



CHEMISTRY

NCERT - NCERT CHEMISTRY(TELUGU)

THE SOLID STATE

Example

1. A compound is formed by two elements X and Y. Atoms of the element Y (as anions) make ccp and those of the element X(as cations) occupy of the octahderal voids . What is the formula of the compound ?

2. Atoms of element B form hcp lattice and those of the element A occupy $2/3^{rd}$ of tetrahedral voids . What is the formula of the compound formed by the element A and B ?

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3. An element has a body-centred cubic (bcc) structure with a cell edge of 288 pm . The density of the element is 7.2 g/cm^3 . How many atoms are present in 208 g of the element ?



4. X-ray diffraction studies show that copper crystallises in an fcc unit cell with cell edge of 3.608×10^{-8} cm . In a separate experiment , copper is determined to have a density of 8.92 g/cm³, calculate the atomic mass of copper.

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5. Silver forms ccp lattice and X-ray studies of its crystals

show that the edge length of its unit cell is 408.6 pm.

Calculate the density of silver

(Atomic mass = 107.9 u).



1. Why are solids rigid ?

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2. Why do solids have a definite volume ?



3. Classify the following as amorphous or crystalline solids : polyurethane , naphthalene , benzoic acid , teflon , potassium nitrate , cellophane , polyvinyl chloride , fibre glass , copper .



same value along all directions . Comment on the nature of this solids . Would it show cleavage property ?



6. Classify the following solids in different categories based on the nature of intermolecular forces operating in them :

Potassium sulphate , tin , benzene , urea , ammonia ,

water , zinc sulphide , graphite , rubidium , argon , silicon carbide .



7. Solid 'A' is a very hard electrical insulator in solid as well as in molten state and melts at extremely high temperature . What type of solid is it ?

8. Ionic solids conduct electricity in molten state but not

in solid state . Explain .



9. What type of solids are electrical conductors , malleable and ductile ?

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10. Give the significance of a lattice point .



11. Name the parameters that characterise a unit cell .

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12. Distinguish between hexagonal and monoclinic unit cells .
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13. Explain how much portion of an atom located at

Corner?

14. What is the two dimensional coordination number of

a molecule in square close packed layer ?



15. A compound forms hexagonal close-packed structure

. What is the total number of voids in 0.5 mol of it ? How

many of these are tetrahedral voids?



16. A compound is formed by two elements M and N . The element N forms ccp and atoms of M occupy $\frac{1}{3}$ rd of tetrahedral voids . What is the formula of the compound ?

i) Find the number of tetrahedral voids as number of tetrahedral voids = $2 \times$ number of atoms present in the lattice .

ii) Calculate the number of atoms (or ratio) of elements
M and N as a chemical formula represents the number
of atoms of different elements presents in a compound .
iii) Derive the formula .



17. Which of the following lattices has the highest packing efficiency?i) Simple cubic ii) Body- centred cubic iii) Hexagonal close-packed lattice

Packing efficiency in

- i) Simple cubic lattice = 52.4 %
- ii) body-centred cubic lattice = 68 %
- iii) Hexagonal close-packed lattice = 74 %

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18. An element with molar mass $2.7 \times 10^{-2} kgmol^{-1}$ forms a cubic unit cell with edge length 405 pm . If its density is $2.7 \times 10^{3} kgm^{-3}$ what is the nature of the cubic unit cell ?

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

? Physical property is affected by it and in what why ?



20. What type of stoichiometric defect is shown by

ZnS



21. Explain how vacancies are introduced in an ionic solid when a cation of higher valence is aded as an impurity in it ?





22. Ionic solids , which have anionic vacancies due to

metal excess defect, develop colour.

Explain with the help of a suitable example .



23. A group 14 elements is to be converted into n- type

semiconductor by doping in with a suitable impurity. To

which group shouyld theis impurity belong?



24. What type of substances would make better permanent magnets, ferromagnetic or ferrimagnetic ? Justify your answer

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1. Define the term amorphous.



2. What makes a glass different from a solid such as quartz? Under what conditions could quartz be converted into glass?

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3. Classify each of the following solids as ionic, metallic,

molecular, network (covalent) or amorphous.

(i) Tetra phosphorus decoxide (P_4O_{10})	(vii) Graphite
(ii) Ammonium phosphate $(NH_4)_3 PO_4$	(viii) Brass
(iv) SiC	(ix) Rb
${\rm (iv)} \hspace{0.1in} I_2$	(x) $LiBr$
(vi) Plastic	(xi) Si

4. (i) What is meant by the term 'coordination number'?

(ii) What is the coordination number of atoms:

(a) in a cubic close-packed structure?

(b) in a body-centred cubic structure?

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5. How do you determine the atomic mass of an unknown metal if you know its density and dimension of its unit cell ? Explain .



6. Stability of a crystal is reflected in the magnitude of its melting points'. Comment. Collect melting points of solid water, ethyl alcohol, diethyl ether and methane from a data book. What can you say about the intermolecular forces between these molecules?



7. How will you distinguish between the following pairs of terms:

(i) Hexagonal close-packing and cubic close-packing?

(ii) Crystal lattice and unit cell?

(iii) Tetrahedral void and octahedral void?

8. How many lattice points are there in one unit cell of

face centered cubic lattice

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9. Explain

(i) The basis of similarities and differences between metallic and ionic crystals.

(ii) Ionic solids are hard and brittle.



10. Calculate the efficiency of packing in case of a metal

of body centered cubic crystal .



11. Silver crystallizes in FCC lattice . If edge of the cell is 4.07×10^{-8} and density is $10.5g.\ cm^3$. Calculate the atomic mass of silver .

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12. A cubic solid is made of two elements P and Q . Atoms of Q are at the corners of the cube and P at the

body - centre . What is the formula of the compound ?

What are the coordination numbers of P and Q?

Watch Video Solution 13. Niobium crystallizes in body - centered cubic structure . If density is 8.55 g cm^{-3} , calculate atomic radius of niobium using its atomic mass 93 U. Watch Video Solution

14. If the radius of the octahedral void is r and radius of

the atoms in close packing is R , derive relation between

r and R .



15. Copper crystallizes into a FCC lattice with edge length 3.61×10^{-8} cm . Show that the calculated density is in agreement with its measured value of $8.92g.\ cm^{-3}$.

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16. Analysis shows that nickel oxide has the formula $Ni^{0.98}0, 1.00$, what fractions of nickel exist as Ni^{2+} and Ni^{3+} ions ?

17. Describe the two main types of semiconductors and

contrast their conduction mechanism .



18. Non-stoichiometric cuprous oxide, Cu_2O can be prepared in laboratory. In this oxide, copper to oxygen ratio is slightly less than 2:1. Can you account for the fact that this substance is a p-type semiconductor?



19. Ferric oxide crystallizes in a hexagonal close - packed array of oxide ions with two of every three octahedral holes occupied by ferric ions . Derive the formula of ferric oxide .



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20. Classify each of the following as either a p-type or a

n -type semiconductor.

1. Ge doped with In 2 . Si doped with B .



21. Gold (atomic radius = 0.144 nm) crystallizes in a face centered unit cell . What is the length of a side of the unit cell ?

• Watch Video Solution 22. In terms of band theory , what is the difference between a conductor and an insulator ?

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23. Explain the following terms with suitable examples:

(i) Schottky defect (ii) Frenkel defect (iii) Interstitials and



24. Aluminium crystallizes in a cubic close packed structure. Its metallic radius is 125 pm .

What is the length of the side of the unit cell .



25. In NaCl is doped with $1 imes 10^{-3}$ mol percent of

 $SrCl_2$, what is the concentration of cation vacancies ?

26. Explain the following with suitable examples:

- (i) Ferromagnetism
- (ii) Paramagnetism
- (iii) Ferrimagnetism
- (iv) Antiferromagnetism
- (v) 12-16 and 13-15 group compounds.