  
(ii) What is the result when  $XY$  crystal is doped with divalent ( $Z^{2+}$ ) impurity?

4. What is the formula of a compound in which the element  $P$  forms ccp lattice and atoms of  $Q$  occupy  $2/3$ rd of tetrahedral voids?

5. (a) An element has atomic mass  $93 \text{ g mol}^{-1}$  and density  $11.5 \text{ g cm}^{-3}$ . If the edge length of its unit cell is  $300 \text{ pm}$ , identify the type of unit cell.  
(b) Write any two differences between amorphous solids and crystalline solids.
6. (a) Calculate the number of unit cells in  $8.1 \text{ g}$  of aluminium if it crystallizes in an f.c.c. structure. (Atomic mass of  $\text{Al} = 27 \text{ g mol}^{-1}$ )  
(b) Give reasons:  
(i) In stoichiometric defects,  $\text{NaCl}$  exhibits Schottky defect and not Frenkel defect.  
(ii) Silicon on doping with Phosphorus forms n-type semiconductor.  
(iii) Ferrimagnetic substances show better magnetism than antiferromagnetic substances.
7. An element crystallizes in a f.c.c. lattice with cell edge of  $400 \text{ pm}$ . The density of the element is  $7 \text{ g cm}^{-3}$ . How many atoms are present in  $280 \text{ g}$  of the element?
8. What type of magnetism is shown by a substance if its domains are arranged in equal number and in opposite directions?
9.  $\text{ZnO}$  turns yellow on heating, why?
10. What would be the nature of the solid if there is no energy gap between valence band and conduction band?
11. An element crystallizes in a b.c.c. lattice with cell edge of  $400 \text{ pm}$ . Calculate the density if  $250 \text{ g}$  of this element contains  $2.5 \times 10^{24}$  atoms.
12. An element crystallizes in a b.c.c. lattice with cell edge of  $500 \text{ pm}$ . The density of the element is  $7.5 \text{ g cm}^{-3}$ . How many atoms are present in  $300 \text{ g}$  of the element?
13. An element crystallizes in a f.c.c. lattice with cell edge of  $250 \text{ pm}$ . Calculate the density if  $300 \text{ g}$  of this element contains  $2.0 \times 10^{24}$  atoms.
14. What is the formula of a compound in which the element Y forms ccp lattice and atoms of X occupy  $1/3$ rd of tetrahedral voids?
15. An element with molar mass  $27 \text{ g mol}^{-1}$  forms a cubic unit cell with edge length  $4.05 \times 10^{-8} \text{ cm}$ . If its density is  $2.7 \text{ g cm}^{-3}$ , what is the nature of the cubic unit cell?
16. How many atoms constitute one unit cell of a face centered cubic crystal?
17. (a) What type of semiconductor is obtained when silicon is doped with boron ?  
(b) What type of magnetism is shown in the following alignment of magnetic moments ?  



(c) What type of point defect is produced when  $\text{AgCl}$  is doped with  $\text{CdCl}_2$  ?
18. Explain how you can determine the atomic mass of an unknown metal if you know its mass density and the dimensions of unit cell of its crystal.
19. Calculate the packing efficiency of a metal crystal for a simple cubic lattice.
20. Calculate the number of unit cells in  $8.1 \text{ g}$  of aluminium if it crystallizes in a face-centered cubic (f.c.c.) structure. (Atomic mass of  $\text{Al} = 27 \text{ g mol}^{-1}$ )
21. (i) Write the type of magnetism - observed when the magnetic moments are appositively aligned and cancel out each other.  
(ii) Which stoichiometric defect does not change the density of the crystal?

22. An element with density  $2.8 \text{ g cm}^{-3}$  forms a f.c.c. unit cell with edge length  $4 \times 10^{-8} \text{ cm}$ . Calculate the molar mass of the element. (Given:  $N_A = 6.022 \times 10^{23} \text{ mol}^{-1}$ ).
23. How may the conductivity of an intrinsic semiconductor be increased?

24. Copper crystallises with face centred cubic unit cell. If the radius of copper atom is  $127.8 \text{ pm}$ , calculate the density of copper metal.  
(Atomic mass of Cu =  $63.55 \text{ u}$  and  
Avogadro's number  $N_A = 6.02 \times 10^{23} \text{ mol}^{-1}$ )

OR

Iron has a body centred cubic unit cell with the cell dimension of  $286.65 \text{ pm}$ . Density of iron is  $7.87 \text{ g cm}^{-3}$ . Use this information to calculate Avogadro's number. (Atomic mass of Fe =  $56.0 \text{ u}$ )

25. Crystalline solids are anisotropic in nature. What does this statement mean?
26. Silver crystallizes in face-centered cubic unit cell. Each side of this unit cell has a length of  $400 \text{ pm}$ . Calculate the radius of the silver atom. (Assume the atoms just touch each other on the diagonal across the face of the unit cell. That is each face atom is touching the four corner atoms.)
27. What type of interactions holds the molecule together in a polar molecular solid?
28. The density of copper metal is  $8.95 \text{ g cm}^{-3}$ . If the radius of copper atom be  $127.8 \text{ pm}$ , is the copper unit cell simple cubic, body-centred cubic or face-centred cubic ?  
(Given : atomic mass of Cu =  $63.54 \text{ g mol}^{-1}$  and  $N_A = 6.02 \times 10^{23} \text{ mol}^{-1}$ )
29. What is the coordination number of each type of ions in a rock-salt type crystal structure?
30. What is a semiconductor? Describe the two main types of semiconductors and explain mechanisms for their conduction.
31. What type of substances exhibit antiferromagnetism?
32. Define the 'forbidden zone' of an insulator.
33. Niobium (Nb) crystallizes in a body-centered cubic (bcc) structure. If its density is  $8.55 \text{ g cm}^{-3}$ , calculate the atomic radius of niobium.  
(Atomic mass of Nb =  $93 \text{ u}$ ;  $N_A = 6.02 \times 10^{23} \text{ mol}^{-1}$ )
34. Explain with suitable examples the following : (a) n-type and p-type semiconductors  
(b) F-centers (c) Ferromagnetism

35. Which crystal defect lowers the density of a solid?
36. Name an element with which silicon may be doped to give a p-type semiconductor.
37. Which point defect in crystals does not alter the density of the relevant solid?
38. Iron has a body-centered cubic unit cell with a cell edge of 286.65 pm. The density of iron is  $7.87 \text{ g cm}^{-3}$ . Use this information to calculate Avogadro's number (At. mass of Fe =  $56 \text{ g mol}^{-1}$ ).
39. How do metallic and ionic substances differ in conducting electricity?
40. Silver crystallizes with face-centered cubic unit cells. Each side of the unit cell has a length of 409 pm. What is the radius of an atom of silver? (Assume that each face atom is touching the four corner atoms.)
41. The well known mineral fluorite is chemically calcium fluoride. It is known that in one unit cell of this mineral there are 4  $\text{Ca}^{2+}$  ions and 8  $\text{F}^{-}$  ions and that  $\text{Ca}^{2+}$  ions are arranged in a fcc lattice. The  $\text{F}^{-}$  ions fill all the tetrahedral holes in the face centered cubic lattice of  $\text{Ca}^{2+}$  ions. The edge of the unit cell is  $5.46 \times 10^{-8} \text{ cm}$  in length. The density of the solid is  $3.18 \text{ g cm}^{-3}$ . Use this information to calculate Avogadro's number (Molar mass of  $\text{CaF}_2 = 78.08 \text{ g mol}^{-1}$ )
42. What type of interactions hold the molecules together in a polar molecular solid?
43. What type of semiconductor is obtained when silicon is doped with arsenic?
44. Silver crystallizes in fcc lattice. If the edge length of the unit cell is  $4.07 \times 10^{-8} \text{ cm}$  and the density of the crystal is  $10.5 \text{ g cm}^{-3}$ , calculate the atomic mass of silver. ( $N_A = 6.02 \times 10^{23} \text{ atoms mol}^{-1}$ )
45. The density of lead is  $11.35 \text{ g cm}^{-3}$  and the metal crystallizes with FCC unit cell. Estimate the radius of lead atom. (At. mass of lead =  $207 \text{ g mol}^{-1}$  and  $N_A = 6.02 \times 10^{23} \text{ mol}^{-1}$ ).

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**CHEMISTRY EXPERT**

“Mr. Rakesh Kumar”