CHEMISTRY

BOOKS - KUMAR PRAKASHAN KENDRA

CHEMISTRY (GUJRATI ENGLISH)

THE SOLID STATE

Section A Try Yourself

1. Calculate the number of atoms in a cubic based unit cell having one atom at each

corner and two atoms on each diagonal.

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2. In a compound AB_2O_4 oxide ions are arranged in ccp, cations A are present in octahedral voids and cations B are equally distributed between tetrahedral and octahedral voids. What percentage of octahedral voids are occupied ?

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3. A compound is made of three elements A, B and C. Atoms A form face centred cubic cell. Atoms B occupies all octahedral voids and atoms C occupies all tetrahedral voids. If all atoms across one body diagonal are removed, calculate the formula of a compound.

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4. An element crystallizes in body - centred cubic structure. If the edge length of the unit

cell is 400 pm . Calculate interatomic distance in the crystal.

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5. The radius of atom is 300 pm. If it crystallizes in a face-centred cubic lattice, calculate the distance between nearest neighbour.

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6. Predict the close packed structure of an ionic compound A^+B^- in which the radius of cation and anion are 148 pm and 195 pm respectively.

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7. A body centred cubic element of density 10.3g cm^3 has a cell edge of 314 pm. Calculate the atomic mass of element.

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8. Lithium borohydride crystallizes in an orthorhombic system. With four molecules per unit cell. The unit cell dimensions are $a = 6.8A^{\circ}, b = 4.4A^{\circ}$ and $c = 7.2A^{\circ}$. If the molar mass is 21.76, calculate the density of a crystal.

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9. The crystal of CsBr has edge length of 437 pm. If the density of the crystal is 4.24g cm^{-3},

determine the type of crystal structure of CsBr

(At. mass of Cs = 133, Br = 80)

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10. Iron occurs as body-centred as well as face centred cubic systems. If the effectiveness radius of an atom of iron is 124 pm, calculate the density of iron in both the structures.

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11. Calcium crystallizes in Face-centred cubic lattice with edge length equals to 556 pm. calculate the density if : (i) There is 0.1% Schottky defect (ii) There is 0.1 % Frenkel defect

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Section A Questions

1. Why liquids and gases are called fluids while solids are rigid ?

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2. On what factors do the stability of the state of matter depends upon ?

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3. Enlist the characteristic properties of solid state.

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4. Explain crystalline and amorphous solids.

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5. Differentiate Crystalline solids and Amorphous solids.

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6. What is anisotropy ? Explain.

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7. Give classification of crystalline solids.

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8. Write a note on ionic solids or electrovalent solids. State its properties.

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9. What are covalent solids ? Give example and state its properties.

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10. Explain why graphite is good conductor of electricity ?

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11. What are molecular solids ? State its types.

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12. Explain types of molecular solids.

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13. Write a note on metallic solids.

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14. What is crystal lattice ? How it is formed ?

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15. Enlist the characteristics of crystal lattice.

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16. What are unit cells ? State its types.

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17. Enlist the characteristics of unit cell.

View Text Solution

18. Explain different types of unit cells.

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19. Explain how each sphere (particles) contributes in formation of particular unit cell.

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20. Calculate the number of atoms per unit cell in primitive, body centred and face centred cubi unit cells.

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21. Explain close packing in one dimension.

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22. Explain close packing in two dimensions.

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23. Explain three dimensional close packing from two dimensional square close-packing.

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24. How the primitive cubic unit cell is obtained ?

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25. Explain three dimensional close packing from two dimensional hexagonal close packing.

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26. Explain formation of face centred cubic unit cell and hexagonal close packing in three dimensions.

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27. Write a note on interstitials

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28. Write a note on Voids.

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29. How the formula of a compound can be known on the basis of voids filled in a lattice structure ?

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30. Explain how the voids can be located in a crystal lattice ?

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31. What is packing efficiency ?

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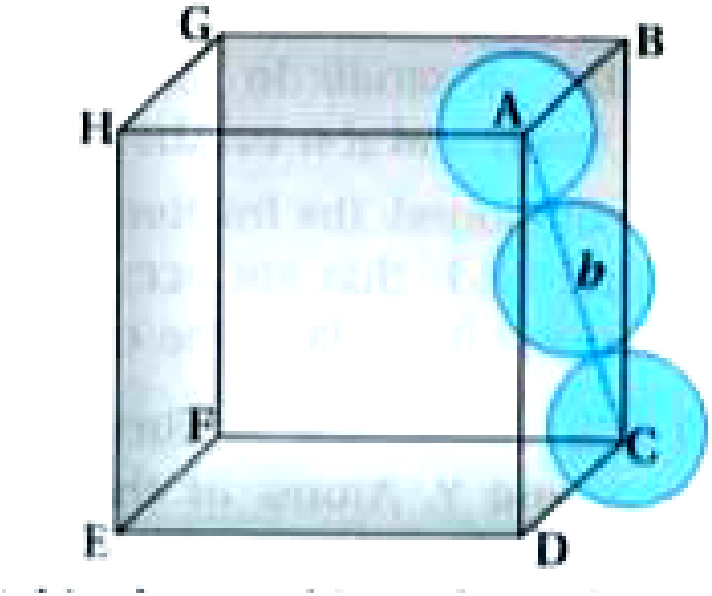
32. Calculate packing efficiency in HCP and CCP structures.



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33. Calculate packing efficiency in body-centred cubic structure.

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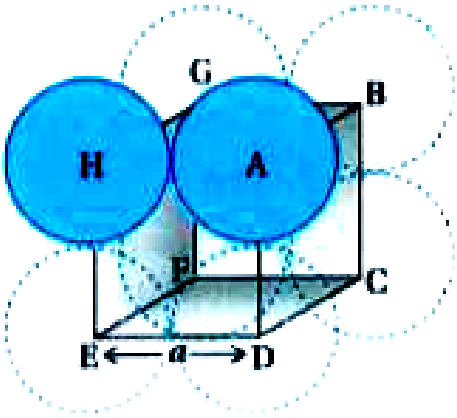
34. Calculate the packing efficiency in simple cubic unit cell.



Simple cubic unit cell. The spheres are in contact with each other along the edge of the cube.

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35. How the density of an unit cell is calculated ?

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36. Derive the expression to calculate density of unit cell.

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37. What are imperfections or defects in solids ?

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38. What are atomic defects ? State its types.

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39. What are point defects and stoichiometric defects?

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40. Explain vacancy and interstitial defects.

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41. Explain stoichiometric defects shown by non ionic solids.

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42. Explain Schottky defect and Frenkel defect.

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43. Explain stoichiometric defects shown by ionic solids.

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44. Write a short note on non-stoichiometric defects.

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45. Explain metal excess defects.

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46. Explain metal deficiency defects.

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47. Explain defects caused by impurity in ionic solids.

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48. Classify solids on basis of electrical conductivities.

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49. Explain conduction of electricity in metals.

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50. What are intrinsic semiconductors ?

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51. What are extrinsic semiconductors ?

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52. Explain doping.

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53. Explain n-type and p-type semiconductors.

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54. Give applications of n-type and p-type semiconductors.

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55. Explain the cause of magnetism in a substance.

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56. Explain origin of magnetic properties in a substance.

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57. Explain paramagnetism and diamagnetism.

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58. Write a note on Ferromagnetism.

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59. Explain antiferromagnetism.

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60. Explain Ferrimagnetism.

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Section A Examples

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 all the octahedral voids. What is the formula of the compound ?

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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 elements 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 $7.2 \mathrm{g/cm}^3$. How many atoms are present in 280 g of the element ?

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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 $8.92 \mathrm{g/cm}^3$, 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).

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Section B Intext Questions And Answers

1. Why are solids rigid ?

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2. Why do solids have a definite volume ?

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

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4. Refractive index of a solid is observed to have the same value along all directions. Comment on the nature of this solid. Would it show cleavage property ?

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5. 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.

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6. 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?

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7. Ionic solids conduct electricity in molten state but not in solid state. Explain.

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

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9. Give the significance of a 'lattice point'.

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10. Name the parameters that characterise a unit cell.

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11. Distinguish between

(i) Hexagonal and monoclinic unit cells

(ii) Face-centred and end-centred unit cells.

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

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13. What is the two dimensional coordination number of a molecule in square close-packed layer ?

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14. 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?

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15. A compound is formed by two elements M and N. The element N forms ccp and atoms of

M occupy $\left(\frac{1}{3}\right)^{rd}$ of tetrahedral voids. What is the formula of the compound ?

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16. Which of the following lattices has the highest packing efficiency (i) simple cubic (ii) bodycentred cubic and (iii) hexagonal close-packed lattice ?

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

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18. What type of defect can arise when a solid is heated ? Which physical property is affected by it and in what way?

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19. What type of stoichiometric defect is shown by : (i) ZnS (ii) AgBr

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

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21. Ionic solids, which have anionic vacancies due to metal excess defect, develop colour. Explain with the help of a suitable example.

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22. A group 14 element is to be converted into ntype semiconductor by doping it with a suitable impurity. To which group should this impurity belong ?

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

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Section C Textual Exercise

1. Define the term 'amorphous'. Give a few examples of amorphous solids.

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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})

(ii) Ammonium phosphate $(NH_4)_3PO_4$

(iii) SiC (viii) Brass

(iv) I_2 (ix) Rb

(v) P_4 (x) LiBr

(vi) Plastic (ix) Si

(vii) Graphite .

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

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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 ?

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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 ?

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8. How many lattice points are there in one unit cell of each of the following lattice ?

(i) Face-centred cubic

(ii) Face-centred tetragonal

(iii) Body-centred

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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.

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10. Silver crystallises in fcc lattice. If edge length of the cell is 4.07×10^{-8} cm and density is $10.5 \mathrm{g\ cm}^{-3}$, calculate the atomic mass of silver.

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11. 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?

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12. Niobium crystallises in body-centred cubic structure. If density is $8.55 \mathrm{g\,cm^{-3}}$, calculate atomic radius of niobium using its atomic mass 93 u.

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13. 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.

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14. Copper crystallises 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 $8.92 \mathrm{g\ cm}^{-3}$.

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15. Analysis shows that nickel oxide has the formula $Ni_{0.98}O_{1.00}$. What fractions of nickel exist as Ni^{2+} and Ni^{3+} ions ?

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16. What is a semiconductor ? Describe the two main types of semiconductors and contrast their conduction mechanism.

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17. 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 ?

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18. Ferric oxide crystallises in a hexagonal close packed array of oxide ions with two out of every three octahedral holes occupied by

ferric ions. Derive the formula of the ferric oxide.

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19. Classify each of the following as being either a p-type or a n-type semiconductor :

(i) Ge doped with In (ii) Si doped with B.

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20. Gold (atomic radius = 0.144 nm) crystallises in a face-centred unit cell. What is the length of a side of the cell ?

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21. In terms of band theory, what is the difference

(i) between a conductor and an insulator

(ii) between a conductor and a semiconductor ?

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22. Explain the following terms with suitable examples : (i) Schottky defect (ii) Frenkel defect (iii) Interstitial defects and (iv) F-centres.

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23. Aluminium crystallises in a cubic close-packed structure. Its metallic radius is 125 pm.

(i) What is the length of the side of the unit

cell ?

(ii) How many unit cells are there in $1.00\mathrm{cm}^3$ of aluminium ?

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24. If NaCl is doped with 10^{-3} mol % of $SrCl_2$, what is the concentration of cation vacancies ?

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25. Explain the following with suitable examples :

12-16 and 13-15 group compounds.

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Section D Ncert Exemplar Solution Multiple Choice Questions

1. Which of the following conditions favours the existence of a substance in the solid state ?

A. High temperature

B. Low temperature

C. High thermal energy

D. Weak cohesive forces

Answer: B

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2. Which of the following is not a characteristic of a crystalline solid?

A. Definite and characteristic heat of fusion.

B. Isotropic nature.

C. A regular periodically repeated pattern of arrangement of constituent particles in the entire crystal.

D. A true solid

Answer: B

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3. Which of the following is an amorphous solid?

A. Graphite (C)

B. Quartz glass (SiO_2)

C. Chrome alum

D. Silicon carbide (SIC)

Answer: B

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4. Which of the following arrangements shows schematic alignment of magnetic moments of antiferromagnetic substances ?

A. 

B. 

C. 

D. 

Answer: D

View Text Solution

5. Which of the following is true about the value of refractive index of quartz glass?

A. Same in all directions

B. Different in different directions

C. Cannot be measured

D. Always zero

Answer: A

View Text Solution

6. Which of the following statement is not true about amorphous solids?

A. On heating they may become crystalline at certain temperature.

B. They may become crystalline on keeping for long time.

C. Amorphous solids can be moulded by heating

D. They are anisotropic in nature.

Answer: D

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7. The sharp melting point of crystalline solids is due to .....

A. a regular arrangement of constituent particles observed over a short distance in the crystal lattice.

B. a regular arrangement of constituent particles observed over a long distance in the crystal lattice.

C. same arrangement of constituent particles in different directions.

D. different arrangement of constituent particles in different directions.

Answer: B

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8. Iodine molecules are held in the crystals lattice by .....

A. London forces

B. dipole-dipole interactions

C. covalent bonds

D. coulombic forces

Answer: A

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9. Which of the following is a network solid ?

A. SO_2 (Solid)

B. I_2

C. Diamond

D. H_2O(Ice)

Answer: C

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10. Which of the following solids is not an electrical conductor ?

$(i)Mg_{(s)}\,(ii)TiO_{(s)}\,(iii)I_{2_s}\,(iv)H_2O_{(s)}$

A. (i) only

B. (ii) Only

C. (iii) and (iv)

D. (ii), (iii) and (iv)

Answer: C

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11. Which of the following is not the characteristic of ionic solids?

A. Very low value of electrical conductivity in the molten state.

B. Brittle nature.

C. Very strong forces of interactions.

D. Anisotropic nature.

Answer: A

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12. Graphite is a good conductor of electricity due to the presence of .....

A. lone pair of electrons

B. free valence electrons

C. cations

D. anions

Answer: B

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13. Which of the following oxides behaves as conductor or insulator depending upon temperature?

A. TiO

B. SiO_2

C. TiO_3

D. MgO

Answer: C

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14. Which of the following oxides shows electrical properties like metals?

A. SiO_2

B. MgO

C. $SO_{2\,(s)}$

D. CrO_2

Answer: D

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15. The lattice site in a pure crystal cannot be occupied by .....

A. molecule

B. ion

C. electron

D. atom

Answer: C

View Text Solution

16. Graphite cannot be classified as .....

A. conducting solid

B. network solid

C. covalent solid

D. ionic solid

Answer: D

View Text Solution

17. Cations are present in the interstitial sites in

A. Frenkel defect

B. Schottky defect

C. Vacancy defect

D. Metal deficiency defect

Answer: A

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18. Schottky defect is observed in crystals when ..... .

A. some cations move from their lattice site to interstitial sites.

B. equal number of cations and anions are missing from the lattice.

C. some lattice sites are occupied by electrons.

D. some impurity is present in the lattice.

Answer: B

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19. Which of the following is true about the charge acquired by p-type semiconductors ?

A. Positive

B. neutral

C. negative

D. depends on concentration of p-impurity

Answer: B

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20. To get a n-type semiconductor from silicon, it should be doped with a substance with valency

A. 2

B. 1

C. 3

D. 5

Answer: D

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21. The total number of tetrahedral voids in the face centred unit cell is .....

A. 6

B. 8

C. 10

D. 12

Answer: B

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22. Which of the following point defects are shown by AgBr(s) crystals ? (i) Schottky defect (ii) Frenkel defect (iii) Metal excess defect (iv) Metal deficiency defect

A. (i) and (ii)

B. (iii) and (iv)

C. (i) and (iii)

D. (ii) and (iv)

Answer: A

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23. In which pair most efficient packing is present?

A. hcp and bcc

B. hcp and ccp

C. bcc and ccp

D. bcc and simple cubic cell

Answer: B

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24. The percentage of empty space in a body centred cubic arrangement is .....

A. 74

B. 68

C. 32

D. 26

Answer: C

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25. Which of the following statement is not true about the hexagonal close packing ?

A. The coordination number is 12.

B. It has 74% packing efficiency.

C. Tetrahedral voids of the second layer are covered by the spheres of the third layer.

D. In this arrangement spheres of the fourth layer are exactly aligned with

those of the first layer.

Answer: D

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26. In which of the following structures coordination number for cations and anions in the packed structure will be same ?

A. Cl^- ion form foc lattice and Na^+ ions occupy all octahedral voids of the unit

cell.

B. Ca^{2+} ions form fcc lattice and F^{-} ions occupy all the eight tetrahedral voids of the unit cell.

C. O^{2-} ions form fcc lattice and Na^{+} ions occupy all the eight tetrahedral voids of the unit cell.

D. S^{2-} ions form fcc lattice and Zn^{2+} ions go into alternate tetrahedral voids of the unit cell.

Answer: A

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27. What is the coordination number in a square close packed structure in two dimensions ?

A. 2

B. 3

C. 4

D. 6

Answer: C

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28. Which kind of defects are introduced by doping ?

A. Dislocation defect

B. Schottky defect

C. Frenkel defect

D. Electronic defect

Answer: D

View Text Solution

29. Silicon doped with electron-rich impurity forms

A. P-type semiconductor

B. n-type semiconductor

C. intrinsic semiconductor

D. insulator

Answer: B

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30. Which of the following statements is not true?

A. Paramagnetic substances are weakly attracted by magnetic field.

B. Ferromagnetic substances cannot be magnetised permanently.

C. The domains in antiferromagnetic substances are oppositely oriented with respect to each other.

D. Pairing of electrons cancels their magnetic moment in the diamagnetic substances.

Answer: B

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31. Which of the following is not true about the ionic solids?

A. Bigger ions form the close-packed structure.

B. Smaller ions occupy either the tetrahedral or the octahedral voids depending upon their size.

C. Occupation of all the voids is not necessary.

D. The fraction of octahedral or tetrahedral voids occupied depends upon the radii of the ions occupying the voids.

Answer: D

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32. A ferromagnetic substance becomes a permanent magnet when it is placed in a magnetic field because ....

A. all the domains get oriented in the direction of magnetic field.

B. all the domains get oriented in the direction opposite to the direction of magnetic field.

C. domains get oriented randomly.

D. domains are not affected by magnetic field.

Answer: A

View Text Solution

33. The correct order of the packing efficiency in different types of unit cells is .....

A. fcc $<$ bcc $<$ simple cubic

B. fcc $>$ bcc $>$ simple cubic

C. fcc $<$ bcc $>$ simple cubic

D. bcc $<$ fcc $>$ simple cubic

Answer: B

View Text Solution

34. Which of the following defects is also known as dislocation defect?

A. Frenkel defect

B. Schottky defect

C. Non-stoichiometric defect

D. Simple interstitial defect

Answer: A

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35. In the cubic close packing, the unit cell has

A. 4 tetrahedral voids each of which is shared by four adjacent unit cells.

B. 4 tetrahedral voids within the unit cell.

C. 8 tetrahedral voids each of the which is shared by four adjacent unit cells.

D. 8 tetrahedral voids within the unit cells.

Answer: D

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36. The edge lengths of the unit cells in terms of the radius of spheres constituting fcc, bcc and simple cubic unit cell are respectively .....

A. $2\sqrt{2}r, \frac{4r}{\sqrt{3}}, 2r$

B. $\frac{4r}{\sqrt{3}}, 2\sqrt{2}r, 2r$

C. $2r, 2\sqrt{2}r, \frac{4r}{\sqrt{3}}$

D. $2r, \frac{4r}{\sqrt{3}}, 2\sqrt{2}r$

Answer: A

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37. Which of the following represents correct order of conductivity in solids ?

A. $k_{\text{metals}} > > k_{\text{insulators}} < k_{\text{semiconductors}}$

B. $k_{\text{metals}} < < k_{\text{insulators}} < k_{\text{semiconductors}}$

C.

$k_{\text{metals}} < k_{\text{semiconductors}} > k_{\text{insulators}} = \text{zero}$

D. $k_{\text{metals}} < k_{\text{semiconductors}} > k_{\text{insulators}} \neq$ zero

Answer: A

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Section D Ncert Exemplar Solution Multiple Choice Questions More Than One Options

1. Which of the following is not true about the voids formed in 3 dimensional hexagonal close packed structure ?

A. A tetrahedral void is formed when a sphere of the second layer is present above triangular void in the first layer.

B. All the triangular voids are not covered by the spheres of the second layer.

C. Tetrahedral voids are formed when the triangular voids in the second layer lie above the triangular voids in the first layer and the triangular shapes of these voids do not overlap.

D. Octahedral voids are formed when the triangular voids in the second layer exactly overlap with similar voids in the first layer.

Answer: A::C::D

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2. The value of magnetic moment is zero in the case of antiferromagnetic substances because the domains

A. get oriented in the direction of the applied magnetic field.

B. get oriented opposite to the direction of the applied magnetic field.

C. are oppositely oriented with respect to each other without the application of magnetic field.

D. cancel out each other's magnetic moment.

Answer: A::C::D

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3. Which of the following statements are not true?

A. Vacancy defect results in a decrease in the density of the substance.

B. Interstitial defects results in an increase in the density of the substance.

C. Impurity defect has no effect on the density of the substance.

D. Frenkel defect results in an increase in the density of the substance.

Answer: A::C::D

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4. Which of the following statements are true about metals ?

A. Valence band overlaps with conduction band.

B. The gap between valence band and conduction band is negligible.

C. The gap between valence band and conduction band cannot be determined.

D. Valence band may remain partially filled.

Answer: A::B::D

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5. Under the influence of electric field, which of the following statements is true about the movement of electrons and holes in a p-type semiconductor ?

A. Electron will move towards the positively charged plate through electron holes.

B. Holes will appear to be moving towards the negatively charged plate.

C. Both electrons and holes appear to move towards the positively charged

plate.

D. Movement of electrons is not related to the movement of holes.

Answer: A::B::D

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6. Which of the following statements are true about semiconductors ?

A. Silicon doped with electron rich impurity is a p-type semiconductor.

B. Silicon doped with an electron rich impurity is an n-type semiconductor.

C. Delocalised electrons increase the conductivity of doped silicon.

D. An electron vacancy increases the conductivity of n-type semiconductor.

Answer: A::B::C::D

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7. An excess of potassium ions makes KCl crystals appear violet or lilac in colour since

A. some of the anionic sites are occupied by an unpaired electron.

B. some of the anionic sites are occupied by a pair of electrons.

C. there are vacancies at some anionic sites.

D. F-centres are created which impart colour to the crystals.

Answer: A::D

View Text Solution

8. The number of tetrahedral voids per unit cell in NaCl crystal is .....

A. 4

B. 8

C. Twice the number of octahedral voids.

D. Four times the number of octahedral voids.

Answer: A::B::C::D

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9. Amorphous solid can also be called .....

A. pseudo solids

B. true solids

C. super cooled liquids

D. super cooled solids

Answer: A::C::D

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10. A perfect crystal of silicon (Fig.) is doped with some elements as given in the options. Which of these options shows n-type semiconductors ?

A. 

B. 

C. 

D. 

Answer: A::C::D

View Text Solution

11. Which of the following statements are correct?

A. Ferrimagnetic substances lose ferri magnetism on heating and become paramagnetic.

B. Ferrimagnetic substances do not lose ferrimagnetism on heating and remain ferrimagnetic.

C. Antiferromagnetic substances have domain structures similar to ferromagnetic substances and their

magnetic moments are not cancelled by each other.

D. In ferromagnetic substances all the domains get oriented in the direction of magnetic field and remain as such even after removing magnetic field.

Answer: A::D

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12. Which of the following features are not shown by quartz glass?

A. This is a crystalline solid.

B. Refractive index is same in all the directions.

C. This has definite heat of fusion.

D. This is also called super cooled liquid.

Answer: A::C::D

View Text Solution

13. Which of the following cannot be regarded as molecular solid ?

A. SiC (Silicon carbide)

B. AIN

C. Diamond

D. I_2

Answer: A::B::C::D

View Text Solution

14. In which of the following arrangements octahedral voids are formed ?

A. hcp

B. bcc

C. simple cubic

D. fcc

Answer: A::D

View Text Solution

15. Frenkel defect is also known as .....

A. stoichiometric defect

B. dislocation defect

C. impurity defect

D. non-stoichiometric defect

Answer: A::B::D

View Text Solution

16. Which of the following defects decrease the density ?

A. Interstitial defect

B. Vacancy defect

C. Frenkel defect

D. Schottky defect

Answer: A::B::D

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Section D Ncert Exemplar Solution Short Answer Type Questions

1. Why are liquids and gases categorised as fluids ?

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2. Why are solids incompressible ?

View Text Solution

3. Inspite of long range order in the arrangement of particles why are the crystals usually not perfect?

View Text Solution

4. Why does table salt NaCl, some times appear yellow in colour ?

View Text Solution

5. Why is $FeO_{(s)}$ not formed in stoichiometric composition ?

View Text Solution

6. Why does white $ZnO_{(s)}$ becomes yellow upon heating?

View Text Solution

7. Why does the electrical conductivity of semi conductors increase with rise in temperature ?

View Text Solution

8. Explain why does conductivity of germanium crystals increase on doping with gallium.

View Text Solution

9. In a compound, nitrogen atoms (N) make cubic close-packed lattice and metal atoms (M) occupy one-third of the tetrahedral voids present. Determine the formula of the compound formed by M and N?

View Text Solution

10. Under which situations can an amorphous substance change to crystalline form ?

View Text Solution

Section D Ncert Exemplar Solution Assertion And Reason Type

1. Assertion : The total number of atoms present in a simple cubic unit cell is one.

Reason: Simple cubic unit cell has atoms at its corners, each of which is shared between eight adjacent unit cells.

A. Assertion and reason both are correct statement and reason is correct

explanation for assertion.

B. Assertion and reason both are correct statements but reason is not correct explanation for assertion.

C. Assertion is correct statement but reason is wrong statement.

D. Assertion is wrong statement but reason is correct statement.

Answer: A

View Text Solution

2. Assertion : Graphite is a good conductor of electricity however diamond belongs to the category of insulators.

Reason: Graphite is soft in nature on the other hand diamond is very hard and brittle.

A. Assertion and reason both are correct statement and reason is correct explanation for assertion.

B. Assertion and reason both are correct statements but reason is not correct explanation for assertion.

C. Assertion is correct statement but reason is wrong statement.

D. Assertion is wrong statement but reason is correct statement.

Answer: B

View Text Solution

3. Assertion : Total number of octahedral voids present in unit cell of cubic close packing including the one that is present at the body centre, is four.

Reason: Besides the body centre there is one octahedral void present at the centre of each of the six faces of the unit cell and each of which is shared between two adjacent unit cells.

A. Assertion and reason both are correct statement and reason is correct

explanation for assertion.

B. Assertion and reason both are correct statements but reason is not correct explanation for assertion.

C. Assertion is correct statement but reason is wrong statement.

D. Assertion is wrong statement but reason is correct statement.

Answer: C

View Text Solution

4. Assertion: The packing efficiency is maximum for the fcc structure.

Reason: The co-ordination number is 12 in fcc structures.

A. Assertion and reason both are correct statement and reason is correct explanation for assertion.

B. Assertion and reason both are correct statements but reason is not correct

explanation for assertion.

C. Assertion is correct statement but reason is wrong statement.

D. Assertion is wrong statement but reason is correct statement.

Answer: B

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5. Assertion : Semiconductors are solids with conductivities in the intermediate range from 10^{-6} to $10^{4}\mathrm{ohm}^{-1}\mathrm{m}^{-1}$.

Reason: Intermediate conductivity in semi conductor is due to partially filled valence band.

A. Assertion and reason both are correct statement and reason is correct explanation for assertion.

B. Assertion and reason both are correct statements but reason is not correct explanation for assertion.

C. Assertion is correct statement but reason is wrong statement.

D. Assertion is wrong statement but reason is correct statement.

Answer: C

View Text Solution

Section D Ncert Exemplar Solution Long Answer Type Questions

1. With the help of a labelled diagram show that there are four octahedral voids per unit cell in a cubic close packed structure.

View Text Solution

2. How does the doping increase the conductivity of semiconductors ?

View Text Solution

3. A sample of ferrous oxide has actual formula $Fe_{0.93}O_{1.00}$. In this sample what fraction of metal ions are Fe^{2+} ions ? What type of nonstoichiometric defect is present in this sample ?

View Text Solution

Section E Multiple Choice Questions Darpan S Exam Oriented Mcqs

1. Which of the following crystallizes in hexagonal close packing ?

A. Cu

B. Na

C. Zn

D. Cs

Answer: C

View Text Solution

2. Which crystalline solid is used as lubricant ?

A. I_2

B. Fullerene

C. KCI

D. Graphite

Answer: D

View Text Solution

3. Fullerene is example of which type of solid ?

A. Amorphous solid

B. Molecular solid

C. Covalent solid

D. Metallic solid

Answer: B

View Text Solution

4. For which crystal system, all four type of unit cell may exist ?

A. Rhombohedral

B. Monoclinic

C. Trigonal

D. Orthorhombic

Answer: D

View Text Solution

5. In which of the following solids, constituent particles are atoms ?

A. SiO_2

B. Solid SO_2

C. MgO

D. KCl

Answer: A

View Text Solution

6. Calcite is example of ..... system.

A. Rhombohedral

B. Tetragonal

C. Triclinic

D. Orthorhombic

Answer: A

View Text Solution

7. In which of the following compounds, the periodicity of the definite formation is not observed ?

A. $I_{2(s)}$

B. Naphthalene

C. Fullerene

D. Glass

Answer: D

View Text Solution

8. The melting points of ionic solids are

A. Normal

B. Very high

C. Abnormal

D. Low

Answer: B

View Text Solution

9. Which of the following statements is incorrect?

A. Ionic solids are hard and brittle

B. Solid SO_2 has low melting point with respect to solid CO_2

C. In metallic solids, positive ions are present in sea of electrons.

D. In diamond and graphite, carbon has different hybrid state.

Answer: B

View Text Solution

10. In CaF_2, the forces present are

A. London forces

B. Dipole-dipole forces

C. Ion-dipole forces

D. Electrostatic forces

Answer: D

View Text Solution

11. A crystalline solid conducts electricity in aqueous state but behaves as non-conductor in solid state. It shatters when striked with hammer. The solid shows high melting point. The solid is ...

A. Graphite

B. NaCl

C. H_2O

D. SO_2

Answer: B

View Text Solution

12. Which among the following is true for amorphous solids?

A. They are super cooled solids

B. The graph of temperature $\rightarrow$ time obtained on cooling after heating is curvature.

C. Melting points are sharp.

D. Refractive index is different in all directions.

Answer: B

View Text Solution

13. Which of the following has tetragonal system?

A. $CaSO_4$

B. $K_2Cr_2O_7$

C. ZnO

D. All of these

Answer: A

View Text Solution

14. At 283 K, which of the following coil exist in solid state ?

A. SO_2, I_2, KCl

B. NaCl, KCl, CsCl

C. $H_2O, I_2, NaCl$

D. H_2O, CaF_2, KCl

Answer: B

View Text Solution

15. Match box is.....

A. Cubic

B. Monoclinic

C. Rhombohedral

D. Orthorhombic

Answer: D

View Text Solution

16. What percent of octahedral voids are occupied by cation in a rock-salt structure ?

A. $100\ \%$

B. $50\ \%$

C. $33\ \%$

D. 25 %

Answer: A

View Text Solution

17. What is the co-ordination number of cations in antifluorite structure ?

A. 4

B. 6

C. 8

D. 12

Answer: A

View Text Solution

18. How many times the number of tetrahedral voids are there as compared to octahedral voids?

A. 0.5

B. 2

C. 8

D. 4

Answer: B

View Text Solution

19. What percent of voids are occupid by Zn^{2+} ions in ZnS crystal ?

A. $50\ \%$

B. $100\ \%$

C. $25\ \%$

D. $75\ \%$

Answer: A

View Text Solution

20. The three dimensional graph of lattice points which sets the pattern of whole lattice is called .....

A. Space lattice

B. Simple lattice

C. Crystal lattice

D. Unit cell

Answer: D

View Text Solution

21. Which is not correct for Frenkel defects ?

A. Low co-ordination number

B. Electrical conductivity increases

C. Low radius ratio

D. Equal number of cations and anions are missing from lattice sites.

Answer: D

View Text Solution

22. Identify the incorrect statement :

A. The conductivity of the metals decreases with the rise in temperature,

B. The conductivity of semiconductors increases with the rise in temperature,

C. Ionic solids conduct electricity due to presence of ions.

D. There is no super conductor at a room temperature.

Answer: C

View Text Solution

23. In crystals, atoms are located at the position of .....

A. Maximum potential energy

B. Zero potential energy

C. Infinite potential energy

D. Minimum potential energy

Answer: D

View Text Solution

24. If an atom from body-centred is removed in bcc, the packing fraction will be ....

A. $52\ \%$

B. $68\ \%$

C. $32\ \%$

D. $74\ \%$

Answer: A

View Text Solution

25. In a ccp arrangement, atoms A are present at corners and B are at face-centred. If two atoms from the corners are missing, the formula of the compound will be .....

A. A_7B_6

B. A_6B_7

C. A_7B_{24}

D. AB_4

Answer: D

View Text Solution

View Text Solution

26. Metallic gold crystallizes in ccp lattice. The length of the cubic unit cell is $4.242A^{\circ}$. The closest distance between two atoms of gold

A. $4A^{\circ}$

B. $3A^{\circ}$

C. $2A^{\circ}$

D. $6A^{\circ}$

Answer: B

View Text Solution

27. Sodium metal exists in bcc unit cell. The distance between nearest sodium atoms is 0.368 nm. The edge length of unit cell is .....

A. 0.368 nm

B. 0.184 nm

C. 0.425 nm

D. 0.575 nm

Answer: C

View Text Solution

28. The distance between two octahedral voids in a ccp is (a = edge length)

A. $\frac{a}{\sqrt{2}}$

B. $\frac{\sqrt{3}a}{2}$

C. $\sqrt{2}a$

D. $\frac{a}{2}$

Answer: A

View Text Solution

29. A solid AB has rock salt structure. If the radius of cation is 100 pm, the maximum radius of anion $B^{\ominus}$ is .....

A. 120.7 pm

B. 68.3 pm.

C. 136.61 pm.

D. 241.54 pm

Answer: D

View Text Solution

30. Which defect increases the density of a crystal lattice ?

A. Vacancy

B. Frenkel

C. Schottky

D. Interstitial

Answer: D

View Text Solution

31. Which will not show Frenkel defect?

A. CsCl

B. AgI

C. AgBr

D. ZnS

Answer: A

View Text Solution

32. In which crystal structure, both vacancy and interstitial defects are observed at the same time?

A. AgI

B. CCl

C. KCl

D. NaCl

Answer: A

View Text Solution

33. F-centres in ionic crystal .....

A. Lattice sites containing electrons

B. Vacant lattice sites

C. Interstitial sites containing cations

D. Interstitial sites containing electrons

Answer: A

View Text Solution

34. In stoichiometric defects, the ratio of positive and negative ions as indicated by chemical formula of the compound .....

A. Decreases

B. Increases

C. Cannot be predicted

D. Remains same

Answer: D

View Text Solution

35. Anti-ferromagnetic solids has .....

A. Zero magnetic moment

B. Low magnetic moment

C. High magnetic moment

D. None of these

Answer: A

View Text Solution

36. Crystals of KCl appears violet due to .....

A. Schottky defects

B. Metal excess defects

C. Metal deficiency defect

D. Impurity of violet colour

Answer: B

View Text Solution

37. Which substance shows paramagnetism when heated ?

A. $NaCl$

B. $ZnFe_2O_4$

C. $CrCl_3$

D. C_6H_6

Answer: B

View Text Solution

38. Which of the following is antiferromagnetic ?

A. CrO_2

B. Ti_2O_3

C. VO_2

D. FeO

Answer: D

View Text Solution

39. FexO contains one Fe(III) for every three Fe(II). What is x?

A. $\frac{2}{3}$

B. $\frac{8}{9}$

C. $\frac{3}{4}$

D. $\frac{5}{3}$

Answer: B

View Text Solution

40. What is correct ratio of Ni^{2+} ions to Ni^{3+} ions in $Ni_{0.98}O$?

A. $24:1$

B. $1:4$

C. $47:3$

D. $47:2$

Answer: D

View Text Solution

41. Which compound has appearence and conductivity similar to copper?

A. TiO

B. ReO_3

C. MnO

D. Ti_2O_3

Answer: B

View Text Solution

42. Which metal oxide behaves as insulators ?

A. TiO

B. VO

C. CuO

D. CrO_2

Answer: C

View Text Solution

43. Which of the following can be used in preparation of permanent magnets?

A. Fe

B. Co

C. Gd

D. All of these

Answer: D

View Text Solution

44. One of the reasons of the flame test of metal salts is .....

A. Metal excess defects

B. Metal deficiency defects

C. Schottky defects

D. Frenkel defect

Answer: A

View Text Solution

45. Which of the following is diamagnetic ?

A. KCl

B. NaCl

C. H_2O

D. All of these

Answer: D

View Text Solution

46. Electrical properties of which oxide varies with the temperature ?

A. TiO_2O_3

B. TiO

C. MnO

D. FeO

Answer: A

View Text Solution

47. A p-type semiconductor is developed by .....

A. Increase in temperature.

B. Addition of electron deficient impurities.

C. Addition of electron rich impurities.

D. All of these

Answer: B

View Text Solution

48. Metal deficiency defects is observed in

A. NiO

B. FeS

C. FeO

D. All of these

Answer: D

View Text Solution

49. When the periodicity of lattice points get disturb in a certain direction it is called .....

A. Point defects

B. Line defects

C. Plane defects

D. Impurity defect

Answer: B

View Text Solution

50. Which of the following solid compound possess crystalline properties?

A. S and P like non-metals

B. NaCl and Nepthelene like compound

C. Cu and Fe like metals

D. (A), (B) and (C) all three

Answer: D

View Text Solution

51. Choose proper option of T (True) or F (False) for the following statement :

(1) Graphite is soft and electrical conductor due to its characteristic structure.

(2) Carbon of graphite possess sp^2 hybridization.

(3) Fourth electron of valence orbital of carbon is responsible for conducting current in graphite

(4) Distance between two successive layer in graphite is 141 pm.

A. FFFT

B. TTTF

C. TTTT

D. FTFT

Answer: B

View Text Solution

52. Silicon carbide (Carborandum) (armor stone) is which type of solid ?

A. Metallic solid

B. Ionic solid

C. Molecular solid

D. Covalent solid

Answer: D

View Text Solution

53. Choose correct option of True (T) or False (F) for the statement given for ionic solid :

(1) They possess high melting and boiling

points.

(2) They are electrolytes

(3) They possess directional properties for bonds.

(4) They may possess collective type of structure.

A. TTFT

B. FTTT

C. FTFT

D. TFTF

Answer: A

View Text Solution

54. Which of the following is false statement for amorphous solid ?

A. It melts in higher temperature ranges.

B. They are true solids

C. They do not possess regular arrangement of particles.

D. They possess different thermal conductivity in different directions.

Answer: B

View Text Solution

55. ..... is amorphous solid.

A. Liquids in true means

B. Chilled liquids

C. Solids in true means

D. Substance with definite melting points

Answer: B

View Text Solution

56. Particles which are present at every corners as well as present on centers of every faces of unit cells are known as .....

A. Body center

B. End center

C. Face center

D. Primitives

Answer: C

View Text Solution

57. For substance having orthorhombic crystalline system edge length would be $a \neq b \neq c$ and angles are ....

A. $\alpha = \beta = \gamma \neq 90^\circ$

B. $\alpha = \gamma = 90^\circ, \beta = 120^\circ$

C. $\alpha = \beta = \gamma = 90^\circ$

D. $\alpha \neq \beta \neq \gamma \neq 90^\circ$

Answer: C

View Text Solution

58. Total volume of simple cube is = ...

A. $4r^3$

B. $2r^3$

C. $\frac{16\pi r^3}{\sqrt{3}}$

D. $8r^3$

Answer: D

View Text Solution

59. Voids present in body center unit cells are....

A. $32\ \%$

B. $34\ \%$

C. $30\ \%$

D. $28\ \%$

Answer: A

View Text Solution

60. In body center crystal arrangement of solid cube, how much percentage of edges is not occupied by atoms ?

A. $39.2\ \%$

B. $26\ \%$

C. $13.4\ \%$

D. $52\ \%$

Answer: C

View Text Solution

61. If edge length in simple cube, bcc and fcc unit cell is a, then the ratio of atomic radius present in them are .....

A. $\frac{a}{2} : \frac{\sqrt{3}}{2} : \frac{\sqrt{2}a}{2}$

B. $\frac{a}{2} : \frac{\sqrt{3}}{4} : \frac{a}{2\sqrt{2}}$

C. $\frac{a}{2} : \sqrt{3}a : \frac{a}{\sqrt{2}}$

D. $14 : \sqrt{3}a : \sqrt{2}a$

Answer: B

View Text Solution

62. One metal possess bcc arrangement. Its unit cell has edge length 3.04 Å, then the volume of unit cell = ... cm^3.

A. 2.81×10^{-23}

B. 1.6×10^{21}

C. 6.6×10^{-24}

D. 6.02×10^{-23}

Answer: A

View Text Solution

63. Element E has bcc crystal arrangement, if its unit cell has edge length of 1.469×10^{-10} meter, then atomic radius of this element is .... meter.

A. 2.252×10^{-8}

B. 4.682×10^{-9}

C. 6.361×10^{-11}

D. 3.582×10^{-10}

Answer: C

View Text Solution

64. Gold (atomic radius = 0.144 nm) crystallize into face centered unit cell, then what is the edge length of unit cell ?

A. 0.4574 nm

B. 0.3347 nm

C. 0.5123 nm

D. 0.4073 nm

Answer: D

View Text Solution

65. In NaCl crystal, distance between Na^+ and Cl^- is X pm, then edge length of unit cell = ... pm.

A. $2X$

B. $\frac{X}{4}$

C. $\frac{X}{2}$

D. $4X$

Answer: A

View Text Solution

66. In bcc unit, how much atoms are required per unit cell ?

A. 1

B. 9

C. 8

D. 6

Answer: B

View Text Solution

67. In which arrangement 1 atom is present per unit cell ?

A. hcp

B. fcc

C. simple cube

D. bcc

Answer: C

View Text Solution

68. In compound made up of A and B elements, element B form hcp lattice structure and element A occupy $\frac{2}{3}$ part of tetrahedral voids, then molecular formula of compound made up of A and B = ...

A. A_3B_4

B. A_4B_3

C. A_2B_3

D. A_3B_5

Answer: B

View Text Solution

69. How many unit cells are present in 2 gm of potassium (Atomic mass = 39) ? (bcc arrangement)

A. 2.88×10^{20}

B. 1.54×10^{22}

C. 5.25×10^{14}

D. 5.85×10^{12}

Answer: B

View Text Solution

70. CSCI possess bcc arrangement, its edge length in unit cell is 400 pm, then inter ionic distance in them are = ... pm

A. $\frac{\sqrt{3}}{2} \times 400$

B. $\sqrt{3} \times 100$

C. 400

D. 800

Answer: B

View Text Solution

71. Numbers of octahedral voids in cubic close pack arrangement is .....

A. 2

B. 4

C. 1

D. 3

Answer: B

View Text Solution

72. Metal alloy crystal consisting eight coordination number is obtained during crystallization of Li and Ag^{+}, then which type of crystal arrangement will observed ?

A. bcc

B. simple cube

C. hexagonal

D. (A), (B) and (C) all three

Answer: A

View Text Solution

73. On solidification of molten silver gives ..... crystals.

A. Shows ccp type of arrangement

B. Shows 6 coordination number

C. Shows 10 coordination number

D. Shows hcp type of arrangement

Answer: A

View Text Solution

74. In $Fe_3O_4\left[Fe^{II}Fe_2^{III}O_4\right]O^{2-}$. Ions are arranged on ccp arrangement. If Fe^{2+} ions are arranged on tetrahedral voids and Fe^{3+} ions are arranged on octahedral voids, then how much portion of tetrahedral and octahedral voids occupied respectively?

A. $\frac{1}{4}, \frac{1}{8}$

B. $\frac{1}{4}, \frac{1}{2}$

C. $\frac{1}{8}, \frac{1}{2}$

D. $\frac{1}{2}, \frac{1}{4}$

Answer: C

View Text Solution

75. Due to which of the following reason diamond is non conductor of electricity ?

A. Hardnes

B. Tetrahedral crystal arrangement

C. High energy gap

D. (A), (B) and (C) all three

Answer: C

View Text Solution

76. Which element is doped with Si to form p-type of semiconductor ?

A. Ge

B. Se

C. As

D. B

Answer: D

View Text Solution

Section E Multiple Choice Questions Mcqs Asked In Jee Neet Aiims

1. How many unit cells are present in a cube shaped ideal crystal of NaCl of mass 1.00 g ? [Atomic masses : Na = 23, Cl = 35.5]

A. 2.57×10^{21}

B. 5.14×10^{21}

C. 1.28×10^{21}

D. 1.71×10^{21}

Answer: A

View Text Solution

2. An ionic compound has unit cell consisting A ions at the corners of a cube and B ions on the centres of the faces of cube. The empirical formula of compound would be ....

A. A_3B

B. AB_3^-

C. A_2B

D. AB

Answer: B

View Text Solution

3. Total volume of atoms present in a facecentred cubic unit cell of a metal is (r = atomic radius)

A. $\frac{20}{3}\pi r^3$

B. $\frac{24}{3}\pi r^3$

C. $\frac{12}{3}\pi r^3$

D. $\frac{16}{3}\pi r^3$

Answer: D

View Text Solution

4. In a compound, atoms of element Y form ccp lattice and those element X occupy $\frac{2}{3}$ of tetrahedral voids. The formula of a compound will be .....

A. X_4Y_3

B. X_2Y_3

C. X_2Y

D. X_3Y_4

Answer: A

View Text Solution

5. CsCl has bcc arrangement. Its unit cell edge length is 400 pm. Its interionic distance is ..... .

A. 400 pm

B. 800 pm

C. 73 x 100 pm

D. $\frac{\sqrt{3}}{2} \times 400$ pm

Answer: C

View Text Solution

6. The arrangement of X-ions around A^+ ion in solid AX is given in the figure (not drawn to scale). If the radius of X^- is 250 pm., the radius of A is .....

A. 104 pm

B. 125 pm

C. 183 pm

D. 57 pm

Answer: A

View Text Solution

7. The number of carbon atoms per unit cell of diamond unit cell is .....

A. 6

B. 1

C. 4

D. 8

Answer: D

View Text Solution

8. In a solid, atom M occupies ccp lattice and $\left(\frac{1}{3}\right)^{rd}$ of tetrahedral voids are occupied by atom N. The formula of compound is .....

A. M_3N_2

B. M_2N_3

C. M_4N_3

D. M_3N_4

Answer: A

View Text Solution

9. CsCl crystallises in body-centred cubic lattice. If 'a' is its edge length then which of the following expressions is correct ?

A. $r_{Cs^+} + r_{Cl^-} = \sqrt{3}a$

B. $r_{Cs^+} + r_{Cl^-} = 3a$

C. $r_{Cs^+} + r_{Cl^-} = \frac{3a}{2}$

D. $r_{Cs^+} + r_{Cl^-} = \frac{\sqrt{3}}{2}a$

Answer: D

View Text Solution

10. If a is the length of the side of the cube, the distance between the body-centred atom and one corner atom in the cube will be .....

A. $\frac{2}{\sqrt{3}}a$

B. $\frac{4}{\sqrt{3}}a$

C. $\frac{\sqrt{3}}{4}a$

D. $\frac{\sqrt{3}}{2}a$

Answer: D

View Text Solution

11. A forms hcp lattice and B are occupying $\left(\frac{1}{3}\right)^{rd}$ of tetrahedral voids. The formula of

compound is .....

A. AB

B. A_3B_2

C. A_2B_3

D. AB_4

Answer: B

View Text Solution

12. Sodium metal crystallizes in a body-centred cubic lattice with a unit cell edge of $4.29A^{\circ}$. The radius of sodium atom is approximately.....

A. $5.72A^{\circ}$

B. $0.93A^{\circ}$

C. $1.86A^{\circ}$

D. $3.22A^{\circ}$

Answer: C

View Text Solution

View Text Solution

13. The correct statement regarding defects in crystalline solids is .....

A. Frenkel defects decreases the density of crystalline solid.

B. Frenkel defect is a dislocation defect.

C. Frenkel defect is found in halides of alkali metals.

D. Schottky defects have no effect on the density of crystalline solids.

Answer: B

View Text Solution

14. A given metal crystallizes out in a cubic structure having edge length of 361 pm. If there are four metal atoms in one unit cell, what is the radius of one atom ?

A. 80 pm

B. 108 pm

C. 40 pm

D. 127 pm

Answer: D

View Text Solution

15. A yellow colour in NaCl crystals is due to .....

A. Excitation of electrons in F-centres

B. Reflection of light from Cl^- ions on the surface.

C. Refraction of light from Na^+ ions.

D. All of the above

Answer: A

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16. In calcium fluoride, having a fluorite structure, the co-ordination numbers for calcium ion $\left(Ca^{2+}\right)$ and fluoride ion $\left(F^{-}\right)$ are :

A. 4 and 2

B. 6 and 6

C. 8 and 4

D. 4 and 8

Answer: C

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17. Lithium has a bcc structure. Its density is $530 \mathrm{kg\ m^{-3}}$ and its atomic mass is $6.94 \mathrm{g\ mol^{-1}}$. Calculate the edge length of the unit cell of lithium metal $\left(N_A = 6.022 \times 10^{23} \mathrm{mol^{-1}}\right)$

A. 527 pm

B. 264 pm

C. 154 pm

D. 352 pm

Answer: D

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18. The ionic radii of A^+ and B^- ions are $0.98 \times 10^{-10} m$ and $1.81 \times 10^{-10} m$. The coordination number of each ion in AB is

A. 8

B. 2

C. 6

D. 4

Answer: C

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19. If an atom crystallizes in bcc lattice with $r = 4A^\circ$, edge length will be .....

A. $2A^\circ$

B. $8A^\circ$

C. $2.39A^\circ$

D. $9.23A^\circ$

Answer: D

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20. Which of the following compound is metallic and ferromagnetic ?

A. TiO_2

B. CrO_2

C. VO_2

D. MnO_2

Answer: B

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21. A metal crystallises in a face -centred cubic structure. If the edge length of its unit cell is 'a' the closest approach between two atoms in metallic crystal will be .....

A. $\sqrt{2}a$

B. $\frac{a}{\sqrt{2}}$

C. $2a$

D. $2\sqrt{2}a$

Answer: B

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22. Which is the incorrect statement ?

A. Density decreases incase of crystals with Schottky defect.

B. NaCl is insulator, silicon is semiconductor, silver is conductor,

quartz is piezo electric crystal

C. Frenkel defect is favoured in those ionic compounds in which sizes of cations and anions are almost equal.

D. $Fe_{0.98}$ has non-stoichiometric metal deficiency defect

Answer: A::C::D

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23. Which type of defect has the presence of cations in the interstitial sites ?

A. Schottky defect

B. Vacancy defect

C. Frenkel defect

D. Metal deficiency defects

Answer: C

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24. Which of the following arrangements show the schematic alignment of magnetic moments of antiferromagnetic substance ?

A. 

B. 

C. 

D. 

Answer: D

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25. All of the following share the same crystal structure except.

A. RbCI

B. CCI

C. LiCi

D. NaCl

Answer: B

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26. Iron exhibits bcc structure at room temperature. Above $900^\circ C$, it transforms to foc structure. The ratio of density of iron at room temperature to that at $900^\circ C$ (assuming molar mass and atomic radius of iron remains constant with temperature) is .....

A. $\frac{\sqrt{3}}{\sqrt{2}}$

B. $\frac{4\sqrt{3}}{3\sqrt{2}}$

C. $\frac{3\sqrt{3}}{4\sqrt{2}}$

D. $\frac{1}{2}$

Answer: C

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27. What colour is observed when ZnO is heated ?

A. Yellow

B. Violet

C. Green

D. Blue

Answer: A

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28. Assertion : Metal deficiency defect can be seen in FeO.

Reason : Li compound (LiCl) has pink colour due to F-centres.

A. Both Assertion and Reason are correct and Reason is correct explanation of Assertion.

B. Both Assertion and Reason are correct but Reason is not the correct explanation of Assertion

C. Assertion is correct, Reason is false.

D. Both Assertion and Reason are false.

Answer: B

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29. The radius of the largest sphere which fits properly at the centre of the edge of the bodycentred cubic unit cell is .....

(Edge length is represented by "a")

A. 0.134 a

B. 0.027 a

C. 0.067 a

D. 0.047 a

Answer: C

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30. A solid having density of $9 \times 10^3 \mathrm{kg\,m^{-3}}$ form face centred cubic crystals of edge length $200\sqrt{2}$ pm. What is the molar mass of solid ? (Avogadro's constant $= 6 \times 10^{23} \mathrm{mol^{-1}}, \pi = 3$)

A. $0.0216 \mathrm{kg\ mol^{-1}}$

B. $0.0432 \mathrm{kg\ mol^{-1}}$

C. $0.4320 \mathrm{kg\ mol^{-1}}$

D. $0.0305 \mathrm{kg\ mol}^{-1}$

Answer: D

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31. The crystal having hcp is A_2B_3. Which atom has hcp structure and by other molecules of tetrahedral voids how much space is occupied ?

A. hcp crystal - A, $2/3$ Tetrahedral Voids - B

B. hcp crystal - A, $1/3$, Tetrahedral Voids - B

C. hcp crystal - B, $1/3$ Tetrahedral Voids - A

D. hcp crystal - A, $2/3$ Tetrahedral Voids - A

Answer: C

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32. If at $100^{\circ}C$ temperature copper possess fcc arrangements. Edge length is xÅ . Then find out approximate density $\left(\mathrm{g/cm^3}\right)$ of Cu at

this temperature. (Atomic weight of Cu = 63.55 u)

A. $\frac{105}{x^3}$

B. $\frac{211}{x^3}$

C. $\frac{205}{x^3}$

D. $\frac{422}{x^3}$

Answer: D

View Text Solution

33. In which primitive unit cell the length of all sides are unequal and angles are unequal to 90° ?

A. Tetragonal

B. Hexagonal

C. Monoclinic

D. Triclinic

Answer: D

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34. A compound is formed by cation C and anion A. The anions form hexagonal close packed (hcp) lattice and the cations occupy 75% of octahedral voids. The formula of the compound is :

A. C_4A_3

B. C_2A_3

C. C_3A_2

D. C_3A_4

Answer: D

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35. The relative strength of inter-ionic/ intermolecular forces in the decreasing order is :

A. ion-dipole $>$ dipole-dipole $>$ ion-ion

B. dipole-dipole $>$ ion-dipole $>$ ion-ion

C. ion-ion $>$ ion-dipole $>$ dipole-dipole

D. ion-dipole $>$ ion-ion $>$ dipole-dipole

Answer: C

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Section E Multiple Choice Questions Mcqs Asked In Board Exams

1. Which of the following solids has highest conductivity of heat and electricity ?

A. W

B. SIC

C. KCI

D. Ice

Answer: A

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2. The space between valence band and conduction band is called.....

A. Conductivity gap

B. Energy gap

C. Valence gap

D. Both (A) and (C)

Answer: B

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3. Diamond has fcc crystal structure in which each carbon atom is attached with four other carbon atoms, then the number of carbon atoms per unit cell in diamond are.

A. 12

B. 6

C. 8

D. 4

Answer: C

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4. In NaCl lattice structure if one of the sodium ion is removed from corner, the formula of the resulting compound is .....

A. Na_7Cl_{24}

B. $NaCl$

C. $NaCl_3$

D. Na_3Cl_{11}

Answer: A

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5. The defect due to which crystal of NaCl shows yellow colour is

A. Frenkel defect

B. Impurity defect

C. Schottky defect

D. Metal excess defect due to vacancy by anion

Answer: D

View Text Solution

6. Which of the following substances when heated loses ferrimagnetism and becomes paramagnetic ?

A. CrO_2

B. H_2O

C. MnO

D. Fe_3O_4

Answer: D

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7. Which of the following is the unit cell dimensions of $K_2Cr_2O_7$?

A. $a \neq b \neq c, \alpha \neq \beta \neq \gamma \neq 90^\circ$

B. $a = b = c, \alpha = \beta = \gamma = 90^\circ$

C. $a \neq b \neq c, \alpha = \beta = \gamma = 90^\circ$

D. $a = b = c, \alpha = \beta = \gamma \neq 90^\circ$

Answer: A

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8. What is the total volume of atom present in body centered unit cell having edge length 69.3 pm ?

A. $2.26 \times 10^4 \mathrm{pm}^3$

B. $2.26 \times 10^5 \mathrm{pm}^3$

C. $1.13 \times 10^6 \mathrm{pm}^3$

D. $1.13 \times 10^5 \mathrm{pm}^3$

Answer: A

View Text Solution

9. How many defects exists in the arrangement of constituent particles of 7.45 g KCl ?

[K = 39, Cl = 35.5 g/mole]

A. 10×10^{23}

B. 1×10^{6}

C. 1.0×10^{-6}

D. 10×10^{4}

Answer: D

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10. Which defect creates when some P atom is added to Si ?

A. Displacement defect

B. Electron defect

C. Metal deficiency defect

D. Metal excess defect

Answer: B

View Text Solution

11. Which of the following is diamagnetic ?

A. Fe^{2+}

B. N_2

C. Cu^{2+}

D. O_2

Answer: B

View Text Solution

12. Which of the following compound has highest melting point ?

A. $SiO_{2(s)}$

B. $H_2O_{(s)}$

C. $Mg_{(s)}$

D. $CO_{2(s)}$

Answer: A

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13. How many number of tetrahedral voids in a closed packed structure having 6×10^{24} atoms?

A. 6×10^{25}

B. 3×10^{24}

C. 1.2×10^{-25}

D. 1.2×10^{23}

Answer: C

View Text Solution

14. Which of the following is correct distance of edge in crystal unit in ZnS ?

A. $a = b \neq c$

B. $a = b = c$

C. $a \neq b = c$

D. $a \neq b \neq c$

Answer: B

View Text Solution

15. Which of the following is correct statement for 'Interstitial defect'?

A. Some of the lattice site are vacant.

B. This defects increase the number of atom for a unit volume.

C. This defects increase the density of substance.

D. Particles like atom or molecule get arranged in the interstitial site of the

crystal.

Answer: B::C::D

View Text Solution

16. A solid has a structure in which "W" atoms are located at the corner of the cubic lattice "O" atoms at the centre of edge and Na atom at the centre of cube. The formula of the compound is .....

A. $NaWO_2$

B. Na_2WO_2

C. $NaWO_3$

D. Na_2WO_3

Answer: C

View Text Solution

17. Which of the oxide shows appearence like metallic copper?

A. ReO_3

B. VO_2

C. TiO_2

D. CrO_2

Answer: A

View Text Solution

18. Which is the correct for radius of atom in ccp unit cell?

A. $r = \frac{1}{2\sqrt{2}} \cdot a$

B. $r = \frac{\sqrt{3}}{4} \cdot a$

C. $r = \frac{4}{\sqrt{3}} \cdot a$

D. $r = 2\sqrt{2} \cdot a$

Answer: A

View Text Solution

19. F-centres are

A. Interstitial sites containing cations.

B. Lattice sites that are vacant.

C. Lattice sites containing electrons.

D. Interstitial sites containing electrons.

Answer: C

View Text Solution

20. In a fcc lattice, the number of neighbours for a given lattice point is .....

A. 12

B. 8

C. 6

D. 14

Answer: A

View Text Solution

21. What is the coordination number of Cst in CsCl unit cell ?

A. 8

B. 1

C. 4

D. -1

Answer: A

View Text Solution

22. Fusion enthalpy of solid KCl is....

A. Not definite and not characteristic

B. Not definite and characteristic

C. Definite and not characteristic

D. Definite and characteristic Ans.

Answer: D

View Text Solution

23. The co-ordination number of copper which crystallise in close-packed structure is...

A. 6

B. 8

C. 12

D. 4

Answer: C

View Text Solution

24. Frenkel defect in the structure of ionic solid is due to.....

A. Charge of the ion.

B. Large difference between ionic sizes of cations and anions.

C. High co-ordination number.

D. (A) and (C) both

Answer: B

View Text Solution

25. In which of the following pair both the crystals are not of the same type ?

A. Mg and Ar

B. NaCl and Bao

C. SiC and Diamond

D. Ice and solid SO_2

Answer: A

View Text Solution

26. How many spheres are required to form octahedral void ?

A. 8

B. 6

C. 4

D. 12

Answer: B

View Text Solution

27. A compound formed by elements X and Y crystallises in a cubic structure in which atom X are at corners of the cube and Y are at face centre. The formula of compound is

A. X_2Y

B. XY

C. XY_2

D. XY_3

Answer: D

View Text Solution

28. What are the number of atoms in end centred unit cell ?

A. 4

B. 1

C. 2

D. 6

Answer: C

View Text Solution

29. Which of the following is paramagnetic ?

A. Zn^{2+}

B. O_2^{2-}

C. Cu^{+}

D. Cr^{3+}

Answer: A

View Text Solution

30. A compound is formed of two element "A" and "B". The atoms of element "A" forms face centred cubic close packing and atoms of "B"

occupies all the tetrahedral voids. The formula of compound is ...

A. AB_2

B. AB_8

C. A_4B

D. A_2B

Answer: A

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31. An element posses cubic lose packing structure. Calculate the radius (μ) of the atom in the unit cell [Edge length a = 252 nm].

A. 152 nm

B. 89.36 nm

C. 12.6 nm

D. 109.1 nm

Answer: B

View Text Solution

32. In which of the following solid substance dispersion forces exist ?

A. SiO_2

B. H_2O

C. CO_2

D. SO_2

Answer: C

View Text Solution

33. In a crystal of compound having molecular formula X_2Y_3, Y atoms are arranged in CCP, then what fraction of tetrahedral voids will be covered by X atoms ?

A. $\frac{1}{3}$

B. $\frac{1}{4}$

C. $\frac{2}{3}$

D. $\frac{3}{4}$

Answer: A

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34. In which of the following defects, some of the cations are arranged in the interstitial sites?

A. Schottky

B. Frenkel defect

C. Metal excess defect

D. Interstitial defect

Answer: B

View Text Solution

35. From the following which type of magnetic substance magnetite is known ?

A. Diamagnetic

B. Antiferromagnetic

C. Ferromagnetic

D. Ferrimagnetic

Answer: D

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