CHEMISTRY

BOOKS - BRILLIANT PUBLICATION

SOLID STATE

Question Level I Homework

1. Which one of the following is a molecular solid?

A. Silicon carbide

B. Calcium fluoride

C. Rock salt

D. Methane

Answer:

2. A particular solid is very hard and has very high melting point. In solid state, it is a non -

C0nductor and its melt is a C0nductor of electricity. Classify the solid

A. Metallic

B. Molecular

C. Network

D. Ionic

Answer:

Watch Video Solution

3. Which of the following statements is not correct?

A. The fraction of the total volume occupied by the atoms in a primitive cell is 0.48

B. Molecular solids are generally volatile

C. The number of carbon atoms in a unit cell of diamond is 8

D. The number of Bravais lattices in which a crystal can be categorised is 14

Answer:

Watch Video Solution

4. Calculate the number of atoms per unit cell in the following :

Body centred cubic unit cell (bcc)

ii) Face centred cubic unit cell (fcc)

A. 1

B. 2

C. 4

D. 6

Answer:

Watch Video Solution

5. In a face centred lattice of X and Y, X atoms are present at the corners while Y atoms are

at face centres. Then formula of the compounds is

A. XY_3

B. X_2Y_3

C. X_3Y

D. XY

Answer:

Watch Video Solution

6. In a metal oxide the oxide ions are arranged in hexagonal close packing and metal ion occupy $2/3rd$ of the octahedral voids. The formula of the oxide is

A. MO

B. M_2O_3

C. MO_2

D. M_2O

Answer:

Watch Video Solution

Watch Video Solution

7. Crystal structure of $Na_2SO_4.10H_2O$ is

A. Monoclinic

B. Rhombic

C. Cubic

D. Tetragonal

Answer:

Watch Video Solution

8. What is the coordination number of atoms:

In a body-centred cubic structure?

A. 8

B. 3

C. 4

D. 6

Answer:

Watch Video Solution

9. Total volume of atoms present in face centred 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:

Watch Video Solution

10. In a crystal system, anions B are in ccp arrangement . Cations A occupy 50% of octahedral voids and 50% tetrahedral voids. Its formula of representation is

A. A_2B_3

B. A_3B_2

C. AB_2

D. AB_3

Answer:

Watch Video Solution

11. What is the maximum possible coordination number of an atom in an hcp crystal structure of an element?

A. 8 and 8

B. 4 and 4

C. 6 and 6

D. 8 and 4

Answer:

Watch Video Solution

12. A solid AB has NaCl type structure with edge length 580.54 pm.The radius of A^+ is 100 pm. The radius of B^- is

A. 178.12 pm

B. 332.3pm

C. 190.2 pm

D. 200 pm

Answer:

Watch Video Solution

13. The cubic unit cell of a metal (molar mass =63.55$gmol^{-1}$) has an edge length of 362 pm. It density of $8.92gcm^{-3}$. The type of unit cell is

A. primitive

B. face centred

C. body centred

D. end centred

Answer:

Watch Video Solution

14. AB is an ionic solid. If the ratio of ionic radius of A^+ and B^- is 0.52 what is the co-ordination number of B^-?

A. 2

B. 3

C. 6

D. 8

Answer:

Watch Video Solution

15. Which of the following fcc structure contains cations in alternate tetrahedral voids?

A. KCl

B. ZnS

C. NACl

D. Na_2O

Answer:

Watch Video Solution

16. A face centred cubic element (atomic mass -60) has a cell edge length of 400 pm. What is its density?

A. $6.2gcm^{-3}$

B. $24.8gm^{-3}$

C. $12.4gcm^{-3}$

D. $3.1gcm^{-3}$

Answer:

Watch Video Solution

17. The total number of unit cell in 78g of potassium if it crystallizes in bcc lattice is

A. 6.022×10^{22}

B. 6.02×10^{23}

C. 3.01×10^{22}

D. 4.1×10^{23}

Answer:

Watch Video Solution

18. An alloy of copper, silver and gold is found to have copper constituting the ccp lattice. If silver atoms occupy the edge centres and gold is present at body centre, the alloy will have the formula

A. Cu_4Ag_2Au

B. Cu_4Ag_4Au

C. Cu_4Ag_3Au

D. Cu_2AgAu

Answer:

Watch Video Solution

19. AgI crystallises in cubic close packed ZnS structure. What fraction of tetrahedral sites is occupied by Ag+ ions?

A. 0.25

B. 0.5

C. 1

D. 0.75

Answer:

Watch Video Solution

20. Bragg'a law is given by the equation

A. A .$n\lambda = 2\theta \sin\theta$

B. B.$n\lambda = 2d \sin\theta$

C. C. $2n\lambda = d\sin\theta$

D. D. $n\lambda = 1/2d\sin\theta$

Answer:

Watch Video Solution

21. For tetrahedral coordination, the radius ratio $\left(\frac{r_+}{r_-}\right)$ should be

A. A.0.414-0.732

B. B. > 0.732

C. C.$0.156 - 0.225$

D. D.$0.225 - 0.414$

Answer:

Watch Video Solution

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

A. 3

B. 1

C. 4

D. 8

Answer:

 Watch Video Solution

23. Which of the following is a ferrite?

A. $Na_2Fe_2O_4$

B. $MgFe_2O_4$

C. $AlFe_4O_4$

D. $ZnFe_3O_4$

Answer:

Watch Video Solution

24. Assumes that a fresh piece of KCI crystal is heated in an atmosphere of potassium vapour. Is there any colour change? Substantiate your answer.

A. Vacancy defect

B. Schottky defect

C. Frenkel defect

D. F-centres

Answer:

Watch Video Solution

25. With which are of the following elements siliC0n should be doped so as to give p- type of semiC0nductor

A. Germanium

B. Arsenic

C. Selenium

D. Boron

Answer:

Watch Video Solution

26. The one which resembles metallic copper in its appearance and conductance is

A. Graphite

B. Diamond

C. FeO

D. ReO_3

Answer:

Watch Video Solution

27. Which among the following compounds is a semiconductor with very fast response and hence used in semiconductor divices?

A. A.GaAs

B. B.ZnS

C. C.NaCl

D. D.AlP

Answer:

Watch Video Solution

28. Antiferromagnetic substances posses

A. Low magnetic moment

B. Large magnetic moment

C. Zero magnetic moment

D. Any value of magnetic moment

Answer:

Watch Video Solution

29. When pressure is increased, the co-ordination number of the crystal

A. Increases

B. Decreases

C. Remains the same

D. Either increases or decreases

Answer:

Watch Video Solution

30. At room temperature the number of Schottky defects per cm^3 in NaCl crystal is

A. 10^2

B. 10^6

C. 10^8

D. 10^{12}

Answer:

Watch Video Solution

Question Level Ii

1. Most unsymmetrical and symmetrical systems are respectively

A. ortho rhombic and cubic

B. tetragonal and cubic

C. triclinic and cubic

D. rhombohedral and ortho rhombic

Answer:

Watch Video Solution

2. Example of unit cell with crystallographic diamensions

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

A. Monoclinic sulphur

B. Graphite

C. Rhombic sulphur

D. Calcite

Answer:

Watch Video Solution

3. On cooling oxygen freezes to dark blue crystalline solid. It belongs to which of the following types of solids?

A. molecular

B. metalic

C. ionic

D. covalent

Answer:

Watch Video Solution

4. How many nearest and next nearest neighbours respectively does potassium have in BCC lattice?

A. 8,8

B. 8,6

C. 6,8

D. 8,2

Answer:

Watch Video Solution

5. The fraction of the total volume occupied by the atoms present in a simple cube is

A. $\frac{\pi}{6}$

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

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

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

Answer:

Watch Video Solution

6. If 'a' stands for the edge length of the cubic systems : Simple cubic, body centred cubic and face centred cubic, then the ratio of the radii

of the spheres, in these system will be respectively

A. $1/2a : \frac{\sqrt{3}a}{4} : \frac{1}{2\sqrt{2}}a$

B. $1/2a : \sqrt{3}a : \frac{1}{\sqrt{2}}a$

C. $1/2a : \frac{\sqrt{3}}{2}a : \frac{\sqrt{2}}{2}a$

D. $1a : \sqrt{3}a : \sqrt{2}a$

Answer:

Watch Video Solution

7. A solid element X forms cubic in which the atoms occupy each corner, two atoms on each body diagonal and also one atom at each edge centre. The effective number of X atoms in the unit cel is

A. 12

B. 4

C. 8

D. 28

Answer:

Watch Video Solution

8. The percentage of vacant space in one layer of square packing of spheres touching each other having 4 spheres is

A. $\frac{3}{8}\pi \times 100$

B. $100 - \frac{\pi}{0}$

C. $\frac{3}{8}\pi$

D. $100 - \frac{\pi}{6} \times 100$

Answer:

Watch Video Solution

9. In a cubic close packed structure of mixed oxides, the lattice is composed of oxide.ions, one eighth of tetrahedral voids are occupied by divalent cations while one hálf of octahedral voids are occupied by trivalent cations. What is the formula of the oxide

A. $+3$

B. $+2$

C. $+4$

D. $+1$

Answer:

Watch Video Solution

10. The packing efficiency of the two dimensional square unit cell shown in below figure is

A. 0.3927

B. 0.6802

C. 0.7405

D. 0.7854

Answer:

Watch Video Solution

11. A crystal is made of particles X,Y and Z. X forms fcc packing. Y occupies all the octahedral voids of X and Z occupies all the tetrahedral voids of X.If the particles along

one body diagonal are removed, then the formula of the crystal would be

A. XYZ_2

B. X_2YZ_2

C. $X_6Y_4Z_5$

D. $X_5Y_4Z_8$

Answer:

Watch Video Solution

12. Density of solid Argon at 40 K is1.65g/mL. If the radius of Argon atom is $1.54 \times 10^{-8} cm$ .What percentage of solid argon is empty ? (At mass of Ar=40)

A. 0.4

B. 0.62

C. 0.6

D. 0.38

Answer:

Watch Video Solution

Watch video solution

13. How many unit cells are present in a cube shaped ideal crystal of NaCl of mass 1.00g? (Atomic mass 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:

Watch Video Solution

14. The distance between an octahedral and tetrahedral void in fcc lattie would be

A. $\sqrt{3}a$

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

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

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

Answer:

Watch Video Solution

15. If the unit cell of a material has cubic close packed array of oxygen atoms with m fraction of octahedral holes occupied by aluminium ions and n fraction of tetrahedral holes occupied by magnesium ions, m and n respectively are

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

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

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

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

Answer:

Watch Video Solution

16. Each rubidium halide crystallizing in the NaCl type lattice has a unit cell length 30 pm greater than for corresponding potassium salt ($r_k = 133$pm) of the same halogen. What is the ionic radius of Rb^+?

A. A.163pm

B. B.300pm

C. C.143pm

D. D. 184pm

Answer:

Watch Video Solution

17. An element crystallises in fcc lattice having edge length 400 pm. What is the maxium diameter of atom which can be placed in

interstitial site without distorting the structure

A. 117pm

B. 130pm

C. 135pm

D. 140pm

Answer:

Watch Video Solution

18. A compound A^+B^- has rock salt type structure. The formula mass of Ab is 6.023 y amu and the closest approach distance of A^+B^- in the crystal is $y^{1/3}$ nm. What is the density of the lattice in Kg/m^3?

A. 5

B. 7

C. 9

D. 11

Answer:

Watch Video Solution

19. KCl crystalizes in the same type of lattice as does NaCl and CsF in the CsCl type of structure. The molar mass of CsF is twice that of KCl and the a value of KCl is 1.5 times that of CsF.The ratio of the densities of CsF to that of KCl is

A. A.2.05

B. B.1.69

C. C.3.2

D. D.4.51

Answer:

Watch Video Solution

20. In diamond, carbon atoms occupy fcc lattice points as well as alternate tetrahedral voids. If edge length of the unit cell is 356 pm, the diameter of carbon atoms is

A. 77.07 pm

B. 154.14 pm

C. 251.7pm

D. 89 pm

Answer:

Watch Video Solution

21. $TlAl(SO_4)_2.\ xH_2O$ is bcc with a=1.22nm. If the density of the solid is 2.32g/cc, then the value of x is (atomic wt: TI=204, Al=27,S=32, O=16,H=1)

A. 2

B. 4

C. 47

D. 70

Answer:

Watch Video Solution

22. Which of the following statements is incorrect?

A. Co-ordination no. of each type of ion is CsCl is 8

B. A metal that crystallises in BCC structure has a co ordination number 12

C. A unit cell of an ionic crystal shares some of its ion with other unit cells

D. Edge length of unit cell in NaCl is 552 pm

$[r_{Na^+} = 95\text{pm}, r_{Cl^-} = 181\text{pm}]$

Answer:

Watch Video Solution

23. Which of the following statements are correct in contect of point defects in a crystal?

A. AgCl has anion frenkel defect and CaF_2 has Schottky defect

B. AgCl has cation Frenkel defect and CaF_2 has anion Frenkel defect

C. AgCl as well as CaF_2 have anion Frenkel defect

D. AgCl as well as CaF_2 have Schottky defect

Answer:

Watch Video Solution

24. Why is zinc oxide white at low temperature and yellow at high temperature?

A. Zn being a transition element

B. paramagenetic nature of the compound

C. Trapping of electrons at the sites vacated by oxide ions

D. Both 1 and 2

Answer:

Watch Video Solution

25. A ferrimagnetic substance among the following is

A. MnO

B. CrO_2

C. CuO

D. $MgFe_2O_4$

Answer:

Watch Video Solution

26. A metal crystallises into a lattice containing a sequence of layers of ABC ABC. If the radius of metal atom is 174 pm, then the

distance between the two successive layers (i.e. A and B) is

A. A.348 pm

B. B.174 pm

C. C.284.2 pm

D. D.492.2 pm

Answer:

Watch Video Solution

27. Analysis shows that nickel oxide has the formula 'Ni_(0.98) , O_(1.00)' What fraction of nickel exist as 'Ni^2+' and 'Ni^3+' ions?

A. 2% Ni^{3+} and 98% Ni^{3+}

B. 4% Ni^{3+} and 96 % Ni^{2+}

C. 3 % Ni^{3+} and 97 % Ni^{2+}

D. 5 % Ni^{3+} and95 % Ni^{2+}

Answer:

Watch Video Solution

28. if AgCl is dopped with 0.001 mol percent of $CdCl_2$ the number of cation vacancies per mol of Agcl will be

A. 6.02×10^{23}

B. 6.02×10^{20}

C. 6.02×10^{18}

D. 3.01×10^{18}

Answer:

Watch Video Solution

29. When an electron in an excited state of Mo atom falls from L to K shell an x-ray is emitted. These x-rays are diffracted at an angle of 7.75° by planes with a separationof $2.64A^\circ$ .What is the difference in energy between K-shell and L-shell in Mo. Assuming a first order dirffraction ? $(\sin 7.75^\circ = 0.1349)$

A. $2.791 \times 10^{18} J$

B. $2.791 \times 10^{15} J$

C. $4.936 \times 10^{-15} J$

D. $4.936 \times 10^{-18} J$

Answer:

Watch Video Solution

30. Calcium crystallises in fcc lattice with edge length 0.5 nm. What is the density if it contains 0.1% Shottky defect?

A. 2.12 g/cc

B. 2.6g/cc

C. 3.4g/cc

D. 4.2g/cc

Answer:

Watch Video Solution

31. KCl crystalizes in NaCl structure if $\frac{\gamma_{Na^+}}{\gamma_{Cl^-}} = 0.5$ and $\frac{\gamma_{Na^+}}{\gamma_{K^+}} = 0.70$, the ratio of the edge length of a unit cell of KCl to that of $NaCl$ is

A. A. 1.18

B. B 2.18

C. C. 1.14

D. D. 2.14

Answer:

Watch Video Solution

Question Level Ii Assertion Reason

1. Assertion (A) : In Rock salt type structuires, all the coctahedral voids in the close packing of anions are occupied by cations.

Reason(R): In Rock salt structure, the distance of closest apprach between two anions is equal to hal the face diagonal of unit cell.

A. A. If both Assertion and Reason are true and the Reason is the correct explanation of Assertion.

B. B. If both Assertion and Reason are true but Reason is not the correct explanation of Assertion

C. C. If Assertion is true but the Reason is false

D. D. If both Assertion and Reason are false

Answer:

Watch Video Solution

2. Assertion (A) :Distance between nearest lattice points in BCC is greater than that in FCC having same edge length.

Reason(R): FCC has greater packing efficiency than BCC.

A. A If both Assertion and Reason are true and the Reason is the correct explanation of Assertion.

B. B. If both Assertion and Reason are true but Reason is not the correct

explanation of Assertion

C. C. If Assertion is true but the Reason is false

D. D. If both Assertion and Reason are false

Answer:

Watch Video Solution

3. Assertion (A) :KCl is more likely to show Schottky defect, while Lil is more likely to show Frenkel defect.

Reason(R): Schottky defects is more likely in ionic solids in which cations and anions are of comparable size while Frenkel defect is more likely in which cations and anions have large differences in their ionic sizes.

A. If both Assertion and Reason are true and the Reason is the correct explanation of Assertion.

B. If both Assertion and Reason are true but Reason is not the correct explanation of Assertion

C. If Assertion is true but the Reason is false

D. If both Assertion and Reason are false

Answer:

Watch Video Solution

4. Assertion (A) :Antiferromagnetic substances become paramagnetic on heating to high temperature.

Reason(R): On heating, the randamization of spin occurs.

A. A. If both Assertion and Reason are true and the Reason is the correct explanation of Assertion.

B. B. If both Assertion and Reason are true but Reason is not the correct explanation of Assertion

C. C. If Assertion is true but the Reason is false

D. D. If both Assertion and Reason are false

Answer:

Watch Video Solution

Question

1. A compound of elements X and Y crystallizes in cubic structure where X atoms occupy the corners of the cube and Y atoms occupy the

centre of the cube. What is the formula of the compound?

Watch Video Solution

2. A cubic crystalline solid contains A atoms at the comers and B atoms at the body centres. If one atom from a comer is missing, what will be the simplest formula of the resulting solid?

Watch Video Solution

3. An alloy of silver and copper crystallizes in a cubic lattice in which silver atoms occupy the lattice points at the comers of a cube and copper atoms occupy the face centres of the cube. Determine the formula of the compound

Watch Video Solution

4. A solid has cubic structure in which X atoms are located at the corners of the cube, Y atoms at the body centre and O atoms at the edge

centres. What is the formula of the compound?

Watch Video Solution

5. In a solid XY, having fcc structure, X atoms occupy the comers of the unit cell and Y atoms occupy the face centres. If all the face centre atoms along one of the axes are removed, what would be the stoichiometry of the solid?

Watch Video Solution

6. Xenon crystallises in fcc structure with edge length 630 pm. Calculate nearest neighbour distance and radius of the xenon atom.

Watch Video Solution

7. A metal of atomic mass 60u has a body centred cubic lattice. The edge length of the unit cell is 286 pm. Calculate the atomic radius and the density of the metal.

Watch Video Solution

8. An element of density 7.2 g cm^{-3} occurs in bcc structure with unit cell edge of 280 pm. Calculate molecular mass of the element and number of atoms present in 100 g of the element.

Watch Video Solution

9. What is the concentration of cation vacancies if NaCl is doped with 10^{-3} mol percent of $MgCl_2$?

Watch Video Solution

10. What is the concentration of cation vacancies if KCl is doped with 0.01% Ga As (gallium arsenide)?

Watch Video Solution

11. The CsCl lattice (bcc) is more stable than $NaCl(fcc)$. Why do halides of Li, Na, K and Rb not have this lattice.

Watch Video Solution

12. In a cubic lattice, the close packed structure of mixed oxides of the lattice is made up of oxide ion, one eighth of the tetrahedral voids are occupied by divalent ions $\left(X^{2+}\right)$ while one half of the octahedral voids are occupied by trivalent ions $\left(Y^{3+}\right)$. What is the formula of the oxide?

Watch Video Solution

13. Calculate the miller indices of crystal planes which cut through the crystal axes at (i) (2a, 3b, c)

Watch Video Solution

14. Calculate the distance between 200, 110 and 222 planes of a body centred cube. The length of the side of the unit cell is 5.4 Å.

Watch Video Solution

Level I

1. The radius of a di val ent cation M^{2+} is 94 pm and of divalent anion X^{2-} is 146 pm. Thus, M^2X^{2-} has

A. rock salt (NaCl) structure

B. zinc blend structure

C. antifluorite structure

D. bcc (CsCl) structure

Answer: A

Watch Video Solution

2. Which has minimum per cent volume occupied by the spheres?

A. Simple cubic

B. Body-centred cubic

C. Hexagonal closest packed

D. Cubic closest packed

Answer: A

Watch Video Solution

3. At very low temperature, oxygen O_2, freezes and forms a crystalline solid. Which term best describes the solid?

A. Covalent network

B. Molecular crystals

C. Metallica

D. Ionic

Answer: B

Watch Video Solution

4. Ferrimagnetic substance is converted into paramagnetic substance at

A. Inversion temperature

B. Critical temperature

C. Boyle point

D. Curie point

Answer: D

Watch Video Solution

5. The addition of a $CaCl_2$ crystal to a KCl crystal

A. lowers the density of the KCl crystal

B. raises the density of the KCl crystal

C. does not affect the density of the KCl crystal

D. increases the Frenkel defects of the KCl crystal

Answer: A

 Watch Video Solution

6. Select the correct statement for Schottky defect.

A. Density of the solid increases

B. Found in ionic compounds having high co-ordination number

C. Found in ionic compounds having low co-ordination number

D. Conduct electricity due to presence of electrons in valence shell of cations and anions

Answer: B

 Watch Video Solution

7. Why is Frenkel defect not found in alkali metal halides?

A. high electropositivity

B. high ionic radii

C. high reactivity

D. ability to occupy interstitial sites

Answer: B

Watch Video Solution

8. Which of the following statement(s) is not true?

A. Ferromagnetic substances cannot be magnetised permanently

B. Paramagnetic substances are weakly attracted by magnetic field

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

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

Answer: A

Watch Video Solution

9. Which type of magnetic behaviour, $MgFe_2O_4$ is exhibited?

A. Diamagnetic

B. Paramagnetic

C. Ferromagnetic

D. Ferrimagnetic

Answer: D

Watch Video Solution

10. Triclinic crystal has the following unit cell parameters:

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

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

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

D. $a = b \neq c, \alpha = \beta = 90^\circ, \gamma = 120^\circ$

Answer: C

Watch Video Solution

11. Molybdenum (At. wt. = 96g mol^{-1}) crystallizes as bcc crystal. If density of crystal is 10.3 g/cm^3, then radius of Mo atom is (use $N_A = 6 \times 10^{23}$):

A. 111 pm

B. 314 pm

C. 135.96 pm

D. 216.35

Answer: C

Watch Video Solution

12. The atomic radius of strontium (Sr) is 215 pm and it crystallizes with a cubic close packing. Edge length of the cube is:

A. 430 pm

B. 608.2 pm

C. 496.53 pm

D. 658 pm

Answer: B

13. Which one of the following schemes of ordering close packed sheets of equal sized

spheres do not generate closest packed lattice?

A. ABCABC

B. ABACABAC

C. ABBAABBA

D. ABCBCABCBC

Answer: D

Watch Video Solution

14. Ina cubic unit cell, seven of the eight corners are occupied by atoms A and centres of faces are occupied by atoms B. The general formula of the compound is:

A. A_7B_6

B. A_7B_{12}

C. A_7B_{24}

D. $A_{24}B_7$

Answer: C

Watch Video Solution

Watch Video Solution

15. An alloy of copper, silver and gold is found to have copper constituting the ccp lattice. If silver atoms occupy the edge centres and gold is present at body centre, the alloy will have the formula:

A. Cu_4Ag_2Au

B. Cu_4Ag_4Au

C. Cu_4Ag_3Au

D. CuAgAu

Answer: C

Watch Video Solution

16. Which of the following statements for crystals having Schottky defect is not correct?

A. Schottky defect arises due to the absence of a cation and anion from the position which it is expected to occupy

B. Schottky defect are more common in ionic compounds with high co-ordination numbers

C. The density of the crystals having Schottky defect is larger than that of the perfect crystal

D. The crystal having Schottky defect is electrically neutral as a whole

Answer: C

 Watch Video Solution

17. Which of the following defects does KBr show?

A. Frenkel

B. Schottky

C. Metal excess

D. Metal deficiency

Answer: B

Watch Video Solution

18. Select the incorrect statement:

A. Stoichiometry of crystal remains uneffected due to Schottky defect

B. Frenkel defect is usually shown by ionic compounds having low coordination number

C. F-centres generation is responsible factor for imparting the colour to the crystal

D. Density of crystal always increases due to substitutional impurity defect

Answer: D

Watch Video Solution

19. The composition of a sample of Wustite is $Fe_{0.93}O$. What is the percentage of iron present as Fe^{3+} in total iron?

A. 15.05

B. 25

C. 35

D. 45

Answer: A

Watch Video Solution

20. The most unsymmetrical and symmetrical systems are respectively:

A. Tetragonal, Cubic

B. Triclinic, Cubic

C. Rhombohedral, Hexagonal

D. Orthorhomic, Cubic

Answer: B

Watch Video Solution

21. Which of the following network solids is an exceptionally good conductor of electricity?

A. SiO_2

B. Graphite

C. Si

D. SiC

Answer: B

Watch Video Solution

22. Which of the following is not a molecular solid?

A. Dry ice

B. Naphthalene

C. Glucose

D. Quartz

Answer: D

Watch Video Solution

23. Silver crystallises in a face-centred cubic unit cell. The density of Ag is 10.5 g cm^{-3}. Calculate the edge length of the unit cell.

A. 409 pm

B. 818 pm

C. 683 pm

D. 653 pm

Answer: A

Watch Video Solution

24. An element has a body centred cubic 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?

A. 1.208×10^{24}

B. 2.416×10^{24}

C. 1.208×10^{31}

D. 2.416×10^{31}

Answer: B

Watch Video Solution

25. An element 'A' has face-centred cubic structure with edge length equal to 361 pm. The apparent radius of atom 'A' is :

A. 127.6 pm

B. 180.5 pm

C. 160.5 pm

D. 64 pm

Answer: A

Watch Video Solution

26. If the radius of Br ion is 0.182 nm, the radius of biggest cation that can fit into its tetrahedral voids?

A. 0.414 pm

B. 0.0753 nm

C. 0.091 nm

D. 0.225 pm

Answer: B

Watch Video Solution

27. How many unit cells are present in 39 g of potassium that crystallises in body-centred cubic structure?

A. N_A

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

C. $0.5N_A$

D. $0.75N_A$

Answer: C

Watch Video Solution

28. A metal crystallises face-centred cubic lattice with edge length of 450 pm. Molar mass of the metal is $50 g \mathrm{mol}^{-1}$ The density of metal will be: (1) 2.64g/cm^3 (2) 3.64 g/cm^3 (3) 4.64 g/cm^3 (4) 2.68 g/cm^3

A. $2.64 g cm^{-3}$

B. $3.64 g cm^{-3}$

C. $4.64 g cm^{-3}$

D. $2.68 g cm^{-3}$

Answer: B

Watch Video Solution

29. In zinc blende, the percentage of tetrahedral voids occupied by Zn^{2+} ions is :

(a) 0.25 (b) 0.5 (c) 0.75 (d) 1

A. 0.25

B. 0.5

C. 0.75

D. 1

Answer: B

Watch Video Solution

30. How many nearest and next nearest neighbours respectively does potassium have in BCC lattice?

A. 8, 8

B. 8, 6

C. 6, 8

D. 8, 2

Answer: B

Watch Video Solution

31. In a solid lattice, the cation has left a lattice site and is located at interstitial position, the lattice defect is:

A. interstitial defect

B. vacancy defect

C. Frenkel defect

D. Schottky defect

Answer: C

Watch Video Solution

32. If we know the ionic radius ratio in a crystal of ionic solid, what can be known of the following?

A. Magnetic property

B. Nature of chemical bond

C. Type of defect

D. Geometrical shape of crystal

Answer: D

Watch Video Solution

33. The number of nearest neighbours with which a given sphere, of packing is in contact, is called coordination number. The incorrect statement about coordination number is:

A. Coordination number decreases on heating

B. Coordination number increases on applying pressure

C. CsCl acquires NaCl type structure on heating

D. Coordination number of octahedral site is 4

Answer: D

Watch Video Solution

34. Total volume of atoms present in face centred 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

Watch Video Solution

35. Percentage of free space in cubic close-packed structure and in body-centred packed structure are, respectively, (1) 48% and 26% (2)

30% and 26% (3) 26% and 32% (4) 32% and 48%

A. 48% and 26%

B. 30% and 26%

C. 26% and 32%

D. 32% and 48%

Answer: C

Watch Video Solution

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

A. 2

B. 4

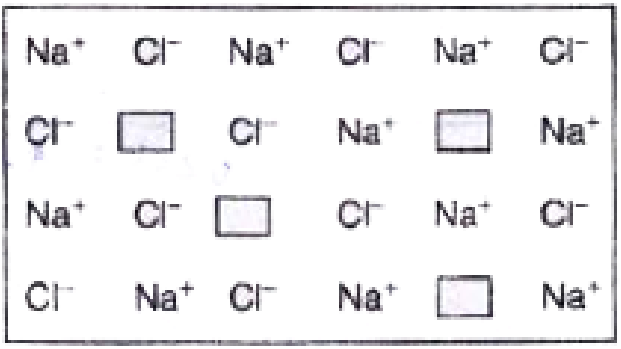
C. 1

D. 3

Answer: C

Watch Video Solution

37. Crystal defect indicated in the diagram below is:



A. Frenkel defect

B. Frenkel and Schottky defects

C. Interstitial defect

D. Schottky defect

Answer: D

 Watch Video Solution

38. Frenkel defect is noticed in

A. AgBr

B. ZnS

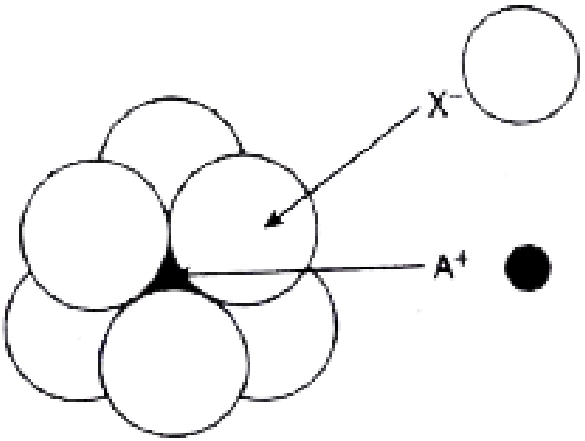
C. AgI

D. All of these

Answer: D

Watch Video Solution

39. 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 very close to:



A. 104 pm

B. 125 pm

C. 183 pm

D. 57 pm

Answer: A

Watch Video Solution

40. Which of the following fcc structure contains cations in the alternate tetrahedral voids?

A. Na_2O

B. ZnS

C. CaF_2

D. CaO

Answer: B

Watch Video Solution

41. CsBr has bcc type structure like CsCl with edge length 4.3 Å. The shortest interionic distance in between Cs^+ and Br^- is

A. 3.72 Å

B. 1.86 Å

C. 7.44 Å

D. 4.3 Å

Answer: A

Watch Video Solution

42. The COordination number of a metal crystallizing in a hexagonal close packed structure is

A. 12

B. 4

C. 8

D. 6

Answer: A

Watch Video Solution

43. A crystal formula AB_3 has A ions at the cube corners and B ions at the edge centres.

The coordination numbers of A and B are, respectively,

A. 6 and 6

B. 2 and 6

C. 6 and 2

D. 8 and 8

Answer: C

Watch Video Solution

44. What type of crystal defect is produced when ' NaCl' is:doped with 'MgCl_2'

A. interstitial

B. Frenkel

C. impurity defect

D. None of these

Answer: C

 Watch Video Solution

45. The lattice parameters are $a = 5.62A^{\circ}, b = 7.41A^{\circ}, c = 9.48A^{\circ}$. The three coordinates are mutually perpendicular to each other. The crystal is

A. tetragonal

B. orthorhombic

C. monoclinic

D. trigonal

Answer: B

 Watch Video Solution

46. At a temperature of absolute zero, an intrinsic semiconductor is

A. an insulator

B. a p-type semiconductor

C. a n-type semiconductor

D. a conductor

Answer: A

 Watch Video Solution

47. The ratio Fe^{3+} and Fe^{2+} ions in $Fe_{0.9}S_{1.0}$ is.

A. 0.28

B. 0.5

C. 2

D. 4

Answer: A

Watch Video Solution

48. The yellow colour of ZnO and conducting nature produced in heating is due to:

A. metal excess defect due to interstitial cation

B. extra positive ions present in an interstitial site

C. trapped electrons

D. all of these

Answer: D

Watch Video Solution

49. In an antiferromagnetic material

A. all the magnetic moment vectors are aligned in one direction.

B. half of the magnetic moment vectors point in one direction and the rest in opposite direction.

C. all the magnetic moment vectors are randomly oriented.

D. is characterised by a very large magnetic moment.

Answer: B

Watch Video Solution

50. Which of the following is not a ferroelectric compound?

A. Rochelle salt

B. $PbZrO_3$

C. $BaTiO_3$

D. KH_2PO_4

Answer: B

Watch Video Solution

Level Ii

1. Total number of voids in 0.5 mole of a compound forming hexagonal closed packed structure are

A. 6.022×10^{23}

B. 3.011×10^{23}

C. 9.034×10^{23}

D. 4.516×10^{23}

Answer: C

Watch Video Solution

2. The radius of Li^+ ion is 60pm and that of F^- is 136 pm. Structure of LiF and coordination number is

A. Like NaCl, CN = 6

B. Like CsCl, CN = 8

C. Anti fluorite, CN = 8

D. Like ZnS, CN = 4

Answer: A

Watch Video Solution

3. The anions (A) form hexagonal closest packing and atoms (C) occupy only 2/3 of

octahedral voids in it, then the general formula of the compound is

A. CA

B. A_2

C. C_2A_3

D. C_3A_2

Answer: C

Watch Video Solution

4. The r_+/r_- ratio of ZnS is 0.402. Pick the false statement out of the statements given below : ZnS is 4 : 4 coordination compound, ZnS does not crystallize in rock salt type lattice because r_+/r_- is too small to avoid overlapping of S^{2-} ions., Zn^{2+} ion is too small to fit precisely into the octahedral voids of S^{2-} ions. , Zn^{2+} ion is too large to fit into the octahedral voids of S^{2-} ions.

A. ZnS is 4 : 4 coordination compound

B. ZnS does not crystallize in rock salt type lattice because r_+/r_- is too small to avoid overlapping of S^{2-} ions.

C. Zn^{2+} ion is too small to fit precisely into the octahedral voids of S^{2-} ions.

D. Zn^{2+} ion is too large to fit into the octahedral voids of S^{2-} ions.

Answer: D

Watch Video Solution

5. In NaCl type structure, if all ions along an edge diagonal are absent, the expression for packing fraction in limiting case is:

A. $\frac{\pi}{3\sqrt{2}}\left(1+\frac{r_c^3}{r_a^3}\right)$

B. $\frac{\pi}{4\sqrt{2}}\left(1+\frac{r_c^3}{r_a^3}\right)$

C. $(\sqrt{2})\frac{\pi}{24}\frac{\left(\frac{5}{2}\right)r_c^3+4r_a^3}{r_a^3}\Bigg)$

D. $\frac{\pi}{2\sqrt{2}}\left(1+\frac{r_c^3}{r_a^3}\right)$

Answer: B

Watch Video Solution

6. Which of the following is correct when atoms are closely packed?

A. The size of tetrahedral void is smaller than that of octahedral void

B. The size of tetrahedral void is greater than that of octahedral void

C. The size of tetrahedral void may be greater or smaller or equal to that of

octahedral void depending upon the size of atoms

D. The size of tetrahedral void is equal to that of octahedral void

Answer: A

 Watch Video Solution

7. CsCl forms unit cells in which caesium ions are in contact with each other and chloride ions occupy the body centre. If the volume of a

unit cell of CsCl is $7.014 \times 10^{-23} cm^3$, the Cs - Cs distance is nearly

A. $1.92A^\circ$

B. $3.5A^\circ$

C. $4.1A^\circ$

D. $4.5A^\circ$

Answer: C

Watch Video Solution

8. Which of the following statement is incorrect about metals?

A. Valence band overlaps with conduction band

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

C. The gap between these bands cannot be determined

D. Valence band may remains partially filled

Answer: C

Watch Video Solution

9. A compound of molecular mass 155 gm mol^{-1} possessing crystal defect exist as orthorhombic crystal having values of a, b and c are respectively $4.2A^{\circ}, 8.6A^{\circ}$ and $8.3A^{\circ}$. The density is observed to be 3.3 gm/cc, the number of formula units calculated per unit cell is

A. 2.93

B. 4.65

C. 3.84

D. 6.02

Answer: C

Watch Video Solution

10. Ferrous oxide has a cubic structure and each edge of the unit cell is 5.0 Å. Assuming density of the oxide as $4.0gcm^{-3}$, then the

number of Fe^{2+} and O^{2-} ions present in each unit cell will be

A. Four Fe^{2+} and four O^{2-}

B. Two Fe^{2+} and four O^{2-}

C. Four Fe^{2+} and two O^{2-}

D. Three Fe^{2+} and three O^{2-}

Answer: A

Watch Video Solution

11. If Germanium crystallises in the same way as diamond, then which of the following statement is not correct?

A. Everv atom in the structure is tetrahedrally bonded to 4 atoms

B. Unit cell consists of 8 Ge atoms and co-ordination number is 4

C. All the octahedral voids are occupied

D. All the octahedral voids and 50% tetrahedral voids remain unoccupied

Answer: C

Watch Video Solution

12. Al (at. wt 27) crystallizes in the cubic system with a cell edge of $4.05A^{\circ}$. Its density is $2.7gcm^{-3}$. Determine the unit cell type and calculate the radius of the Al atom

A. fcc, $2.432A^{\circ}$

B. bcc, $2.432A^{\circ}$

C. bcc, $1.432A^{\circ}$

D. fcc, $1.432A^{\circ}$

Answer: D

 Watch Video Solution

13. KCl crystalizes in the same type of lattice as does NaCl and CsF in the CsCl type of structure. The molar mass of CsF is twice that of KCl and the a value of KCl is 1.5 times that of CsF.The ratio of the densities of CsF to that of KCl is

A. 2.05

B. 1.69

C. 3.2

D. 4.51

Answer: B

 Watch Video Solution

14. Each rubidium halide crystallizing in the NaCl type lattice has a unit cell length 30 pm greater than for corresponding potassium salt

($r_k = 133$pm) of the same halogen. What is the ionic radius of Rb^+?

A. 1265 pm

B. 1056 pm

C. 985 pm

D. 148 pm

Answer: D

Watch Video Solution

15. Which of the following statements is correct about the defects in the crystals?

A. Schottky defect is observed in the compounds in which there is a large difference in the size of cation and anion, whereas Frenkel defect is observed when cation and anion are approximately of the same size.

B. Schottky defects disturb the ratio of cations and anions, whereas Frenkel defects maintain the ratio.

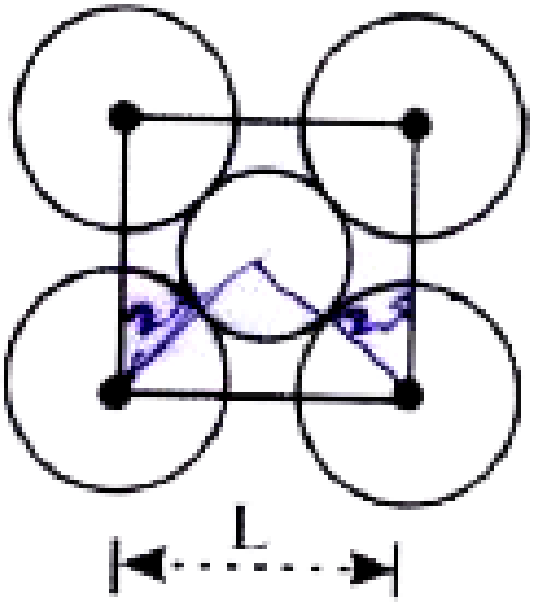
C. Schottky defects lead to lowering in density, whereas Frenkel defects do not affect the density.

D. Both interstitial defects and Frenkel defects cause increase in the density of solid

Answer: C

Watch Video Solution

16. The packing efficiency of the two-dimensional square unit cell consisting of identical circles shown in below figure is



A. 0.3927

B. 0.6802

C. 0.7405

D. 0.7854

Answer: D

 Watch Video Solution

17. A material has cubic close packed (ccp) array of oxide ions with 'm' fraction of octahedral holes occupied by aluminium ions

and 'n' fraction of tetrahedral holes cocupied by magnesium ions to form a perfect crystal, m and n, respectively, are

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

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

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

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

Answer: A

Watch Video Solution

18. Metallic magnesium has a hexagonal close-packed structure and a density of $1.74gcm^{-3}$. Assuming magnesium atoms to be spherical, calculate the radius of magnesium atom. (Atomic mass of Mg = 24.3 u)

A. 1.6×10^{-8} cm

B. 2.5×10^{-8} cm

C. 3.5×10^{-8} cm

D. 4.5×10^{-8} cm

Answer: A

Watch Video Solution

19. The density of solid argon is 1.65 g/mL at $-233^{\circ}C$. If the argon atom is assumed to be sphere of radius 1.54×10^{-8} cm, what percentage of solid argon is apparently empty space? (Ar = 40)

A. 0.84

B. 0.78

C. 0.62

D. 0.48

Answer: C

Watch Video Solution

20. A metal crystalizes into two cubic phases, face centred cubic (FCC) and body centred cubc (BCC), whose unit cell lengths are 3.5 and $3.0A^{\circ}$, respectively. Calculate the ratio of densities of FCC and BCC.

A. 1.259

B. 12.59

C. 0.259

D. 0.0259

Answer: A

Watch Video Solution

21. If NaCl crystals are doped with 2×10^{-3} mol per cent of $SrCl_2$, calculate the cation vacancies per mole.

A. 1.204×10^{20}

B. 12.04×10^{20}

C. 12.04×10^{19}

D. 1.204×10^{19}

Answer: D

Watch Video Solution

22. Lithium borohydride crystallizes in an orthorhombic system with 4 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 crystal.

A. $0.671 gcm^{-3}$

B. $6.71 gcm^{-3}$

C. $6.71 \times 10^{-3} gcm^{-3}$

D. $6.71 \times 10^{-4} gcm^{-3}$

Answer: A

Watch Video Solution

23. Which of the following statements is correct for the rock-salt structure of an ionic compounds?

A. Coordination number of cation is four, whereas that of anion is six.

B. Coordination number of cation is six, whereas that of anion is four

C. Coordination number of each cation and anion is four

D. Coordination number of each cation and anion are six

Answer: D

Watch Video Solution

24. Which of the following statements is incorrect?

A. The coordination number of each type of ion in CsCl is 8

B. A metal that crystallises in BCC structure has a coordination number 12.

C. A unit cell of an ionic crystal shares some of its ions with other unit cells.

D. The length of the unit cell in NaCl is 552 pm, if

$$r_{Na^+} = 95\text{pm} \text{ and } r_{Cl^-} = 181\text{pm}$$

Answer: B

Watch Video Solution

25. KCl crystallizes in the same type of lattice as does NaCl. Given that $r_{Na^+}/r_{Cl^-} = 0.55$ and $r_{K^+}/r_{Cl^-} = 0.74$. Calculate the ratio of the side of the unit cell for KCl to that of NaCl

A. 1.123

B. 0.891

C. 1.414

D. 0.141

Answer: A

Watch Video Solution

26. Melting point of RbBr is $682^{\circ}C$, while that of NaF is $988^{\circ}C$. The principal reason that melting point of NaF is much higher than that of RbBr is that:

A. the two crystals are not isomorphous

B. the molar mass of NaF is smaller than that of RbBr

C. the internuclear distance $r_c + r_a$ is greater for RbBr than for NaF

D. the bond in RbBr has more covalent character than the bond in NaF

Answer: C

Watch Video Solution

27. A binary solid $\left(A^+B^-\right)$ has a zinc blende structure with B^- ions constituting the

lattice and A^+ ions occupying 25% tetrahedral holes. The formula of solid is:

A. AB

B. A_2B

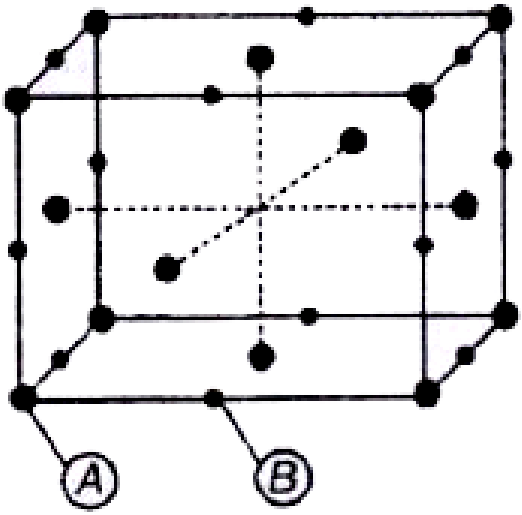
C. AB_2

D. AB_4

Answer: C

Watch Video Solution

28. For a solid with the following structure, the co-ordination number of the point B is:



A. 3

B. 4

C. 5

D. 6

Answer: D

Watch Video Solution

29. If 'a' stands for the edge length of the cubic systems: simple cubic, body-centred cubic and face-centred cubic, then the ratio of radii of the spheres in these systems will be respectively:

A. $\frac{1}{2}a : \frac{\sqrt{3}}{2}a : \frac{\sqrt{2}}{2}a$

B. $1a : \sqrt{3}a : \sqrt{2}a$

C. $\frac{1}{2}a : \frac{\sqrt{3}}{4}a : \frac{1}{2\sqrt{2}}a$

D. $\frac{1}{2}a : \sqrt{3}a : \frac{1}{\sqrt{2}}a$

Answer: C

Watch Video Solution

30. The density of KBr is 2.75 gm cm^{-3} and length of the unit cell is 654 pm. K = 39, Br = 80, then what is true about the predicted nature of the solid?

A. Solid has face-centred cubic system with co-ordination number = 6

B. Solid has simple cubic system with co-ordination number = 4

C. Solid has face-centred cubic system with co-ordination number = 1

D. None of these

Answer: A

Watch Video Solution

31. A solid has a b.c.c. structure. If the distance of closest approach between the two atoms is 1.73Å. The edge length of the cell is:

A. 200 pm

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

C. 142.2 pm

D. $\sqrt{2}$ pm

Answer: A

Watch Video Solution

32. Experimentally it was found that a metal oxide has formula $M_{0.98}O$. Metal M, is present as M^{2+} and M^{3+} in its oxide. Fraction of metal which exists as M^{3+} would be:

A. 0.0605

B. 0.0508

C. 0.0701

D. 0.0408

Answer: D

Watch Video Solution

33. In a close packed face-centred unit cell, are all lattice positions occupied by 'A' atoms and body-centred octahedral hole is occupied by atom 'B' having appropriate size. Choose the correct statement(s) regarding such crystal.

A. void percentage is 24.6

B. percentage space occupied is 80.3

C. formula of the compound is A_2B_3

D. formula of the compound is AB

Answer: A

Watch Video Solution

34. Element X crystallizes in a 12 co-ordination fcc lattice. On applying high temperature it changes to 8 coordination bcc lattice. Find the ratio of the density of the crystal lattice before and after applying high temperature?

A. $1:1$

B. $3:2$

C. $\sqrt{2}:\sqrt{2}$

D. $2(\sqrt{2})^3:(\sqrt{3})^3$

Answer: D

Watch Video Solution

35. For which of the following crystals would you expect the assumption of anion-anion contact to be valid?

A. CsBr

B. NaI

C. NaF

D. KCl

Answer: B

Watch Video Solution

36. A compound of A, B and C has cubic close packed arrangement of A, B occupy one half of octahedral voids and C occupy $1/4^{th}$ of

tetrahedral voids. The simplest formula of the compound is

A. A_2BC

B. A_2B_2C

C. $A_2B_2C_2$

D. $A_2B_4C_3$

Answer: A

Watch Video Solution

37. The compound MO (molar mass = 100 g mol^{-1}) has zinc-blende structure. If the radius of M^{2+} is 69.4 pm, the density of MO will be

A. A.$2.5 gcm^{-3}$

B. B.$1.5 gcm^{-3}$

C. C.$0.75 gcm^{-3}$

D. D.$1.0 gcm^{-3}$

Answer: D

Watch Video Solution

38. An ionic compound MX has rock-salt structure. If $r_c = 120$ pm and $r_a = 180$ pm, then the number of molecules of MX in a cube of edge length of 1 cm is about

A. 1.85×10^{20} molecules

B. 1.85×10^{21} molecules

C. 1.85×10^{22} molecules

D. 1.85×10^{23} molecules

Answer: C

Watch Video Solution

39. What is the density of Na_2O having antifluorite-type crystal structure, if the edge length of cube is 100 pm and what is the effect on density by 0.05% Frenkel defect?

A. $823.5gcm^{-3}$, density decreases

B. $414.16gcm^{-3}$, density decreases

C. $823.5gcm^{-3}$, density remains same

D. $414.16gcm^{-3}$, density remains same

Answer: D

Watch Video Solution

40. In cubic ZnS if the radii of Zn^{2+} and S^{2-} atoms are 0.74 Å and 1.70 Å, the lattice parameter of ZnS is

A. 11.87 Å

B. 5.634 Å

C. 5.14 Å

D. 2.97 Å

Answer: B

Watch Video Solution

41. The γ-form of iron has fcc structure (edge length 386 pm) and β-form has bcc structure (edge length 290 pm). The ratio of density in γ -form and β-form is

A. 0.8481

B. 1.02

C. 1.57

D. 0.6344

Answer: A

Watch Video Solution

42. An element forms crystals of density of $8570kgm^{-3}$. The packing efficiency is 0.68. If the closest distance between neighbouring atoms is 2.86 Å. The mass of one atom is (1 amu = 1.66×10^{-27} kg)

A. 186 amu

B. 93 amu

C. 46.5 amu

D. 43 amu

Answer: B

 Watch Video Solution

43. In bronze, copper forms fcc arrangement and tin occupies interstitial sites. The density of bronze sample is $7717kgm^{-3}$ and its lattice parameter is 3.903 Å. What is the approximate

mole fraction of tin in the alloy?

(At. mass of Cu = 63.54u, Sn = 118.7u)

A. 0.01

B. 0.04

C. 0.10

D. 0.4

Answer: B

 Watch Video Solution

44. A metal of density $7.5 \times 10^3 kgm^{-3}$ has an fcc crystal structure with lattice parameter a = 400 pm. Calculate the number of unit cells present in 0.015 kg of the metal.

A. 6.250×10^{22}

B. 3.125×10^{23}

C. 3.125×10^{22}

D. 1.563×10^{22}

Answer: C

Watch Video Solution

Watch Video Solution

45. The ratio of the volume of a tetragonal lattice unit cell to that of a hexagonal lattice unit cell is (both having same respective lengths)

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

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

C. $\frac{2}{\sqrt{3}}\frac{a^2c}{b}$

D. 1.33

Answer: B

Watch Video Solution

46. The correct statement regarding defects in solids is

A. Frenkel defect is usually favoured by a very small difference in the sizes of cation and anion.

B. Schottky defect appears generally in strongly ionic compounds having a low co-ordination number.

C. Trapping of an electron in the lattice leads to the formation of F-centre.

D. Schottky defects have no effect on the physical properties of solids.

Answer: C

Watch Video Solution

47. A certain sample of cuprous sulphide is found to have composition $Cu_{1.8}S$, because of incorporation of Cu^{2+} ions in the lattice. What is the mole % of Cu^{2+} in total copper content in this crystal?

A. $99.8\ \%$

B. $11.11\ \%$

C. $88.88\ \%$

D. $33.33\ \%$

Answer: B

Watch Video Solution

48. Ammonium chloride crystallises in CsCl type (bcc) lattice with unit cell edge length of 387 pm. Distance between oppositely charged ions in the lattice and radius of the NH_4^+ ion are respectively (if the radius of Cl^- ion is 181 pm).

A. 356.12 pm, 175.12 pm

B. 348.23 pm, 167.23 pm

C. 335.15 pm, 154.15 pm

D. 326.35 pm, 145.35 pm

Answer: C

Watch Video Solution

49. For rock salt type structure, select the incorrect statement.

A. In limiting case, $\frac{r_{\text{cation}}}{r_{\text{anion}}} = 0.414$

B. In the lattice, each chloride ion is surrounded by four sodium ions

C. C.N. of cation = 6

D. Packing fraction in limiting case is greater than 74%

Answer: B

Watch Video Solution

50. In spinel structure, O^{2-} ions are cubic-close packed, where 1/8th of the tetrahedral holes are occupied by A^{2+} cations and 1/2 of

the octahedral holes are occupied by cations B^{3+}. The general formula of this compound is

A. A_2BO_4

B. AB_2O_4

C. A_2B_4O

D. A_4B_2O

Answer: B

Watch Video Solution

Level Ii Assertion Reason Type

1. Assertion : In any ionic solid [MX] with Schottky defects, the number of positive and negative ions are same.

Reason : Equal number of cation and anion vacancies are present.

A. If both (A) and (R) are correct and (R) is the correct explanation of(A).

B. If both (A) and (R) are correct, but (R) is not the correct explanation of (A).

C. If (A) is correct, but (R) is incorrect.

D. If both (A) and (R) are incorrect.

Answer: A

Watch Video Solution

2. Assertion : Electrical conductivity of intrinsic semiconductors increases with increasing temperature.

Reason : With increase in temperature, large number of electrons from the valence band can jump to the conduction band.

A. If both (A) and (R) are correct and (R) is the correct explanation of(A).

B. If both (A) and (R) are correct, but (R) is not the correct explanation of (A).

C. If (A) is correct, but (R) is incorrect.

D. If both (A) and (R) are incorrect.

Answer: A

 Watch Video Solution

3. Assertion : Due to Frenkel defect, there is no change in the density of the crystalline solid.

Reason : In Frenkel defect, no cation or anion leaves the crystal.

A. If both (A) and (R) are correct and (R) is the correct explanation of(A).

B. If both (A) and (R) are correct, but (R) is not the correct explanation of (A).

C. If (A) is correct, but (R) is incorrect.

D. If both (A) and (R) are incorrect.

Answer: A

Watch Video Solution

4. Assertion : On heating ferromagnetic or ferrimagnetic substances, they become paramagnetic.

Reason : Randomisation of electron spin occurs on heating.

A. If both (A) and (R) are correct and (R) is the correct explanation of(A).

B. If both (A) and (R) are correct, but (R) is not the correct explanation of (A).

C. If (A) is correct, but (R) is incorrect.

D. If both (A) and (R) are incorrect.

Answer: A

Watch Video Solution

5. Assertion : In crystalline solids, the value of resistance is different in different directions.

Reason : Crystalline solids are isotropic in nature.

A. If both (A) and (R) are correct and (R) is the correct explanation of(A).

B. If both (A) and (R) are correct, but (R) is not the correct explanation of (A).

C. If (A) is correct, but (R) is incorrect.

D. If both (A) and (R) are incorrect.

Answer: C

Watch Video Solution

6. Assertion : A tetrahedral void is surrounded by four spheres and an octahedral void is surrounded by six spheres.

Reason : In hcp or ccp the number of tetrahedral voids is double the number of close packed spheres and number of octahedral voids is equal to number of close packed spheres.

A. If both (A) and (R) are correct and (R) is the correct explanation of(A).

B. If both (A) and (R) are correct, but (R) is not the correct explanation of (A).

C. If (A) is correct, but (R) is incorrect.

D. If both (A) and (R) are incorrect.

Answer: B

Watch Video Solution

7. Assertion : Frenkel defect is also called dislocation defect.

Reason : Frenkel defect is shown by ionic

substances in which cation and anion are of almost similar sizes.

A. If both (A) and (R) are correct and (R) is the correct explanation of(A).

B. If both (A) and (R) are correct, but (R) is not the correct explanation of (A).

C. If (A) is correct, but (R) is incorrect.

D. If both (A) and (R) are incorrect.

Answer: C

Watch Video Solution

8. Assertion : Ferromagnetic substances are strongly attracted by magnetic field.

Reason : Ferromagnetism arises due to spontaneous alignment of magnetic moments in the direction of applied magnetic fields.

A. If both (A) and (R) are correct and (R) is the correct explanation of(A).

B. If both (A) and (R) are correct, but (R) is not the correct explanation of (A).

C. If (A) is correct, but (R) is incorrect.

D. If both (A) and (R) are incorrect.

Answer: A

Watch Video Solution

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

Reason : In case of semiconductors, the gap

between the valence band and conduction band is small.

A. If both (A) and (R) are correct and (R) is the correct explanation of(A).

B. If both (A) and (R) are correct, but (R) is not the correct explanation of (A).

C. If (A) is correct, but (R) is incorrect.

D. If both (A) and (R) are incorrect.

Answer: A

Watch Video Solution

10. Assertion : Graphite is an example of tetragonal crystal system.

Reason : For a tetragonal system, $a = b \neq c, \alpha = \beta = 90^\circ, \gamma = 120^\circ$.

A. If both (A) and (R) are correct and (R) is the correct explanation of(A).

B. If both (A) and (R) are correct, but (R) is not the correct explanation of (A).

C. If (A) is correct, but (R) is incorrect.

D. If both (A) and (R) are incorrect.

Answer: D

 Watch Video Solution

11. Assertion : A metal crystallizing in bcc structure has coordination number of eight.

Reason : Each metal atom at the corner is surrounded by eight body centred atoms.

A. If both (A) and (R) are correct and (R) is the correct explanation of(A).

B. If both (A) and (R) are correct, but (R) is not the correct explanation of (A).

C. If (A) is correct, but (R) is incorrect.

D. If both (A) and (R) are incorrect.

Answer: A

 Watch Video Solution

12. Assertion (A) : In Rock salt type structuires, all the coctahedral voids in the close packing of anions are occupied by cations.

Reason(R): In Rock salt structure, the distance of closest apprach between two anions is equal to hal the face diagonal of unit cell.

A. If both (A) and (R) are correct and (R) is the correct explanation of(A).

B. If both (A) and (R) are correct, but (R) is not the correct explanation of (A).

C. If (A) is correct, but (R) is incorrect.

D. If both (A) and (R) are incorrect.

Answer: B

Watch Video Solution

13. Assertion : If the length of the unit cell of LiCl having NaCl structure is 5.14 Å, the ionic radius of Cl^- ion is 1.82 Å.

Reason : Anion-anion contact is retained in

LiCl structure because anions constitute the lattice.

A. If both (A) and (R) are correct and (R) is the correct explanation of(A).

B. If both (A) and (R) are correct, but (R) is not the correct explanation of (A).

C. If (A) is correct, but (R) is incorrect.

D. If both (A) and (R) are incorrect.

Answer: A

Watch Video Solution

14. Assertion : When 1.0 mol of NaCl is doped with 10^{-3} mol $SrCl_2$, the number of cationic sites remaining vacant is 10^{-3}.

Reason : Each $SrCl_2$ unit produces two cation vacancies.

A. If both (A) and (R) are correct and (R) is the correct explanation of(A).

B. If both (A) and (R) are correct, but (R) is not the correct explanation of (A).

C. If (A) is correct, but (R) is incorrect.

D. If both (A) and (R) are incorrect.

Answer: D

Watch Video Solution

15. Assertion : When an atom crystallizes in either fcc or hcp arrangement, density of the solid remains same in both the arrangements.

Reason : Both fcc and hcp have same value of limiting packing fractions.

A. If both (A) and (R) are correct and (R) is the correct explanation of(A).

B. If both (A) and (R) are correct, but (R) is not the correct explanation of (A).

C. If (A) is correct, but (R) is incorrect.

D. If both (A) and (R) are incorrect.

Answer: A

 Watch Video Solution

16. Assertion : Hexagonal close packing is more closely packed than cubic close packing.

Reason : Hexagonal close packing has a coordination number of 12 whereas cubic close packing has a coordination number of 8.

A. If both (A) and (R) are correct and (R) is the correct explanation of(A).

B. If both (A) and (R) are correct, but (R) is not the correct explanation of (A).

C. If (A) is correct, but (R) is incorrect.

D. If both (A) and (R) are incorrect.

Answer: D

Watch Video Solution

17. Assertion : A simplified coordination number ratio for ions of any ionic crystal is inverse of molar ratio.

Reason : Coordination number ratio of cation to anion in CaF_2 (fluorite structure) is 8 : 4.

A. If both (A) and (R) are correct and (R) is the correct explanation of(A).

B. If both (A) and (R) are correct, but (R) is not the correct explanation of (A).

C. If (A) is correct, but (R) is incorrect.

D. If both (A) and (R) are incorrect.

Answer: B

 Watch Video Solution

18. Assertion : Increase in dielectric constant is observed in Frenkel defect.

Reason : Ions come in interstitial space in case of Frenkel defect.

A. If both (A) and (R) are correct and (R) is the correct explanation of(A).

B. If both (A) and (R) are correct, but (R) is not the correct explanation of (A).

C. If (A) is correct, but (R) is incorrect.

D. If both (A) and (R) are incorrect.

Answer: A

Watch Video Solution

19. Assertion : In hexagonal close packing voids are between three touching spheres whose centres lie at the corners of an equilateral triangle.

Reason : In hexagonal close packing voids are called square voids.

A. If both (A) and (R) are correct and (R) is the correct explanation of(A).

B. If both (A) and (R) are correct, but (R) is not the correct explanation of (A).

C. If (A) is correct, but (R) is incorrect.

D. If both (A) and (R) are incorrect.

Answer: C

 Watch Video Solution

20. Assertion : Solids having more F-centres possess intense colours.

Reason : Excess of Na^+ in NaCl solid having F-centres makes it appear to pink.

A. If both (A) and (R) are correct and (R) is the correct explanation of(A).

B. If both (A) and (R) are correct, but (R) is not the correct explanation of (A).

C. If (A) is correct, but (R) is incorrect.

D. If both (A) and (R) are incorrect.

Answer: C

Watch Video Solution

Questions

1. A compound of elements X and Y crystallizes in cubic structure where X atoms occupy the corners of the cube and Y atoms occupy the centre of the cube. What is the formula of the compound?

Watch Video Solution

2. A cubic crystalline solid contains A atoms at the comers and B atoms at the body centres. If one atom from a comer is missing, what will be the simplest formula of the resulting solid?

Watch Video Solution

3. An alloy of silver and copper crystallizes in a cubic lattice in which silver atoms occupy the lattice points at the comers of a cube and

copper atoms occupy the face centres of the cube. Determine the formula of the compound

Watch Video Solution

4. A solid has cubic structure in which X atoms are located at the corners of the cube, Y atoms at the body centre and O atoms at the edge centres. What is the formula of the compound?

Watch Video Solution

5. In a solid XY, having fcc structure, X atoms occupy the comers of the unit cell and Y atoms occupy the face centres. If all the face centre atoms along one of the axes are removed, what would be the stoichiometry of the solid?

Watch Video Solution

6. Xenon crystallises in fcc structure with edge length 630 pm. Calculate nearest neighbour distance and radius of the xenon atom.

Watch Video Solution

7. A metal of atomic mass 60u has a body centred cubic lattice. The edge length of the unit cell is 286 pm. Calculate the atomic radius and the density of the metal.

Watch Video Solution

8. An element of density 7.2 g cm^{-3} occurs in bcc structure with unit cell edge of 280 pm. Calculate molecular mass of the element and

number of atoms present in 100 g of the element.

Watch Video Solution

9. What is the concentration of cation vacancies if NaCl is doped with 10^{-3} mol percent of $MgCl_2$?

Watch Video Solution

10. What is the concentration of cation vacancies if KCl is doped with 0.01% Ga As (gallium arsenide)?

Watch Video Solution

11. The CsCl lattice (bcc) is more stable than $NaCl(fcc)$. Why do halides of Li, Na, K and Rb not have this lattice.

Watch Video Solution

12. In a cubic lattice, the close packed structure of mixed oxides of the lattice is made up of oxide ion, one eighth of the tetrahedral voids are occupied by divalent ions $\left(X^{2+}\right)$ while one half of the octahedral voids are occupied by trivalent ions $\left(Y^{3+}\right)$. What is the formula of the oxide?

Watch Video Solution

13. Calculate the miller indices of crystal planes which cut through the crystal axes at (i) (2a,

3b, c)

Watch Video Solution

14. Calculate the distance between 200, 110 and 222 planes of a body centred cube. The length of the side of the unit cell is 5.4 Å.

Watch Video Solution

Level 1

1. The radius of a di val ent cation M^{2+} is 94 pm and of divalent anion X^{2-} is 146 pm. Thus, M^2X^{2-} has

A. rock salt (NaCl) structure

B. zinc blend structure

C. antifluorite structure

D. bcc (CsCl) structure

Answer: A

 Watch Video Solution

2. Which has minimum per cent volume occupied by the spheres?

A. Simple cubic

B. Body-centres cubic

C. Hexagonal closest packed

D. Cubic closest packed

Answer: A

Watch Video Solution

3. At very low temperature, oxygen O_2, freezes and forms a crystalline solid. Which term best describes the solid?

A. Covalent network

B. Molecular crystals

C. Metallic

D. Ionic

Answer: B

Watch Video Solution

4. Ferrimagnetic substance is converted into paramagnetic substance at

A. Inversion temperature

B. Critical temperature

C. Boyle point

D. Curie point

Answer: D

Watch Video Solution

5. The addition of a $CaCl_2$ crystal to a KCl crystal

A. lowers the density of the KCl crystal

B. raises the density of the KCl crystal

C. does not affect the density of the KCl crystal

D. increases the Frenkel defects of the KCl crystal

Answer: A

Watch Video Solution

6. Select the correct statement for Schottky defect.

A. Density of the solid increases

B. Found in ionic compounds having high co-ordination number

C. Found in ionic compounds having low co-ordination number

D. Conduct electricity due to present of electrons in valence shell of cations and anions

Answer: B

7. Frenkel defect is not found in the halides of alkali metals because alkali metals have:

A. high electropositivity

B. high ionic radiii

C. high reactivity

D. ability to occupy interstitial sites

Answer: B

Watch Video Solution

8. Which of the following statement(s) is not true?

A. Ferromagnetic substances cannot be magnetised permanently

B. Paramagnetic substances are weakly attracted by magnetic field

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

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

Answer: A

Watch Video Solution

9. Which type of magnetic behaviour, $MgFe_2O_4$ is exhibited?

A. Diamagnetic

B. Paramagnetic

C. Ferromagnetic

D. Ferrimagnetic

Answer: D

Watch Video Solution

10. Triclinic crystal has the following unit cell parameters:

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

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

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

D. $a = b \neq c, \alpha = \beta = 90^\circ, \gamma = 120^\circ$

Answer: C

Watch Video Solution

11. Molybdenum (At. wt. = 96g mol^{-1}) crystallizes as bcc crystal. If density of crystal is 10.3 g/cm^3, then radius of Mo atom is (use $N_A = 6 \times 10^{23}$):

A. 111 pm

B. 314 pm

C. 135.96 pm

D. 216.35 pm

Answer: C

 Watch Video Solution

12. The atomic radius of strontium (Sr) is 215 pm and it crystallizes with a cubic close packing. Edge length of the cube is:

A. 430 pm

B. 608.2 pm

C. 496.53 pm

D. 658 pm

Answer: B

 Watch Video Solution

13. Which one of the following schemes of ordering close packed sheets of equal sized spheres do not generate closest packed lattice?

A. ABCABC

B. ABACABAC

C. ABBAABbA

D. ABCBCABCBC

Answer: D

14. Ina cubic unit cell, seven of the eight corners are occupied by atoms A and centres

of faces are occupied by atoms B. The general formula of the compound is:

A. A_7B_6

B. A_7B_{12}

C. A_7B_{24}

D. $A_{24}B_7$.

Answer: C

Watch Video Solution

15. An alloy of copper, silver and gold is found to have copper constituting the ccp lattice. If silver atoms occupy the edge centres and gold is present at body centre, the alloy will have the formula

A. Cu_4Ag_2Au

B. Cu_4Ag_4Au

C. Cu_4Ag_3Au

D. $CuAgAu$

Answer: C

Watch Video Solution

16. Which of the following statements for crystals having Schottky defect is not correct?

A. Schottky defect arises due to the absence of a cation and anion from the position which it is expected to occupy

B. Schottky defect are more common in ionic compounds with high co-ordination numbers

C. The density of the crystals having Schottky defect is larger than that of the perfect crystal

D. The crystal having Schottky defect is electrically neutral as a whole

Answer: C

 Watch Video Solution

17. Which of the following defects does KBr show?

A. Frenkel

B. Schottky

C. Metal excess

D. Metal deficiency

Answer: B

 Watch Video Solution

18. Select the incorrect statement:

A. Stoichiometry of crystal remains uneffected due to Schottky defect

B. Frenkel defect is usually shown by ionic compounds having low coordination number

C. F-centres generation is responsible factor for imparting the colour to the crystal

D. Density of crystal always increases due to substitutional impurity defect

Answer: D

Watch Video Solution

19. The composition of a sample of Wustite is $Fe_{0.93}O$. What is the percentage of iron present as Fe^{3+} in total iron?

A. $15.05\ \%$

B. $25\ \%$

C. $35\ \%$

D. $45\ \%$

Answer: A

Watch Video Solution

20. The most unsymmetrical and symmetrical systems are respectively:

A. Tetragonal, Cubic

B. Triclinic, Cubic

C. Rhombohedral, Hexagonal

D. Orthorhomic, Cubic

Answer: B

Watch Video Solution

21. Which of the following network solids is an exceptionally good conductor of electricity?

A. SiO_2

B. Graphite

C. Si

D. SiC

Answer: B

Watch Video Solution

22. Which of the following is not a molecular solid?

A. Dry ice

B. Naphthalene

C. Glucose

D. Quartz

Answer: D

Watch Video Solution

23. Silver crystallises in a face-centred cubic unit cell. The density of Ag is 10.5 g cm^{-3}. Calculate the edge length of the unit cell.

A. 409 pm

B. 818 pm

C. 683 pm

D. 653 pm

Answer: A

Watch Video Solution

24. An element has a body centred cubic 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?

A. 1.208×10^{24}

B. 2.416×10^{24}

C. 1.208×10^{31}

D. 2.416×10^{31}

Answer: B

Watch Video Solution

25. An element ‘A’ has face-centred cubic structure with edge length equal to 361 pm. The apparent radius of atom 'A' is :

A. 127.6 pm

B. 180.5 pm

C. 160.5 pm

D. 64 pm

Answer: A

Watch Video Solution

26. If the radius of Br ion is 0.182 nm, the radius of biggest cation that can fit into its tetrahedral voids?

A. 0.414 pm

B. 0.0753 nm

C. 0.091 nm

D. 0.225 pm

Answer: B

Watch Video Solution

27. How many unit cells are present in 39 g of potassium that crystallises in body-centred cubic structure?

A. N_A

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

C. $0.5N_A$

D. $0.75N_A$

Answer: C

Watch Video Solution

28. A metal crystallises face-centred cubic lattice with edge length of 450 pm. Molar mass of the metal is $50 g \mathrm{mol}^{-1}$ The density of metal will be: (1) 2.64g/cm^3 (2) 3.64 g/cm^3 (3) 4.64 g/cm^3 (4) 2.68 g/cm^3

A. $2.64 g \quad cm^{-3}$

B. $3.64 g \quad cm^{-3}$

C. $4.64 g \quad cm^{-3}$

D. $2.68 g \quad cm^{-3}$.

Answer: B

Watch Video Solution

29. In zinc blende, the percentage of tetrahedral voids occupied by Zn^{2+} ions is :

(a) 0.25 (b) 0.5 (c) 0.75 (d) 1

A. 0.25

B. 0.5

C. 0.75

D. 1

Answer: B

Watch Video Solution

30. How many nearest and next nearest neighbours respectively does potassium have in BCC lattice?

A. 8,8

B. 8,6

C. 6,8

D. 8,2

Answer: B

Watch Video Solution

31. In a solid lattice, the cation has left a lattice site and is located at interstitial position, the lattice defect is:

A. interstitial defect

B. vacancy defect

C. Frenkel defect

D. Schottky defect

Answer: C

Watch Video Solution

32. If we know the ionic radius ratio in a crystal of ionic solid, what can be known of the following?

A. Magnetic property

B. Nature of chemical bond

C. Type of defect

D. Geometrical shape of crystal

Answer: D

Watch Video Solution

33. The number of nearest neighbours with which a given sphere, of packing is in contact, is called coordination number. The incorrect statement about coordination number is:

A. Coordination number decreases on heating

B. Coordination number increases on applying pressure

C. CsCl acquires NaCl type structure on heating

D. Coordination number of octahedral site is 4

Answer: D

Watch Video Solution

34. Total volume of atoms present in face centred 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

Watch Video Solution

35. Percentage of free space in cubic close-packed structure and in body-centred packed structure are, respectively, (1) 48% and 26% (2)

30% and 26% (3) 26% and 32% (4) 32% and 48%

A. 48% and 26%

B. 30% and 26%

C. 26% and 32%

D. 32% and 48%

Answer: C

Watch Video Solution

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

A. 2

B. 4

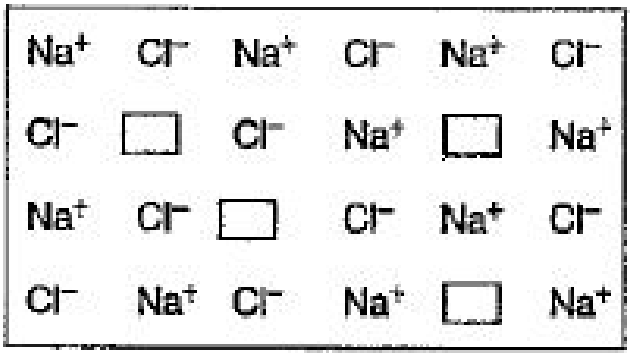
C. 1

D. 3

Answer: C

Watch Video Solution

37. Crystal defect indicated in the diagram below is:



A. Frenkel defect

B. Frenkel and Schottky defects

C. Interstitial defect

D. Schottky defect

Answer: D

 Watch Video Solution

38. Frenkel defect is noticed in

A. AgBr

B. ZnS

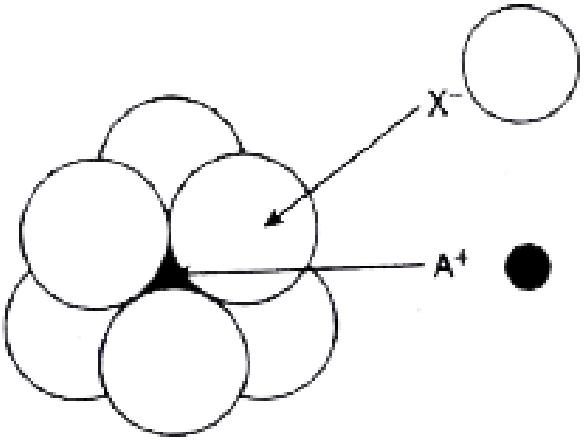
C. AgI

D. All of these

Answer: D

Watch Video Solution

39. 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 very close to:



A. 104 pm

B. 125 pm

C. 183 pm

D. 57 pm

Answer: A

Watch Video Solution

40. Which of the following fcc structure contains cations in the alternate tetrahedral voids?

A. Na_2O

B. ZnS

C. CaF_2

D. CaO

Answer: B

Watch Video Solution

41. CsBr has bcc type structure like CsCl with edge length 4.3 Å. The shortest interionic distance in between Cs^+ and Br^- is

A. 3.72 A°

B. 1.86 A°

C. 7.44 A°

D. 4.3 A°

Answer: A

Watch Video Solution

42. The COordination number of a metal crystallizing in a hexagonal close packed structure is

A. 12

B. 4

C. 8

D. 6

Answer: A

 Watch Video Solution

43. A crystal formula AB_3 has A ions at the cube corners and B ions at the edge centres.

The coordination numbers of A and B are, respectively,

A. 6 and 6

B. 2 and 6

C. 6 and 2

D. 8 and 8

Answer: C

Watch Video Solution

44. When NaCl is doped with $MgCl_2$ the nature of defect produced is

Watch Video Solution

45. The lattice parameters are $a = 5.62A^\circ, b = 7.41A^\circ, c = 9.48A^\circ$. The three coordinates are mutually perpendicular to each other. The crystal is

A. tetragonal

B. orthorhombic

C. monoclinic

D. trigonal

Answer: B

 Watch Video Solution

46. At a temperature of absolute zero, an intrinsic semiconductor is

A. an insultor

B. a p-type semiconductor

C. a n-type semiconductor

D. a conductor

Answer: A

Watch Video Solution

47. The ratio Fe^{3+} and Fe^{2+} ions in $Fe_{0.9}S_{1.0}$ is.

A. 0.28

B. 0.5

C. 2

D. 4

Answer: A

 Watch Video Solution

48. The yellow colour of ZnO and conducting nature produced in heating is due to:

A. metal excess defect due to interstitial cation

B. extra positive ions present in an interstitial site

C. trapped electrons

D. All of these

Answer: D

 Watch Video Solution

49. In an antiferromagnetic material

A. all the magnetic moment vectors are aligned in one direction

B. half of the magnetic moment vectors point in one direction and the rest in opposite direction.

C. all the magnetic moment vectors are randomly oriented.

D. is characterised by a very large magnetic moment.

Answer: B

Watch Video Solution

50. Which of the following is not a ferroelectric compound?

A. Rochelle salt

B. $PbZrO_3$

C. $BaTiO_3$

D. KH_2PO_4

Answer: B

Watch Video Solution

Level 2

1. In NaCl type structure, if all ions along an axis joining centres of the opposite face centers are missing, the expression for packing fraction in limiting case is:

A. $\frac{\pi}{3\sqrt{2}}\left(1+\frac{r_c^3}{r_a^3}\right)$

B. $\frac{\pi}{4\sqrt{2}}\left(1+\frac{r_c^3}{r_a^3}\right)$

C. $\frac{\pi}{\sqrt{2}}\left(1+\frac{r_c^3}{r_a^3}\right)$

D. $\frac{\pi}{2\sqrt{2}}\left(1+\frac{r_c^3}{r_a^3}\right)$.

Answer: B

Watch Video Solution

2. Which of the following is correct when atoms are closely packed?

A. The size of tetrahedral void is smaller than that of octahedral void

B. The size of tetrahedral void is greater than that of octahedral void

C. The size of tetrahedral void may be greater or smaller or equal to that of octahedral void depending upon the size of atoms

D. The size of tetrahedral void is equal to that of octahedral void

Answer: A

 Watch Video Solution

3. CsCl forms unit cells in which caesium ions are in contact with each other and chloride ions occupy the body centre. If the volume of a unit cell of CsCl is $7.014 \times 10^{-23} cm^3$, the Cs - Cs distance is nearly

A. 1.92 A°

B. $3.5A^\circ$

C. $4.1A^\circ$

D. $4.5A^\circ$

Answer: C

Watch Video Solution

4. Which of the following statement is incorrect about metals?

A. Valence band overlaps with conduction band

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

C. The gap between these bands cannot be determined

D. Valence band may remains partially filled

Answer: C

Watch Video Solution

5. A compound of molecular mass 155 gm mol^{-1} possessing crystal defect exist as orthorhombic crystal having values of a, b and c are respectively $4.2A^{\circ}, 8.6A^{\circ}$ and $8.3A^{\circ}$.

The density is observed to be 3.3 gm/cc, the number of formula units calculated per unit cell is

A. 2.93

B. 4.65

C. 3.84

D. 6.02

Answer: C

Watch Video Solution

6. Ferrous oxide has a cubic structure and each edge of the unit cell is 5.0 Å. Assuming density of the oxide as $4.0gcm^{-3}$, then the number of Fe^{2+} and O^{2-} ions present in each unit cell will be

A. Four Fe^{2+} and four O^{2-}

B. Two Fe^{2+} and four O^{2-}

C. Four Fe^{2+} and two O^{2-}

D. Three Fe^{2+} and three O^{2-}

Answer: A

Watch Video Solution

7. If Germanium crystallises in the same way as diamond, then which of the following statement is not correct?

A. Every atom in the structure is tetrahedrally bonded to 4 atoms

B. Unit cell consists of 8 Ge atoms and coordination number is 4

C. All the octahedral voids are occupied

D. All the octahedral voids and 50% tetrahedral voids remain unoccupied

Answer: C

 Watch Video Solution

8. Al (at. wt 27) crystallizes in the cubic system with a cell edge of $4.05A^{\circ}$. Its density is $2.7gcm^{-3}$. Determine the unit cell type and calculate the radius of the Al atom

A. fcc, 2.432 Å

B. bcc, 2.432 Å

C. bcc, 1.432 Å

D. fcc, 1.432 Å

Answer: D

 Watch Video Solution

9. KCl crystalizes in the same type of lattice as does NaCl and CsF in the CsCl type of structure. The molar mass of CsF is twice that

of KCl and the a value of KCl is 1.5 times that of CsF.The ratio of the densities of CsF to that of KCl is

A. 2.05

B. 1.69

C. 3.2

D. 4.51

Answer: B

Watch Video Solution

10. Each rubidium halide crystallizing in the NaCl type lattice has a unit cell length 30 pm greater than for corresponding potassium salt ($r_k = 133$pm) of the same halogen. What is the ionic radius of Rb^+?

A. 1265 pm

B. 1056 pm

C. 985 pm

D. 148 pm

Answer: D

Watch Video Solution

11. Which of the following statements is correct about the defects in the crystals?

A. Schottky defect is observed in the compounds in which there is a large difference in the size of cation and anion, whereas Frenkel defect is observed when cation and anion are approximately of the same size.

B. Schottky defects disturb the ratio of cations and anions, whereas Frenkel defects maintain the ratio.

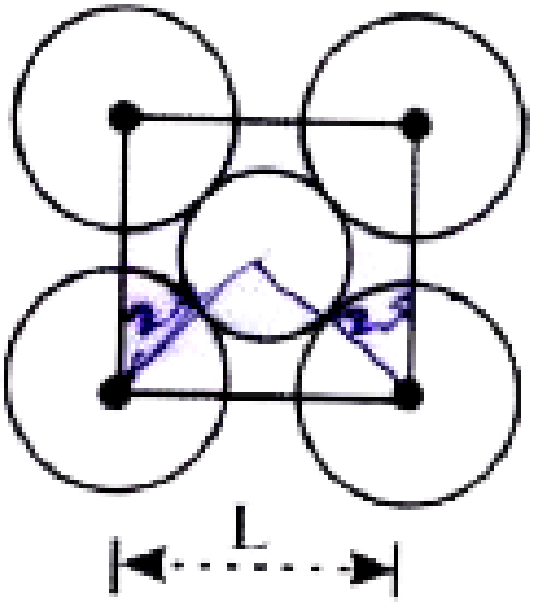
C. Schottky defects lead to lowering in density, whereas Frenkel defects do not affect the density.

D. Both interstitial defect and Frenkel defect cause increase in the density of solid

Answer: C

Watch Video Solution

12. The packing efficiency of the two-dimensional square unit cell consisting of identical circles shown in below figure is



A. 0.3927

B. 0.6802

C. 0.7405

D. 0.7854

Answer: D

 Watch Video Solution

13. A material has cubic close packed (ccp) array of oxide ions with 'm' fraction of octahedral holes occupied by aluminium ions

and 'n' fraction of tetrahedral holes cocupied by magnesium ions to form a perfect crystal, m and n, respectively, are

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

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

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

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

Answer: A

Watch Video Solution

14. Metallic magnesium has a hexagonal close-packed structure and a density of $1.74 g cm^{-3}$. Assuming magnesium atoms to be spherical, calculate the radius of magnesium atom. (Atomic mass of Mg = 24.3 u)

A. $1.6 \times 10^{-8} cm$

B. $2.5 \times 10^{-8} cm$

C. $3.5 \times 10^{-8} cm$

D. $4.5 \times 10^{-8} cm$

Answer: A

Watch Video Solution

15. The density of solid argon is 1.65 g/mL at $-233^{\circ}C$. If the argon atom is assumed to be sphere of radius 1.54×10^{-8} cm, what percentage of solid argon is apparently empty space? (Ar = 40)

A. 0.84

B. 0.78

C. 0.62

D. 0.48

Answer: C

Watch Video Solution

16. A metal crystalizes into two cubic phases, face centred cubic (FCC) and body centred cubc (BCC), whose unit cell lengths are 3.5 and $3.0A^{\circ}$, respectively. Calculate the ratio of densities of FCC and BCC.

A. 1.259

B. 12.59

C. 0.259

D. 0.0259

Answer: A

Watch Video Solution

17. If NaCl crystals are doped with 2×10^{-3} mol per cent of $SrCl_2$, calculate the cation vacancies per mole.

A. 1.204×10^{20}

B. 12.04×10^{20}

C. 12.04×10^{19}

D. 1.204×10^{19}

Answer: D

Watch Video Solution

18. Lithium borohydride crystallizes in an orthorhombic system with 4 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 crystal.

A. $0.671g \quad cm^{-3}$

B. $6.71g \quad cm^{-3}$

C. $6.71 \times 10^{-3} \text{ g } \quad cm^{-3}$

D. $6.71 \times 10^{-4} \text{ g } \quad cm^{-3}$

Answer: A

Watch Video Solution

19. Which of the following statements is correct for the rock-salt structure of an ionic compounds?

A. Coordination number of cation is four, whereas that of anion is six.

B. Coordination number of cation is six, whereas that of anion is four

C. Coordination number of each cation and anion is four

D. Coordination number of each cation and anion are six

Answer: D

Watch Video Solution

20. Which of the following statements is incorrect ?

A. The coordination number of each type of ion in CsCl is 8

B. A metal that crytallises in BCC structure has a coordination number 12.

C. A unit cell of an ionic crystal shares some of its ions with other unit cells.

D. The length of the unit cell in NaCl is 552 pm, if $r_{Na^+} = 95$ pm and $r_{Cl^-} = 181$ pm

Answer: B

Watch Video Solution

21. KCl crystallizes in the same type of lattice as does NaCl. Given that $r_{Na^+}/r_{Cl^-} = 0.55$ and $r_{K^+}/r_{Cl^-} = 0.74$. Calculate the ratio of the side of the unit cell for KCl to that of NaCl

A. 1.123

B. 0.891

C. 1.414

D. 0.141

Answer: A

Watch Video Solution

22. Melting point of RbBr is $682^{\circ}C$, while that of NaF is $988^{\circ}C$. The principal reason that melting point of NaF is much higher than that of RbBr is that:

A. the two crystals are not isomorphous

B. the molar mass of NaF is smaller than that of RbBr

C. the internuclear distance $r_c + r_a$ is greater for RbBr than for NaF

D. the bond in RbBr has more covalent character than the bond is NaF

Answer: C

Watch Video Solution

23. A binary solid $\left(A^+B^-\right)$ has a zinc blende structure with B^- ions constituting the

lattice and A^+ ions occupying 25% tetrahedral holes. The formula of solid is:

A. AB

B. A_2B

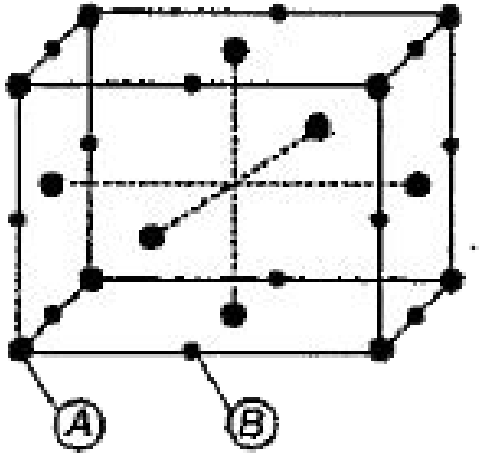
C. AB_2

D. AB_4

Answer: C

Watch Video Solution

24. For a solid with the following structure, the coordination number of the point B is:



A. 3

B. 4

C. 5

D. 6

Answer: D

Watch Video Solution

25. If 'a' stands for the edge length of the cubic systems: simple cubic, body-centred cubic and face-centred cubic, then the ratio of radii of the spheres in these systems will be respectively:

A. $\frac{1}{2}a : \frac{\sqrt{3}}{2}a : \frac{\sqrt{2}}{2}a$

B. $1a : \sqrt{3}a : \sqrt{2}a$

C. $\frac{1}{2}a : \frac{\sqrt{3}}{4}a : \frac{1}{2\sqrt{2}}a$

D. $\frac{1}{2}a : \sqrt{3}a : \frac{1}{\sqrt{2}}a$

Answer: C

Watch Video Solution

26. The density of KBr is 2.75 gm cm^{-3} and length of the unit cell is 654 pm. K = 39, Br = 80, then what is true about the predicted nature of the solid?

A. Solid has face-centred cubic system with coordination number=6

B. Solid has simple cubic system with coordination number=4

C. Solid has face-centred cubic system with coordination number=1

D. None of these

Answer: A

 Watch Video Solution

27. A solid has a b.c.c. structure. If the distance of closest approach between the two atoms is 1.73Å. The edge length of the cell is:

A. 200 pm

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

C. 142.2 pm

D. $\sqrt{2}$ pm

Answer: A

Watch Video Solution

28. Experimentally it was found that a metal oxide has formula $M_{0.98}O$. Metal M, is present as M^{2+} and M^{3+} in its oxide. Fraction of metal which exists as M^{3+} would be:

A. 0.0605

B. 0.0508

C. 0.0701

D. 0.0408

Answer: D

Watch Video Solution

29. In a close packed face-centred unit cell, are all lattice positions occupied by 'A' atoms and body-centred octahedral hole is occupied by atom 'B' having appropriate size. Choose the correct statement(s) regarding such crystal.

A. void percentage is 24.6

B. percentage space occupied is 80.3

C. formula of the compound is A_2B_3

D. formula of the compound is AB

Answer: A

Watch Video Solution

30. Element X crystallizes in a 12 co-ordination fcc lattice. On applying high temperature it changes to 8 coordination bcc lattice. Find the ratio of the density of the crystal lattice before and after applying high temperature?

A. $1:1$

B. $3:2$

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

D. $2(\sqrt{2})^3:(\sqrt{3})^3$

Answer: D

Watch Video Solution

31. When a crystal surface is exposed to X-rays of 250 pm wave length, the first order reflection occurs at 30°. The interplanar distance of the planes producing this reflection is

A. 125 pm

B. 250 pm

C. 373 pm

D. 500 pm

Answer: B

Watch Video Solution

32. A compound of A, B and C has cubic close packed arrangement of A, B occupy one half of octahedral voids and C occupy $1/4^{th}$ of

tetrahedral voids. The simplest formula of the compound is

A. A_2BC

B. A_2B_2C

C. $A_2B_2C_2$

D. $A_2B_4C_3$

Answer: A

Watch Video Solution

33. The compound MO (molar mass = 100 g mol^{-1}) has zinc-blende structure. If the radius of M^{2+} is 69.4 pm, the density of MO will be

A. 2.5 g cm^{-3}

B. 1.5 g cm^{-3}

C. 0.75 g cm^{-3}

D. 1.0 g cm^{-3}

Answer: D

Watch Video Solution

34. An ionic compound MX has rock-salt structure. If $r_c = 120$ pm and $r_a = 180$ pm, then the number of molecules of MX in a cube of edge length of 1 cm is about

A. 1.85×10^{20} molecules

B. 1.85×10^{21} molecules

C. 1.85×10^{22} molecules

D. 1.85×10^{23} molecules

Answer: C

Watch Video Solution

35. What is the density of Na_2O having antifluorite-type crystal structure, if the edge length of cube is 100 pm and what is the effect on density by 0.05% Frenkel defect?

A. 823.5 g cm^{-3}, density decreases

B. 414.16 g cm^{-3}, density decreases

C. 823.5 g cm^{-3}, density remains same

D. 414.16 g cm^{-3}, density remains same

Answer: D

Watch Video Solution

36. In cubic ZnS if the radii of Zn^{2+} and S^{2-} atoms are 0.74 Å and 1.70 Å, the lattice parameter of ZnS is

A. 11.87 Å

B. 5.634 Å

C. 5.14 Å

D. 2.97 Å

Answer: B

 Watch Video Solution

37. The γ-form of iron has fcc structure (edge length 386 pm) and β-form has bcc structure (edge length 290 pm). The ratio of density in γ -form and β-form is

A. 0.8481

B. 1.02

C. 1.57

D. 0.6344

Answer: A

Watch Video Solution

38. An element forms crystals of density of $8570 kgm^{-3}$. The packing efficiency is 0.68. If the closest distance between neighbouring atoms is 2.86 Å. The mass of one atom is (1 amu = 1.66×10^{-27} kg)

A. 186 amu

B. 93 amu

C. 46.5 amu

D. 43 amu

Answer: B

 Watch Video Solution

39. In bronze, copper forms fcc arrangement and tin occupies interstitial sites. The density of bronze sample is $7717kgm^{-3}$ and its lattice parameter is 3.903 Å. What is the approximate

mole fraction of tin in the alloy?

(At. mass of Cu = 63.54u, Sn = 118.7u)

A. 0.01

B. 0.04

C. 0.1

D. 0.4

Answer: B

 Watch Video Solution

40. A metal of density $7.5 \times 10^3 kgm^{-3}$ has an fcc crystal structure with lattice parameter a = 400 pm. Calculate the number of unit cells present in 0.015 kg of the metal.

A. 6.250×10^{22}

B. 3.125×10^{23}

C. 3.125×10^{22}

D. 1.563×10^{22}

Answer: C

Watch Video Solution

Watch video solution

41. The ratio of the volume of a tetragonal lattice unit cell to that of a hexagonal lattice unit cell is (both having same respective lengths)

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

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

C. $\frac{2}{\sqrt{3}}\frac{a^2c}{b}$

D. 1

Answer: B

Watch Video Solution

42. The correct statement regarding defects in solids is

A. Frenkel defect is usually favoured by a very small difference in the sizes of cation and anion.

B. Schottky defect appears generally in strongly ionic compounds having a low coordination number.

C. Trapping of an electron in the lattice leads to the formation of F-centre.

D. Schottky defects have no effect on the physical properties of solids.

Answer: C

Watch Video Solution

43. A certain sample of cuprous sulphide is found to have composition $Cu_{1.8}S$, because of incorporation of Cu^{2+} ions in the lattice. What is the mole % of Cu^{2+} in total copper content in this crystal?

A. 0.998

B. 0.1111

C. 0.8888

D. 0.3333

Answer: B

Watch Video Solution

44. Ammonium chloride crystallises in CsCl type (bcc) lattice with unit cell edge length of 387 pm. Distance between oppositely charged ions in the lattice and radius of the NH_4^+ ion are respectively (if the radius of Cl^- ion is 181 pm).

A. 356.12 pm, 175.12 pm

B. 348.23 pm, 167.23 pm

C. 335.15 pm, 154.15 pm

D. 326.35 pm, 145.35 pm

Answer: C

Watch Video Solution

45. Using X-rays of wavelength 141 pm, the angle of incidence for maximum intensity first order reflection for four different crystals are given. Which crystal has larger interplanar distance ?

A. 20.0°

B. 27.4°

C. 35.8°

D. 50°

Answer: A

Watch Video Solution

46. In spinel structure, O^{2-} ions are cubic-close packed, where 1/8th of the tetrahedral holes are occupied by A^{2+} cations and 1/2 of

the octahedral holes are occupied by cations B^{3+}. The general formula of this compound is

A. A_2BO_4

B. AB_2O_4

C. A_2B_4O

D. A_4B_2O

Answer: B

Watch Video Solution

Level 3

1. The unit cell length of NaCl is observed to be 0.5627 nm by X-ray diffraction studies, the measured density of NaCl is 2.164 g cm^{-3}. Calculate % of missing Na^{+} and Cl^{-} ions.

A. 0.00775

B. 0.1775

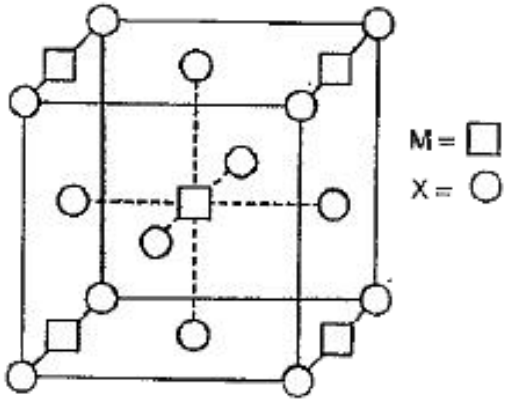
C. 0.03939

D. 0.0753

Answer: A

Watch Video Solution

2. A compound M_pX_q has cubic close packing (ccp) arrangement of X. its unit cell structure is shown in the following figure. The empirical formula of the compound is



A. MX

B. MX_2

C. M_2X

D. M_5X_{14}

Answer: B

Watch Video Solution

3. Calculate the glancing angle on the cube (100) of a rock salt (a=28.14nm) corresponding to second order diffraction maximum for X-rays of wavelength 14.07 nm.

A. 20°

B. 30°

C. 60°

D. 80°

Answer: B

Watch Video Solution

4. Eight identical spheres of radius R are arranged in contact with each other to form a cubic pattern and is placed inside a cubic

container of size just enough to contain them. What fraction of the volume of the container does the spheres occupy

A. 0.5233

B. 0.2616

C. 0.8438

D. 0.6808

Answer: A

Watch Video Solution

5. A strong current of trivalent gaseous boron passed through a germanium crystal decreases the density of the crystal due to part replacement of germanium by boron and due to interstitial vacancies created by missing Ge atoms. In one such experiment, one gram of germanium is taken and the boron atoms are found to be 150 ppm by weight, when the density of the Ge crystal decreases by 4%. calculate the percentage of missing vacancies due to germanium, which

are filled up boron atoms. [Atomic wt. Ge=72.6, B=10] : 2.05% , 1.2%, 6.6%, none of above

A. 0.098

B. 0.123

C. 0.047

D. 0.028

Answer: C

 Watch Video Solution

6. Select correct statement(s)

A. 8Cs^+ ions occupy the second nearest neighbour location of a Cs^+ ion

B. Each sphere is surrounded by four voids in two dimensional hexagonal close packed layer

C. If the radius of cations and anions are 0.3 Å and 0.4 Å then coordination number of cation in the crystal is 6.

D. In AgCl, the silver ion displaced from its lattice position to an interstitial position is called a Frenkel defect.

Answer: D

 Watch Video Solution

7. Diamond has face-centred cubic lattice of carbon containing carbon atoms in alternate tetrahedral voids. The ratio of the carbon-

carbon bond distance to the edge of the unit cell is

A. $\frac{\sqrt{3}}{4}$

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

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

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

Answer: A

Watch Video Solution

8. Calculate the void space in fcc packing of n spheres of radius 1 nm, n spheres of radius 0.414 nm, and 2n spheres of radius 0.225 nm in appropriate voids.

A. 0.19

B. 0.26

C. 0.17

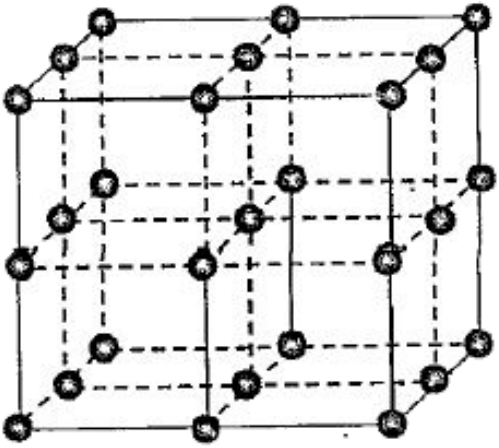
D. 0.12

Answer: A

Watch Video Solution

Watch Video Solution

9. The folowing diagram shows the arrangement of lattice points with a=b=c and $\alpha = \beta = \gamma = 90^\circ$. Choose the correct options.



A. The arrangement is simple cubic with each lattice point surrounded by 6 nearest neighbours.

B. The arrangement is simple cubic with each lattice point surrounded by 8 nearest neighbours.

C. The arrangement is face centred cubic with each lattice point surrounded by 12 nearest neighbours.

D. The arrangement is body centred cubic with each lattice point surrounded by 8 nearest neighbours.

Answer:

Watch Video Solution

10. Two ionic solids AB and CB crystallize in rock salt structure. If $r_{A^{\oplus}}/r_{B^{\ominus}}$ and $r_{C^{\oplus}}/r_{B^{\ominus}}$ are 0.50 and 0.70,

respectively, the ratio of unit cell edge length of AB and CB is

A. 0.68

B. 0.78

C. 0.88

D. 0.98

Answer: C

Watch Video Solution

Level 3 Multiple Correct Answer Type

1. Which of the following statements are correct ?

A. Piezoelectricity is due to net dipole moment

B. Some electric current is produced on heating polar crystals, this is pyroelectricity

C. Ferroelectricity is due to alignment of dipole in same direction

D. All the above

Answer: A::B::C

Watch Video Solution

2. With respect to graphite and diamond, which of the statement(s) given below is (are) correct ?

A. Graphite is harder than diamond

B. Graphite has higher electrical conductivity than diamond

C. Graphite has higher thermal conductivity than diamond

D. Graphite has higher C-C bond order than diamond

Answer: B::D

Watch Video Solution

3. Antiferromagnetic substances have zero value of magnetic moment, 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 the magnetic field

D. Cancel out each other's magnetic moment

Answer: C::D

Watch Video Solution

4. Which of the following statements is/are correct ?

A. Piezoelectric crystals are used as pick-ups in record players, they are also used

in microphones, ultrasonic generators, and sonar detectors.

B. $BaTiO_3$, Rochelle salt and KH_2PO_4 are ferroelectric and piezoelectric solids.

C. The temperature above which no ferromagnetism is observed is called curie temperature.

D. The temperature at which the material shows superconductivity is called transition temperature.

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

Watch Video Solution

5. Ions of NaCl which are touched by one body diagonal are

A. A. Cl^{Θ} ions present at the corner of cube

B. B. Cl^{Θ} ions present at the face centre of cube

C. C. $Na^{\oplus}$ ions present at the edge centre of cube

D. D. $Na^{\oplus}$ present at body centre of cube

Answer: A::D

Watch Video Solution

6. Identical spheres are undergoing two-dimensional packing in square close packing and hexagonal close packing. Which is correct regarding the spheres ?

A. The ratio of coordination number of a sphere in first case to that in second case is 2:3.

B. Packing in second case is more effective.

C. Packing in first case is more effective.

D. The stacking of layer of first type produces simple cubic structure.

Answer: A::B::D

 Watch Video Solution

7. For the spinel structure $(MgAl_2O_4)$, the correct statement is/are

A. 50% octahedral voids are occupied by Al^{3+} ions

B. Al^{3+} is equally distributed in tetrahedral voids and octahedral voids

C. Oxide ions occupy ccp lattice

D. 12.5% tetrahedral voids are occupied by Mg^{2+} ions

Answer: A::C::D

Watch Video Solution

8. Which of the following statements is/are correct ?

A. Dislocation of ion from lattice site to interstitial site is called frenkel defect

B. Missing of +ve and -ve ions from their respective position producing a pair of

holes is called Schottky defect.

C. The presence of ions in the vacant interstital sites along with lattice point is called interstitial defect.

D. Non-stoichiometric NaCl is yellow solid.

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

 Watch Video Solution

9. Recently discovered superconductivity materials are

A. M_3C_{60}

B. $YBa_2Cu_3O_7$

C. SiC

D. $Hg_2Ba_2YCaCu_2O_7$

Answer: A::B::D

Watch Video Solution

10. For a compound AB which crystallises in $CsCl$ (bcc) lattice with 'a' as the edge length of unit cell

A. the minimum possible distance between A and A is 'a'

B. the mean distance between A and B is $\sqrt{3}a/2$

C. the density of crystal is given by $\rho = \frac{2}{a^3}\frac{M_{AB}}{N_A}$

D. the minimum distance between B and B is a/2.

Answer: A::B

Watch Video Solution

11. Which of the following statements are correct ?

A. a. Amorphous solids have long-range order

B. b. Crystalline solids have flat faces and sharp edges

C. c. Amorphous solids may be classified as supercooled liquids with high viscosity

D. d. Amorphous solids have sharp melting points

Answer: B::C

 Watch Video Solution

12. If the radius of $Cs^{\oplus} = 1.69\text{Å}$ and $Br^{\Theta} = 1.95$ Å, then which of the following is/are correct statements ?

A. a. The edge length of unit cell is 4.2 Å

B. b. The coordination number for $Cs^{\oplus}$ is 6

C. c. CsBr has bcc-type structure

D. d. Br^{Θ} ions touch each other along the edge

Answer: A::C::D

Watch Video Solution

13. Select the correct statement:

A. Solid with F-centres are paramagnetic

B. Ferrimagnetic character of Fe_3O_4 at room temperature changes to paramagnetic character at 850 K

C. Anti ferromagnetic V_2O_3 changes to paramagnetic at 150 K

D. Non stoichiometric NiO is p-type semiconductor

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

Watch Video Solution

Level 3 Matching Column Type

1. Match the crystal systems/unit cells mentioned in Column I with their

characteristic features mentioned in Column II.

Column I	Column II
A) simple cubic and face-centred cubic	p) have these cell parameters $a = b = c$ and $\alpha = \beta = \gamma$
B) cubic and rhombohedral	q) are two crystal systems
C) cubic and tetragonal	r) have only two axial angles of 90°
D) hexogonal and monoclinic	s) belong to same crystal system

Watch Video Solution

2. Match the following columns

Column I **Substances**	Column II **Magnetic and polar nature**
A) Rochelle salt	p) Ferroelectric
B) Ferrites	q) Paramagnetic
C) Nitric oxide (NO)	r) Antiferromagnetic
D) Manganese dioxide (MnO_2)	s) Ferrimagnetic

Watch Video Solution

3. Match the imperfection in solids with the characteristic features.

Column I	Column II
A) Schottky defects	p) Excess-cations occupy interstitial sites
B) Frenkel defects	q) Equal number of cations and anions are missing from their lattice points
C) Metal excess defects	r) Act as p-type semiconductors
D) Metal deficient defects	s) Are non-stoichiometric defects

Watch Video Solution

4. Match the types of solid with their examples/properties.

Column I	Column II
A) Molecular solid	p) Dry ice
B) Covalent solid	q) Copper
C) Metallic solid	r) Generally behave as insulators
D) Ionic solid	s) Generally have low melting points

Watch Video Solution

5. Match the following

Column I	Column II
A) Cubic	p. Simple or primitive
B) Tetragonal	q. Body centred
C) Orthorhomic	r. Face centred
D) Monoclinic	s. End centred

Watch Video Solution

Level 3 Numerical Type

1. Diamond structure is based on a face centred cubic lattice where four out of the eight tetrahedral holes are occupied by carbon atoms. Every atom in this structure is surrounded tetrahedrally by four other carbon atoms. How many carbon atoms per unit cell in diamond structure ?

Watch Video Solution

2. In a compound, atom A form ccp arrangement, atom B present in 12.5% of the tetrahedral voids and atom C present in 25% of the octahedral voids and rational formula is expressed as $A_xB_yC_z$ then value of $(x+y+z)$ is:

Watch Video Solution

3. In hexagonal close packing, the difference in the number of tetrahedral and octahedral

voids in a unit cell is

Watch Video Solution

4. Iron (II) oxide has a cubic structure and each unit cell ha side 500 pm. If the density of the oxide is 4 g cm^{-3} the no. of oxide ions present in each unit cell is____. (Molar mass of $FeO = 72g \quad mol^{-1}, N_A = 6.02 \times 10^{23} mol^{-1}$).

Watch Video Solution

5. At room temperature, sodium crystallizes in a body-centred cubic lattice with a=4.24 Å, calculate theoretical density of sodium in g cm^{-3} (atomic mass of Na=23).

Watch Video Solution

6. An ionic compound AB has a rock salt structure with A:B=1:1. the formula mass of AB is 6.02y amu and the closest A-B distance is $y^{1/3}$ nm. Calculate the density of lattice in kg m^{-3}.

Watch Video Solution

7. A molecule A_2B (molar mass=166.4) occupies triclinic lattice with a=5Å, b=8Å and c=4Å. If density of AB_2 is 5.2 g cm^{-3}, the number of molecules present in one unit cell is:

Watch Video Solution

Level 3 Statement Type

1. Statement 1: In crystal lattice, the size of the tetrahedral void is larger than an octahedral void.

Statement 2: The cations occupy less space than anions in crystal packing.

A. Statement 1 is True, statement 2 is true, statement 2 is correct explanation for statement 1.

B. Statement 1 is true, statement 2 is true, statement 2 is NOT a correct explanation

for statement 1.

C. Statement 1 is true, statement 2 is false

D. Statement 1 is false, statement 2 is true

Answer: D

Watch Video Solution

2. Statement 1: Electrical conductivity of intrinsic semiconductors increases with increasing temperature.

Statement 2: With increase in temperature,

large number of electrons from the valence band can jump to the conduction band.

A. Statement 1 is True, statement 2 is true, statement 2 is correct explanation for statement 1.

B. Statement 1 is true, statement 2 is true, statement 2 is NOT a correct explanation for statement 1.

C. Statement 1 is true, statement 2 is false

D. Statement 1 is false, statement 2 is true

Answer: A

 Watch Video Solution

3. Statement 1: Frenkel defect is also called dislocation defect.

Statement 2: Frenkel defect is shown by ionic substances in which cation and anion are of almost similar sizes.

A. Statement 1 is True, statement 2 is true, statement 2 is correct explanation for

statement 1.

B. Statement 1 is true, statement 2 is true, statement 2 is NOT a correct explanation for statement 1.

C. Statement 1 is true, statement 2 is false

D. Statement 1 is false, statement 2 is true

Answer: C

 Watch Video Solution

4. Assertion : Ferromagnetic substances are strongly attracted by magnetic field.

Reason : Ferromagnetism arises due to spontaneous alignment of magnetic moments in the direction of applied magnetic fields.

A. Statement 1 is True, statement 2 is true, statement 2 is correct explanation for statement 1.

B. Statement 1 is true, statement 2 is true, statement 2 is NOT a correct explanation

for statement 1.

C. Statement 1 is true, statement 2 is false

D. Statement 1 is false, statement 2 is true

Answer: A

Watch Video Solution

5. Assertion (A) : In Rock salt type structuires, all the coctahedral voids in the close packing of anions are occupied by cations.

Reason(R): In Rock salt structure, the distance

of closest apprach between two anions is equal to hal the face diagonal of unit cell.

A. Statement 1 is True, statement 2 is true, statement 2 is correct explanation for statement 1.

B. Statement 1 is true, statement 2 is true, statement 2 is NOT a correct explanation for statement 1.

C. Statement 1 is true, statement 2 is false

D. Statement 1 is false, statement 2 is true

Answer: B

Watch Video Solution

Level 3 Linked Comprehension Type

1. F centre is an example of metal excess defect due to the presence of extra cations at interstitial sites. Zinc oxide is white in colour at room temperature, on heating it loses oxygen and turns yellow.

$$ZnO \xrightarrow{\text{Heat}} Zn^{2+} + \frac{1}{2}O_2 + 2e^-$$

Now there is excess of zinc in the crystal and its formula becomes Zn_{1+x} O. the excess of Zn^{2+} ions move to interstitial sites and the electrons to neighbouring interstitial sites.

There are many solids which are difficult to prepare in the stiochiometric composition and contain less amount of the metal as compared to stiochiometric proportion. a typical example of this type is FeO which is mostly found with a composition of $Fe_{0.95}$. it may actually range from $Fe_{0.96}$ O.

Q. In $Fe_{0.95}$ O:

A. Metal excess defect is present

B. Metal deficiency defect is present

C. F-centre is present

D. All of the above are present

Answer: B

Watch Video Solution

2. Q. In the crystal of $Fe_{0.95}$ O:

A. No. of Fe^{2+}, ions missing=no. of Fe^{3+} ions present

B. Some Fe^{2+} cations are missing and the loss of positive charge is made up by the presence of required no. of Fe^{3+} ions

C. Some Fe^{2+} ions are missing and some protons are present

D. none of the above

Answer: B

Watch Video Solution

3. Q. Which of the following is true about F-centre ?

A. It is not common in alkali metal halides

B. F-centre impart pink colour to the crystal of NaCl

C. Excess of Li makes LiCl crystals pink and excess of potassium makes KCl crystals violet (or lilac). It is due to F-centre.

D. F-centre is a stiochiometric point defect.

Answer: C

Watch Video Solution

4. Q. A mineral having the formula AB_2 crystallises in the cubic closed packed lattice, with A^{2+} atoms occupying the lattice points and B^- tetrahedral voids. the coordination number of A, B and fraction of the tetrahedral sites occupied by B atom respectively are:

A. 8,4,100%

B. 4,8,100%

C. 8,6,57%

D. 6,8,57%

Answer: A

 Watch Video Solution

5. In crystalline solids, atoms or molecules are arranged in a regular and long range order fashion in a three dimensional pattern. Q. An alloy of Cu and gold crystallises in cubic lattie

in which the gold atoms occupy the lattice points at the corners of cube and copper atoms occupy the centre of each face. the formula of this compound is:

A. $AuCu_3$

B. $AuCu$

C. $AuCu_2$

D. $CuAu_3$

Answer: A

Watch Video Solution

6. In crystalline solids, atoms or molecules are arranged in a regular and long range order fashion in a three dimensional pattern. Q. The fraction of Ni^{2+} and Ni^{3+} ions in $Ni_{0.98}O_{1.00}$ is:

A. 96, 4

B. 90, 10

C. 4, 96

D. 10, 90

Answer: A

Watch Video Solution

7. In crystalline solids, atoms or molecules are arranged in a regular and long range order fashion in a three dimensional pattern. T Q. An element (density 6.8 g/cm^3) occurs in bcc structure with cell edge of 290 pm. the number of atoms present in 200 g of element is:

A. 24×10^{23}

B. 24×10^{24}

C. 24×10^{22}

D. 24×10^{20}

Answer: A

Watch Video Solution

8. Density of a unit cell is the same as the density of the substance. So, if the density of the substance is known, we can calculate the

number of atoms or dimensions of the unit cell. The density of the unit cell is related to its formula mass (M), number of atoms per unit cell (z), edge length (a in cm), and Avogadro's constant N_A, as

$$\rho = \frac{z \times M}{a^3 \times N_A}$$

Q. An element X crystallizes in a structure having an fcc unit cell of an edge 100 pm. if 24 g of the element contains 24×10^{23} atoms, the density is

A. 2.40 g cm^{-3}

B. 40 g cm^{-3}

C. 4 g cm^{-3}

D. 24 g cm^{-3}

Answer: B

Watch Video Solution

9. Q. The number of atoms present in 100 g of a bcc crystal (density=10 g cm^{-3}) having cell edge 200 pm is

A. 1×10^{25}

B. 1×10^{24}

C. 2×10^{24}

D. 2×10^{26}

Answer: C

Watch Video Solution

10. Density of a unit cell is the same as the density of the substance. So, if the density of the substance is known, we can calculate the number of atoms or dimensions of the unit

cell. The density of the unit cell is related to its formula mass (M), number of atoms per unit cell (z), edge length (a in cm), and Avogadro's constant N_A, as

$$\rho = \frac{z \times M}{a^3 \times N_A}$$

Q. A metal A (atomic mass=60) has a body-centred cubic crystal structure. the density of the metal is 4.2 g cm^{-3}. the volume of unit cell is

A. $8.2 \times 10^{-23} cm^3$

B. $4.74 \times 10^{-23} cm^3$

C. $3.86 \times 10^{-23} cm^3$

D. $5.86 \times 10^{-23} cm^3$

Answer: B

Watch Video Solution