CHEMISTRY

BOOKS - GRB CHEMISTRY (HINGLISH)

SOLID STATE

Others

1. What type of solid is generally characterized by having low melting point and low electrical conductivity?

A. Ionic

B. Metallic

C. Molecualr

D. Network covalent

Answer:

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2. Which property best distinguishes metals from other types of solids?

A. Metals exhibit three-dimensional order.

B. Metals metlt at low-temperatures.

C. Metals have a shiny, silvery-white appearance.

D. Metals exhibit three-dimensional electrical conductivity.

Answer:

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3. What type of solid is silicon carbide, SiC?

A. Ionic

B. Metallic

C. Molecular

D. Network covalent

Answer:

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4. The number of crystal systems known are:

A. 7

B. 8

C. 6

D. 4

Answer:

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5. A low molar heat of fusion is expected for a solid that is:

A. ionic

B. metallic

C. molecualr

D. network covalent

Answer:

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6. Which element has the highest electrical conductivity?

A. Ga

B. Ge

C. As

D. Si

Answer:

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7. A hard, crystalline solid with a high melting point does not conduct electricity in any phase. This solid is most likely:

A. an ionic solid

B. a metallic solid

C. a molecular solid

D. a network covalent solid

Answer:

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8. What type of semiconductor results when highly purified silicon is doped with arsenic?

A. n-type

B. p-type

C. q-type

D. s-type

Answer:

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9. The lowest melting points overall occur for members of which class of solids?

A. Ionic

B. Metallic

C. Molecualr

D. Network covalent

Answer:

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10. The electrical conductivity of a solild is slight at $25^\circ (C)$ and much greater at $125^\circ C$. The solid is most likely a(n):

A. ionic compound

B. insulator

C. metal

D. semiconductor

Answer:

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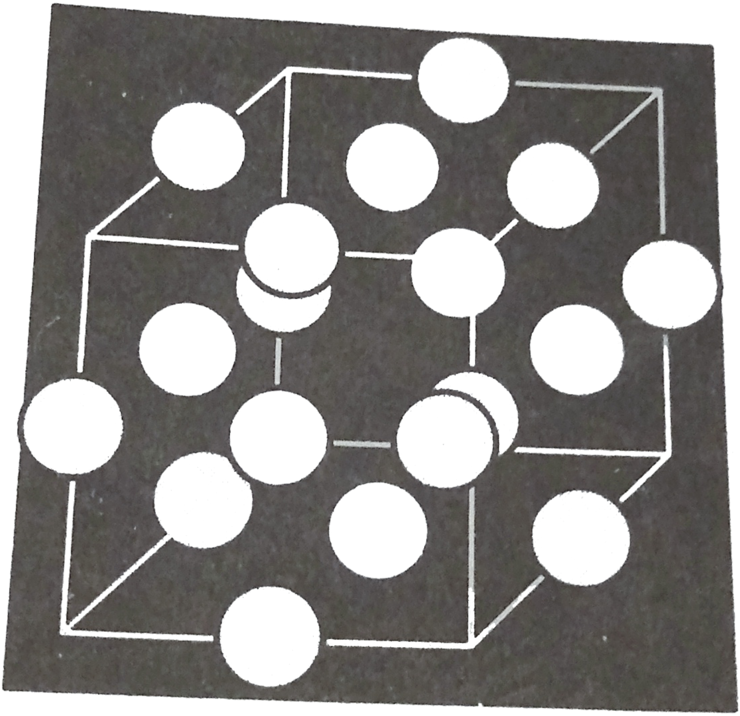
11. The structure of a unit cell of an oxide of niobium is depicted here. Niobiums are dark and oxygen are light. What is the empirical formular of thes compound?



A. NbO

B. NbO_2

C. NbO_3

D. Nb_2IO_3

Answer:

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12. Which combination represents an n-type semiconductor?

A. Si doped with Ge

B. Si doped with As

C. Si doped with Ga

D. As doped with Ga

Answer:

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13. Which substance is matched incorrectly with the type of solid it forms?

A. Ammonium sulphate-ionic solid

B. Lead-metallic solid

C. Potassium chloride-ionic solid

D. Silicon dioxide-molecualr solid

Answer:

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14. What is the principle differnece between crystalline and amorphous solids?

Crystalline solids	Amorphous Solids
(a) ionic bonding	Covalent bonding
(b) Higher molar masses	Lower molar masses
(c) Stoichiometric solids	Non-stoichiometric solids
(d)Long-range order	Lack of long-range order

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15. The arrangement of ions in a solid is best investigaged by means of:

A. infrared spectroscopy

B. mass spectroscopy

C. UV-visible spectroscopy

D. X-ray crystallography

Answer:

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16. An oxide of rhenium crystallizes with eight rhenium atoms at the corners of the unit cell and 12 oxygen atoms on the edges between them. What is the formula of this oxide?

A. ReO

B. Re_2O_3

C. ReO_2

D. ReO_3

Answer:

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17. Diamond is an exmaple of what kind of solid?

A. Ionic

B. Metallic

C. Molecular

D. Network covalent

Answer:

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18. Which of the statements is true regarding electric properties of solids?

A.

$$\text{Conductivity})_{\text{metals}} < \; < \text{Conductivity})_{\text{insulator}} < \text{Conductivity})_{\text{semic}}$$

B. Depending upon temperature TiO can behave as insulator or conductor

C. $I_2(s)$ cannot conduct electricity

D. n-type semiconductor will have conductivity less than pure semiconductor

Answer:

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

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

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

C. Amorphous solids can be moulded by heating.

D. They are anisotropic in nature.

Answer:

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20. Iodine molecules are held in the crystal lattice by:

A. London forces

B. dipole-dipole interactions

C. covalent bonds

D. coulombic forces

Answer:

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21. Which of the following is/are pseudo solids?

(P) KCl

(Q) Barium chloride dihydrate

(C) Cake left after distillation of cool tar:

A. P,R

B. Q,R

C. R,S

D. Only R

Answer:

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22. Choose the correct statements

A. Equivalent points in unit cells of a periodic lattice lie on a Bravais lattice

B. There are four Bravais lattices in two dimensions.

C. There are five Bravais lattices in three dimensions.

D.

Answer:

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23. Which of the following are not correctly matched with the bonds found between the constituents particle?

A. Solid CO_2 : Van der Waals'

B. Graphite: Covalent and van der Waals

C. Grey cast Iron : Ionic

D. Metal alloys : Ions-delocalised electrons

Answer:

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24. A Piece of copper and another of Ge are cooled from room temperature to 80K. The resistance of:

A. each of them increase

B. Cu increases and that of Ge decreases

C. Cu decreases and that of Ge increases

D. each of them decreases

Answer:

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25. Which of the following solids substances will hve same refractive index when measured in diifferent directions?

A. NaCl

B. Monoclinic sulphur

C. Rubber

D. Graphite

Answer:

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26. Identify the option representing correct set of true/false statements:

Statements-1: TiO_3 can behve as conductor or insulator depending upon temperature.

Statement-2: CrO_2 has electrical properties like metals.

Statements-3: AgBr can shows both frenkel as well as Schottky defects

A. All the statements are correct

B. Only statements-3 is correct

C. Only statements-1 is incorrect

D. Only statements-2 is correct

Answer:

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27. Which of the following statements regarding solids is correct?

A. Electrical resistance of quartz glass will be different in different directions.

B. Solid rubber metals at a sharp melting point.

C. Ionic solids are good conductors of electricity.

D. Amorphous solids may get converted to crystalline solids at some temperature.

Answer:

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28. Which of the followig statements is correct for solid rubber?

A. It will have a definite value of enthalpy of fusion.

B. Its refractive index will be same in all the directions.

C. It has a uniform arrangement of atoms.

D. It has a long range order.

Answer:

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

A. domains get randomly oriented.

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

C. all the domains get aligned in the direction of magnetic field.

D. some of the domains get aligned either in same directions or in opposite direction.

Answer:

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30. Which of the following crystalline arrangements will have at least one of the following equal to 90° and at least two axial lengths same?

A. Orthorhombic

B. Rhombohedral

C. Monoclinic

D. Tetragonal

Answer:

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31. Select the correct match about crystal system

A. $\begin{array}{lll} \text{Crystal system} & \text{interfacial angle} & \text{No. of bravais unit cell} \\ \text{Cubic system} & \alpha = \beta = \gamma = 90^\circ & 4 \end{array}$

B. $\begin{array}{lll} \text{Crystal system} & \text{interfacial angle} & \text{No. of bravais unit cell} \\ \text{Hexagonal} & \alpha = \beta \ne \gamma & 1 \end{array}$

C. $\begin{array}{lll} \text{Crystal system} & \text{interfacial angle} & \text{No. of bravais unit cell} \\ \text{Orthorhombic} & \alpha = \beta = \gamma = 90^\circ & 3 \end{array}$

D. $\begin{array}{lll} \text{Crystal system} & \text{interfacial angle} & \text{No. of bravais unit cell} \\ \text{Monoclinic} & \alpha = \beta \ne \gamma & 1 \end{array}$

Answer:

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32. Which of the following uni cells will have at least two lengths same and at least two angles same?

A. Monoclinic

B. Rhombohedral

C. Orthorhombic

D. Triclinic

Answer:

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33. which of the following crystal structrues have length of all the crystallographic axis different and have at least one angle equal to 90°?

A. Triclinic crystal structure

B. Trigonal crystal structure

C. Tetragonal crystal structrues

D. Monoclinic crystal structures

Answer:

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34. Which of the following are the correct axial distance and axial angles for rhombohedral system?

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

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

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

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

Answer:

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35. Tetragonal crystal system has the following unit cell dimensions:

A. a = b = c amd $\alpha=\beta=\gamma=90^{\circ}$

B. a=b ne c and $\alpha=\beta=\gamma=90^{\circ}$

C. $a \ne b \ne c \text{ and } \alpha=\beta=\gamma=90^{\circ}$

D. $a=b \ne c \text{ and } \alpha=\beta=90^{\circ}, \gamma=120^{\circ}$

Answer:

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36. The lattice parameters of a given crystal are $a=5.62\text{Å}, b=7.41\text{Å} \text{ and } c=9.48\text{Å}.$ The three cordinate axes are mutually perpendicular to each other. The crystal is:

A. tetragonal

B. orthorhombic

C. monoclinic

D. trigonal

Answer:

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37. Which of the following is not a crystal system?

A. Triclinic crystal structure

B. Rhombohedral

C. Tetragonal

D. isomorphous

Answer:

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38. The crystal system in which $a \neq b \neq c$ and the angles $\alpha \neq \beta \neq \gamma$ is:

A. tricline

B. Monoclinic sulphur

C. hexagonal

D. cubic

Answer:

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39. An element X (At. Wt. =224) forms FCC lattice. If the edge length of lattice is 4×10^{-8} cm and the observed density is $2.4 \times 10^{3kg/m^3}$. Then the percentage occupancy of lattice point by element X is : $(N_A = 6x10^{23})$

A. 96

B. 98

C. 99

D. 99.9

Answer:

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40. Platinum crystallize in a face centered cube crystal with a unit cell length of 3.9231Å. The density and atomic radius of platinum are respectively: [Atomic mass of Pt = 195]

A. $45.25g.\ cm^{-3}, 2.516\text{Å}$

B. $21.53g.\ cm^{-3}, 1.387\text{Å}$

C. $29.46g.\ cm^{-3}, 1.387\text{Å}$

D. none of the above

Answer:

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41. Aluminium metal has a density of $2.72 gcm^{-3}$ and crystallizes in a cubic lattice with an edge of 404 pm. Which is//are correct?

A. If forms a body centred cubic unit cell

B. If forms a face centerd cubic unit cell

C. its coordination number is 8

D. Its coordination number is 6

Answer:

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42. The density of KCl is $1.0893 g. cm^{-}$ and the length of a side of unit cell is 6.29082Å. The value of Avogadro's number is:

A. 6.07×10^{23}

B. 6.023×10^{23}

C. 6.03×10^{23}

D. 6.017×10^{19}

Answer:

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43. For the same atoms at the lattice points, which lattice exhibits the lowest density?

A. Body-centered cubic

B. Face-centered cubic

C. Hexagonal

D. Simple cubic

Answer:

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44. A salt AB crystallises in BCC arrangement where edge length of cube is found to be 4Å. Calcualte its density : (molar mass of salt AB = 128gm)

A. $\left(\frac{20}{3}\right)g/cm^3$

B. $\left(\frac{10}{3}\right)g/cm^3$

C. $\left(\frac{80}{3}\right)g/cm^3$

D. $20g/cm^3$

Answer:

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45. Ice crystallizes in hexagonal lattice. At the low temperature at which structure was determined, the lattice contents were were $a = 4.53\text{Å}$ and $c = 7.41\text{Å}$.

$c = 741\text{Å}$. Calcuate the no. of H_2O molecules present in a unit cell. (Density of ice $= 9.22g/cm)$

A. 4

B. 8

C. 12

D. 24

Answer:

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46. A metal crystallizes into two cubic phases, face-centred cubic and body-centred cubic, which have unit cell lengths 3.5 and $3.0A$, respectively. Calculate the ration of densities of fcc and bcc.

A. 3.12

B. 2.04

C. 1.26

D. 0.72

Answer:

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47. A metal having atomic mass $60.23gm/mo \leq$ crystallises in ABCABC close packing. Calculate the density of each metal atom if edge length is 10Å.

[Given : N_(A) = 6.023 xx 10^(23)]`

A. $0.40gm/ml$

B. $40gm/ml$

C. $0.54gm/ml$

D. $54gm/ml$

Answer:

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48. An element (atomic mass $= 100g/mol$) having bcc structure has unit cell edge 400 pm .Them density of the element is

A. $2.144g/cm^3$

B. $5.2g/cm^3$

C. $7.289g/cmo^3$

D. $10.376g/cm^3$

Answer:

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49. Barium metal crystallizes in a body-centered cubic lattice with barium atoms only at the lattice points. If the density of barium metal is $3.50g/cm^3$, What is the length of the unit cell?

A. 3.19×10^{-8} cm

B. 4.02×10^{-8}cm

C. 5.07×10^{-8} cm

D. 6.39×10^{8} cm

Answer:

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50. A metal exist as face centered cubic crystals. If the atomic radius is $100\sqrt{2}$pm and the density of metal is $12, 500kg/m^3$, the metal is :9Given : Ca = 40, Co= 58.9 , Sn = 119.8, Pb= 208.4, N_(A) = 6 xx 10^(23)`

A. Ca

B. Co

C. Sn

D. Pb

Answer:

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51. Silicon has crystalline structure like diamond. If the shortest distance between two silicon atoms is $100\sqrt{3}$ pm , the density of silicon is:

[Si = 30, N_(A) = 6 xx 10^(23)]`

A. $6.25 gm / cm^3$

B. $3.125 gm / cm^3$

C. $12.5 gm / cm^3$

D. $2.5 gm / cm^3$

Answer:

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52. The densities of ice and water at $0^\circ C$ and 1 bar are 0.96 and 0.99 gm cm^{-3} respectively. If the percentage of occupied space in ice is x, the the percentage of empty space in water is:

A. $\left(\frac{32}{33}\right)x$

B. $\left(\frac{33}{32}\right)x$

C. $100 - \left(\frac{22}{33}\right)x$

D. $100 - \left(\frac{33}{32}\right)x$

Answer:

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53. What is the approximate shortest internuclear distance between any two carbon atoms in diamond if it has density equal to $2gm/ml$? $[N_A = 6 \times 10^{23}]$

A. $1.414 \times 10^{-\frac{23}{3}}$ cm

B. $\left(100 - \left(\frac{22}{33}\right)x100 - \left(\frac{33}{32}\right)x\right.$

C.

D.

Answer:

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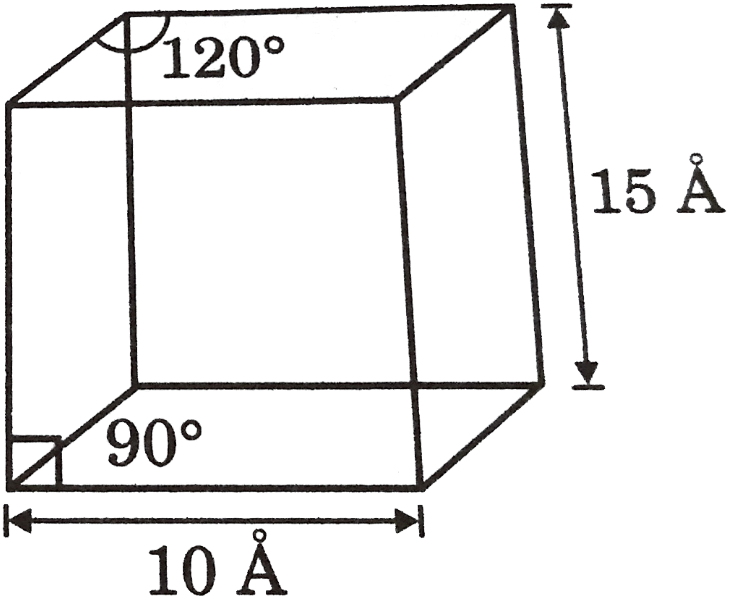
54. A solid crystallines in a hexagonal structures as shown in the figure. If density of solid is $2\sqrt{3}gm/cm^3$. How many molecules are present in the given unit cell?



[Take Avogadro's number $= 6 \times 10^{23}$, Atomic mass of solid = 450]

A. 6

B. 18

C. 2

D. 4

Answer:

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55. The density of KBr is $2.75gm/cc$ length of the unit cell is $654 \pm$ (atomic masses of $K = 38, Br = 80)$ then what is true about the predicted nature of the solid

A. Solid has FCC structure with co-ordination number = 6

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

C. Solid has FCC structure with co-ordination number = 1

D. None of the above

Answer:

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56. A solid element (monoatomic) exists as cubic crystal. If its atomic radius is 1.0Å and the ratio of packing fraction and density is $0.1 cm^3 gm$, then the atomic mass of the element is : $(N_A = 6 \times 10^{23}$

A. 8π

B. 16π

C. 80π

D. 4π

Answer:

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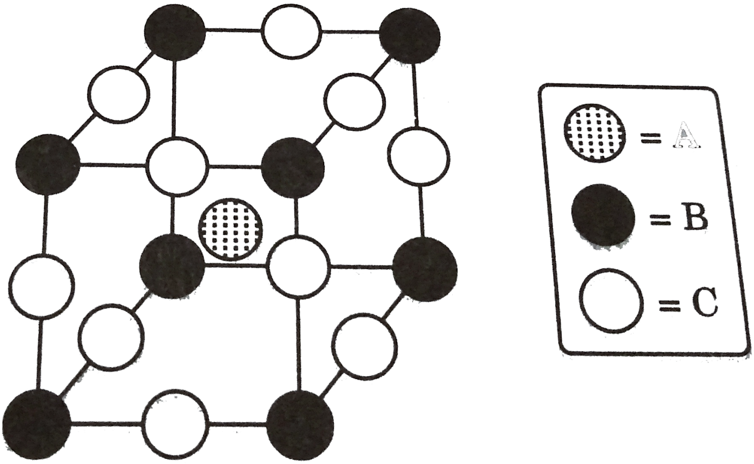
57. The cubic unit cell of a perovakite structure containing atoms of types A, B and C is illustrated below. What is the empirical formula of this substance?



A. ABC

B. ABC_3

C. AB_4C_6

D. AB_8C_{12}

Answer:

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58. Three elements P, Q and R crystallize in a cubic solid lattice. The P atoms occupy the corners. Q atoms the cube centres and R atoms the edges. The formula of the compound is

A. PQR

B. PQR_2

C. PQR_3

D. PQ_3R

Answer:

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59. Consider a cube 1 of body-centered cubic unit cell of edge length 'a'. Now atom at the body center can be viewed to be lying on the corner of another cube 2. Find the volume common to cube 1 and cube 2.

A. $\left(\frac{a^3}{27}\right)$

B. $\left(\frac{a^3}{64}\right)$

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

D. $\frac{a^3}{8}$

Answer:

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60. In a face centerd lattice of X and YX atoms are present at the corners while Y atom are at face centers .Then the formula of the compound is

A. XY^3

B. X_2Y_3

C. X_3Y

D. XY

Answer:

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61. A compound of A and B crystallizes in a cubic lattice in which A atoms occupy the lattice points at the corners of a cube and two atoms of B occupy the center of each of the cube faces. What is the formula of this compound?

A. AB_3

B. AB_4

C. AB_2

D. AB_6

Answer:

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62. In a solid AB having the $NaCl$ structure, A atom occupies the corners of the cubic unit cell. If all the face-centred atoms along one of the axes are removed, then the resultant stoichiometry of the solid is

A. AB_2

B. AB_4

C. AB_2

D. AB_6

Answer:

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63. An ionic compound has a unit cell consisting of A ions at the corners of cube and B ions on the centers of the face of the cube. The empirical formula for this compound would be:

A. AB

B. A_2B

C. AB_3

D. A_3B

Answer:

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64. A substance A_xB_y crystallizes in a face-centred cubic lattice in which atoms A occupy the centres of each face of the cube. Identify the correct composition of the substance A_xB_y.

A. AB_3

B. A_4B_3

C. A_3B

D. composition cannot be specified

Answer:

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65. A crystal is made up of particals X, Y, and Z. X froms f packing. Y occupies all octahedral voids of X and Z occupies all tetrahedral voids of X. If all the particles along one body diagonal are removed. Then the fromula of the crystal would be

A. $X_5Y_4Z_8$

B. XYZ

C. $X_8Y_4Z_5$

D. X_2YZ

Answer:

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66. In a face-centered lattice of X and Y, X atoms are present at the corners while Y atoms are at face centers. Then the formular of the compound would be if two atoms of X are missing from the corners:

A. X^4Y

B. X_3Y_4

C. XY_4

D. XY_3

Answer:

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67. In a cubic structure of compound which is made from X and Y, where X atoms are at the corners of the cube and Y at the face centers of the cube. The molecular formular of compound is:

A. X_2Y

B. X_3Y

C. XY_2

D. XY_3

Answer:

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68. In a face centered lattice of X and Y, X atoms are present at the corners while Y atoms are at face centers. Then the formula of the compound would be if one of the X atoms is missing from a corner in each unit cell:

A. X_7Y_{24}

B. $X_{24}Y_7$

C. XY_{24}

D. $X_{24}Y$

Answer:

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69. In a CCP lattice of X and Y atoms are present at the corners while Y atoms are at face centeres .Then the formula of the compound would be if one of the atoms from a corner is replaced by Z atoms (also monovalent)?

A. $X_7Y_{24}Z_2$

B. $X_7Y_{24}Z$

C. $X_{24}Y_7Z$

D. $XY_{24}Z$

Answer:

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70. A solid has a structure in which W atoms are located at the corners of a cubic lattice, O atom at the centre of edges, and Na atom at the centre of the cube. The formula for the compound is

A. $NaWO_2$

B. $NaWO_3$

C. Na_2WO_3

D. $NaWO_4$

Answer:

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71. Find the lowest possible empirical formular in an arrangements of unit cell where A atoms are present at corners and alternate face centers, B atoms are present at alternate edge centers and C atoms are present at half of the mid of line joining opposite face centers.

Assume: Any atom present in the inner location of the unit cell should be considered completely within the unit cell structure.

A. A_2BC_6

B. A_2B_3C

C. A_6BC_6

D. $A_6B_3C_3$

Answer:

72. The volume of atom present in a face-centred cubic unit cell of a metal (r is atomic radius) is

A. $\left(\frac{20}{3}\right)\pi r^3$

B. $\left(\frac{24}{3}\right)\pi r^3$

C. $\left(\frac{12}{3}\right)\pi r^3$

D. $\left(\frac{16}{3}\right)\pi r^3$

Answer:

73. Percentage of free space in cubic close packed structure and in body centered packed structure are responsive:

A. 30% and 26%

B. 26% and 32%

C. 32% and 48%

D. 48% and 26%

Answer:

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74. In a face centerd cubic cell, the contribution of an atom at a face of the unit cell is:

A. 43467

B. 1

C. 2

D. 3

Answer:

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75. An fcc lattice has a lattice parameter $a = 400$ pm. Calculater the molar volume of the lattice including all the empty space.

A. 10.8 mL

B. 96 mL

C. 8.6 mL

D. 9.6 mL

Answer:

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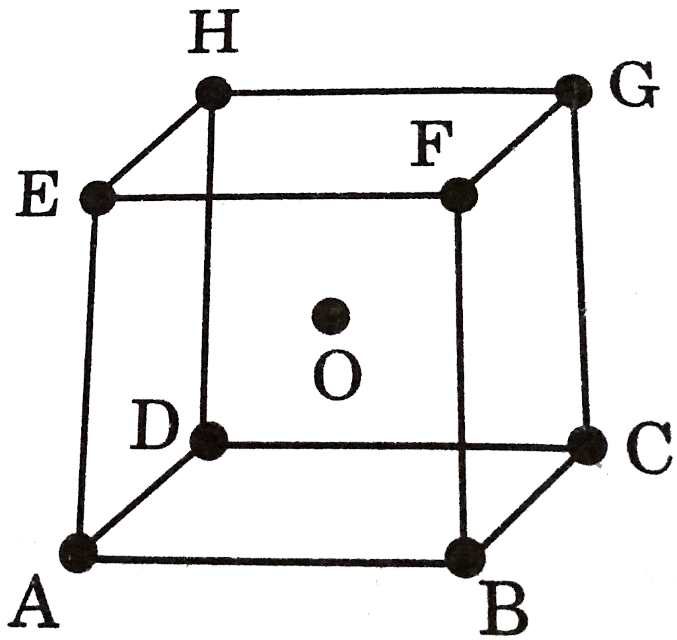
76. A body centred cubic arrangement is shown below:



O is the body center, A, B, C, D, ...,H are the corners. What is the magnitude of the angle AOB?

A. 120°

B. $109^\circ, 28$

C. $104^\circ 31$

D. $70^\circ 32$

Answer:

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77. In a face centered cubic cell , an the face contributes in the unit cell

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

B. 1

C. 2

D. 3

Answer:

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78. Copper crystallises in a structure of face centred cubic unit cell. The atomic radius of copper is 1.28Å. What is axial length on an edge of copper?

A. 2.16Å

B. 3.62Å

C. 3.94Å

D. 4.15Å

Answer:

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79. If the radius of a metal is 2.00Å and its crystal structure is in cubic close packed (fc lattice), what is the volume $\left(\in cm^3\right)$ of one unit cell?

A. 8.00×10^{-24}

B. 1.60×10^{-23}

C. 1.80×10^{-23}

D. 2.26×10^{-23}

Answer:

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80. Platinum crystallize in a face-centred cubic crystal with a unite cell length a. the distance between nearest neighbours is:

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81. 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. $\sqrt{2}$pm

B. $\sqrt{\left(\frac{3}{2}\right)}$ pm

C. 200 pm

D. 142.2pm

Answer:

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82. The compound AB crystallizes in cube lattice in which both the elements have co-ordination number of eight. The crystal class is:

A. simple cubic

B. face-centred cubic

C. body centred cubic

D. none of these

Answer:

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83. if a metal has a bcc crystal structure, the coordination number is 8,because :

A. each atom touches four atoms in the layer above it, four in the layer below it and none it its own layer

B. each atom touches four atoms in the layer above it, fourth in the layer below it and one its own layer

C. two atoms touch four atoms in the layer above them, four in the layer below them, and none in their own layer.

D. each atom touches eight atoms in the layer above it, eight in the layer below it, and none in their own layer.0

Answer:

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84. In a ccp structure, the :

A. first and third layers are repeated

B. first and fourth layers are repeated

C. second and fourth layers are repeated

D. first, thired and sixth layers are repeated

Answer:

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85. In a face centred cubic lattice the number of nearest neighbours for a given lattice point are:

A. 6

B. 8

C. 12

D. 4

Answer:

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86. How manyu '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:

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87. What is the maximum radius of the circle which can be kept in a two dimensional arrangement of identical atoms if atoms have a radius of 200pm without distorting the arrangement?

A. 82.8pm

B. 31pm

C. 100pm

D. 90pm

Answer:

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88. Which of the following options represents correctly matched value of number of next nearest neighbours in different cubic unit cells?

A. Simple cubic-8

B. Body centred cubic-6

C. Face centred cubic-12

D. Face centred cubic-8

Answer:

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89. Which of the following options represents correctly matched value of number of next nearest neighbours in different cubic unit cells?

A. 8 ml

B. 6ml

C. 4.8ml

D. 2ml

Answer:

Watch Video Solution

90. The closest distance between Si and C in SiC is 0.866Å. What will be the molar volume of unit cell?

A. 8 ml

B. 6 ml

C. 4.8ml

D. 2ml

Answer:

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91. In a BBC unit cell, fraction of face diagonal not covered by atoms is approximately equal to:

A. 0.54

B. 0.39

C. 0.62

D. 0.41

Answer:

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92. The only incorrect statement for the packing of identical spheres in two dimension is:

A. for square close packing, coordinatioin number is 4.

B. for hexagonal, close packing, coordination number is 6.

C. there is only one void per atom in both, square and hexagonal close packing.

D. hexagonal close packing is more efficiently packed than square close packing.

Answer:

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93. In the body-centred cubic unit cell and face centred cubic unit cell, the radius of atom in terms of edge length(a) of the unit cell is respectively:

A. $\left(\frac{a}{2}\right), \left(\frac{a}{2\sqrt{2}}\right)$

B. $\left(\frac{a}{2}\sqrt{2}\right), \left(\frac{\sqrt{3}a}{4}\right)$

C. $\left(\frac{\sqrt{3}a}{4}\right), \left(\frac{a}{\sqrt{2}}\right)$

D. $\left(\frac{\sqrt{3}a}{2}\right), \left(\frac{a}{2}\sqrt{2}\right)$

Answer:

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94. In which pair most efficient packing is present?

A. hcp and bcc

B. hcp and ccp

C. bcc and ccp

D. bcc and simple cubic cell

Answer:

Watch Video Solution

95. What is the coordination number in a square close packed structures in two dimensions?

A. 2

B. 3

C. 4

D. 6

Answer:

Watch Video Solution

96. Which one of the following schemes of ordering closed packed sheets of equal sized spheres does not generate close packed lattice?

A. ABCABC

B. ABACABAC

C. ABBAABBA

D. ABCBCABCBC

Answer:

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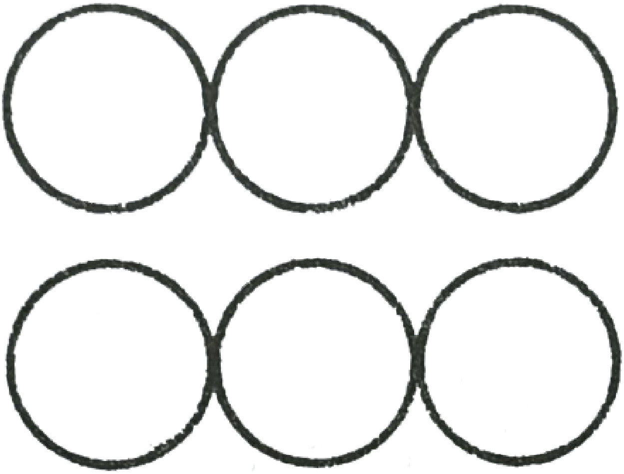
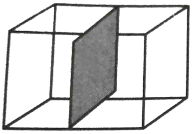
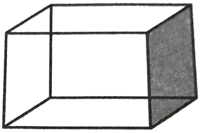
97. Which of the following shaded plane in fcc lattice contains arrangement of atoms



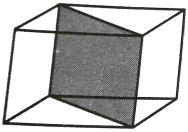
A. (a)



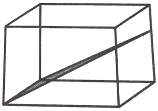
B. (b)



C. (c)



D. (d)



Answer:

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98. Lithium crystallizes in a body centred cubic lattice. How many next-nearest neighbours does each Li have?

A. 6

B. 8

C. 12

D. 4

Answer:

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99. Consider a Body Centred Cube (BCC) arrangement, let d_e, d_{fd}, d_{bd} be the distances between successive atoms located along the edge, the face-diagonal, the body diagonal respectively in a unit cell. Their order is given as:

A. $d_e < d_{fd} < d_{bd}$

B. $d_{fd} > d_{bd} > d_e$

C. $d_{fd} > d_e > d(bd)$

D. $d_{bd} > d_e > d_{fd}$

Answer:

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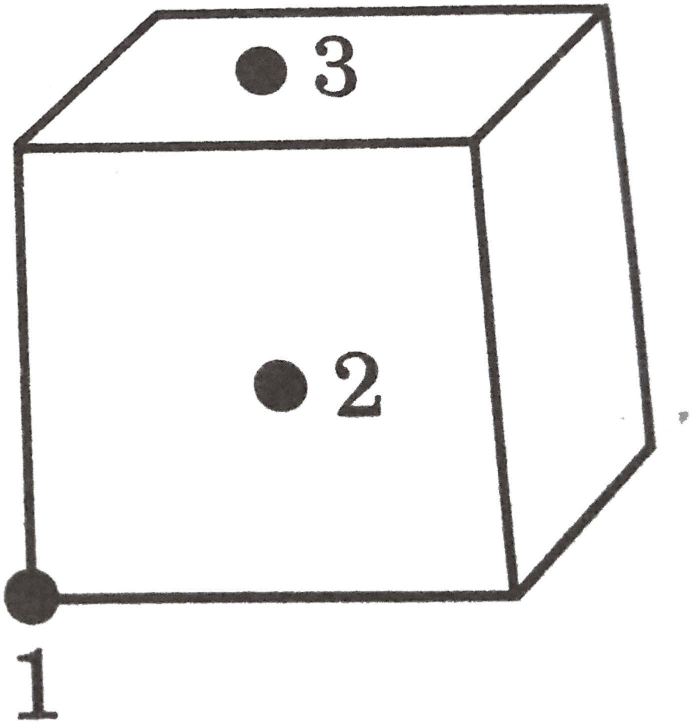
100. Figure shows a cube of unit cell of CCP arrangements with face centred atoms marked 1,2, 3. Which of the following is true?



A. Atom 3 is twice as far from 1 as from 2

B. Atom 2 is equidistant from atoms 1 and 3

C. Atom 2 is nearer to 1 than to 3

D. All atoms lie on a right angled triangle.

Answer:

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101. You are given 6 identical balls. What is the maximum number of square voids and triangular voids (in separate arrangements) that can be created?

A. 2,4

B. 4,2

C. 4,3

D. 3,4

Answer:

Watch Video Solution

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102. Square packed sheets are arranged on the top fo the other such that a sphere in the next layer rests on the center of a square in the previous layer. Identify the type of arrangement and find the coordination number:

A. Simple Cubic, 6

B. Face Centered Cubic, 8

C. Face Centered Cubic, 12

D. Body Centered Cubic, 8

Answer:

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103. Na and Mg crystallize in BCC and FCC type crystal respectively, then the number of atoms of Na and Mg present in the unit cell of their respective crystal is:

A. 4 and 2

B. 9 and 14

C. 14 and 9

D. 2 and 4

Answer:

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104. Copper crystallises in fcc with a unit cell length of 361 pm. What is the radius of copper atom?

A. 127 pm

B. 157 pm

C. 181 pm

D. 108 pm

Answer:

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105. C represents the height of the HCP unit cell and a represents the edge length of the hexagonal surface of the HCP unit cell. What is the value of $\frac{C}{a}$?

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

B. $\sqrt{\frac{8}{3}}$

C. $\sqrt{\frac{32}{3}}$

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

Answer:

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106. Metallic gold crystallises in face centred cubic lattice with edge-length 4.07Å. Closest distance between gold atoms is:

A. 2.035Å

B. 8.140Å

C. 2.878Å

D. 1.357Å

Answer:

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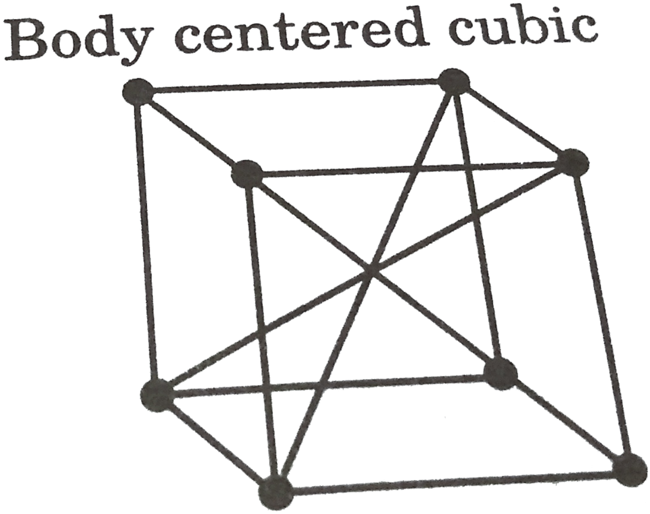
107. Metallic sodium has a body-centred cubic unit cell. How many atoms are contained in one unit cell?



A. 1

B. 2

C. 5

D. 9

Answer:

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108. The metal M crystallizes in a bocy centred lattice with cell edge 400pm. The atomic radius of M is:

A. 200pm

B. 100pm

C. 173pm

D. 141pm

Answer:

Watch Video Solution

109. How many nearest neighbours surrounded each particle in a face-centred cubic lattice?

A. 4

B. 6

C. 8

D. 12

Answer:

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110. Consider the solids: body-centred cubic (bcc), face-centred cubic (fcc), simple cube (sc) (or primitive), constructed of spheres of the same size. When they are arranged in incnreasing order of the percentage of free space in a unit cell, which order is correct?

A. fcc, bcc, sc

B. bcc, sc, fcc

C. sc, fcc, bcc

D. bcc, fcc, sc

Answer:

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111. Solid calcium occurs as either cubic closest packing or hexagonal closest packing. What is the most significant difference between these two structures?

A. The placement of layers of calcium atoms

B. The distance between calcium atoms in a single layer

C. The distance between calcium atoms in adjacent layers

D. The coordination number of the calcium atoms in a single layer.

Answer:

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112. The atoms in crystals of silver metal are arranged in a cubic closest paced structure. What is the unit cell in this structure?

A. Body-centered cubic

B. Face-centred cubic

C. Hexagonal-close packed

D. Simple cubic

Answer:

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113. In a crystal of a typical metallic element, an atom has how many nearest neighbours?

A. 4

B. 6

C. 12

D. 16

Answer:

Watch Video Solution

114. What is the coordination number of each atom in a hexagonal close-packed solid?

A. 4

B. 6

C. 8

D. 12

Answer:

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115. Which statement about atoms arranged in a body-centered cubic (bcc) crystal structure is correct?

A. It is not observed as the structure of any metallic elements

B. It is also called the cubic close-packed (ccp) structure.

C. The unit cell contains two atoms.

D. Each atom has 6 nearest neighbours.

Answer:

Watch Video Solution

116. Packing fraction in F.C.C lattice is:

A. $\left(\frac{\pi}{6}\right)$

B. $\frac{\sqrt{2}\pi}{6}$

C. $\left(\frac{\pi}{2\sqrt{3}}\right)$

D. $\left(\frac{\sqrt{3\pi}}{8}\right)$

Answer:

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117. If X = no. of second nearest neighbours of a metal atom which crystallizes in BBC and Y = no. of second nearest neighbours of a metal atom which crystallizes in FCC, then value of (X-Y) is?

A. 6

B. 8

C. 0

D. 4

Answer:

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118. Of the three types of cubic lattices, which have the highest and lowest densities for the mass atoms?

A.

Highest	Lowest
Simple cubic	Body-centred cubic

B.

Highest	Lowest
Face-centered cubic	Simple cubic

C.

Highest	Lowest
Body-centered cubic	Face-centred cubic

D.

Highest	Lowest
Face-centered cubic	Body-centred cubic

Answer:

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119. A metal crystallizes in a body centred cubic lattice (bcc) with the edge of the unit cell 5.2Å. The distance between the next nearest neighbour is:

A. 10.4Å

B. 4.5Å

C. 5.2Å

D. 9.0Å

Answer:

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120. A solid crystallinses as cubic close packing of O^{2-} ions. A^{x+} ions occupy 25% of the tetrahedral voids and B^{y+} ions occupy 50% of the octahedral voids. The suitable values of x and y are:

A. x = 1, y=3

B. x =2, y=1

C. x=3, y=2

D. x-=1, y=2

Answer:

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121. Select the correct statements about FCC (ABCAB...) Structures.

A. Distance between nearest octahedral void and tetrahedral void is $\left(\frac{\alpha}{4}\right)$

B. Distance between two nearest octahedral void is $\left(\frac{\alpha}{2}\right)$

C. Distance between two nearest tetrahedral void is $\left(\frac{\sqrt{a}}{2}\right)$

D. Distance between layer A and B is $2r\sqrt{\frac{2}{3}}$

Answer:

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122. What will be approximate packing efficiency of the crystal which forms FCC with half the tetrahedral and octahedral voids occupied without disturbing the lattice?

A. 0.74

B. 0.68

C. 0.81

D. 0.77

Answer:

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123. Which of the following option(s) is//are incorrect if an arrangement is formed by two different atoms A and B such that B forms cubic close packing and A atoms occupy all the octahedral voids without causing any distortions.

[Given : Edge length of cube = a, Radius of atom A= r_(a), Radius of atom B = r_(b)]

A. $4r_b = \sqrt{2a}$

B. $r_a + r_b = \sqrt{2}. r_a$

C. The arrangement can be viewed as A atoms forming cubic packing and B atoms occupying all octahedral void without any distortions.

D. Distance between two nearest atoms of A will be equal to twice the radius of atom of B.

Answer:

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124. Two elements A and B have atomic masses 40 and 60 respectively. If B from hcp arrangements and A is occupying $\frac{1}{3}$ of thte tetrahedral voids, then what will be number of hexagonal primitive unit cells w.r.t. B atoms in 130mg of the substance? (Given : $N_A = 6 \times 10^{23}$

A. 1.0×10^{20}

B. 4.5×10^{20}

C. 4×10^{20}

D. 1.2×10^{21}

Answer:

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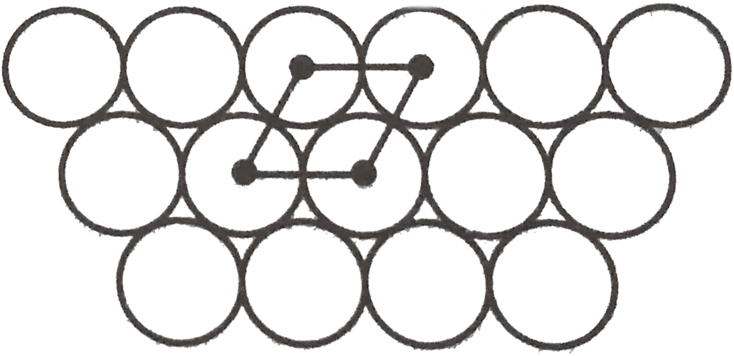
125. For the following unit cell of a 2D arrangement what will be approximate void % ?



A. 0.76

B. 0.24

C. 0.9

D. 0.1

Answer:

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126. If C-C bond length in diamond is 1.5Å, then which be the edge length of the cubic close packed units cell of diamond having alternate tetrahedral voids occupied?

A. 1.5Å

B. 3Å

C. $\left(\frac{3}{\sqrt{2}}\right)\text{Å}$

D. $\left(\frac{6}{\sqrt{3}}\right)\text{Å}$

Answer:

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127. The density of a pure substance A whose atoms pack in cubic close park arrangement is $1gm/$. If B atoms can occupy tetrahedral void without distortions and they occupy all the tetrahedral voids, then what is the density of resulting solid in $gm/$? [Given: $M_A = 30a\mu, M_B = 50a\mu$]

A. 4.33

B. 2.33

C. 1.33

D. 5.33

Answer:

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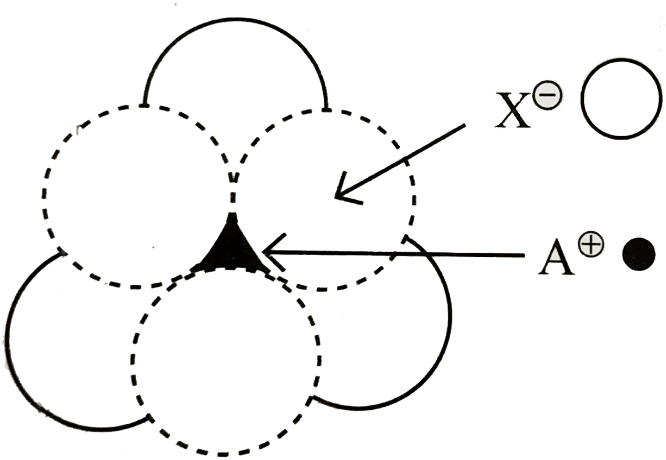
128. The arrangement of $X^{\ominus}$ ions around $A^{\oplus}$ ion in solid AX is given in the figure (not drawn to scale). If the radius of $X^{\ominus}$ is $250 \pm$, the radius of

$A^{\oplus}$ is



A. 104pm

B. 125pm

C. 183pm

D. 57pm

Answer:

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129. A compound has a cubical arrangement and consist of atoms of P, Q and R, P atoms are pressure at the corners, Q atoms occupy face center position and R occupy alternate tetrahederal void as well as all octahedral void. If all the atoms lying on any one body diagonal are missing, then what would be the formula?

A. PQ_3R_8

B. PQ_4R_8

C. $P_3Q_{12}R_{32}$

D. $P_3Q_{12}R_{20}$

Answer:

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130. A metal crystallizes in fcc arrangement with edge length equal to 400 nm. Calculate maximum possible radius of the atom which can fit in the voids without disturbing the crystal structure?

A. 165.6nm

B. 39nm

C. 71.71nm

D. 58.55nm

Answer:

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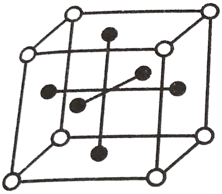
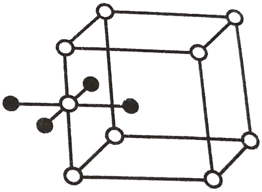
131. Which of the following statements is true?

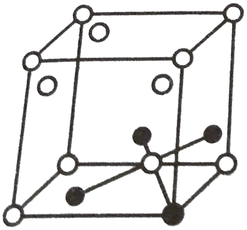
(P)



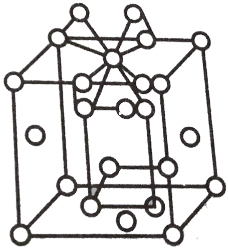
(Q)



(R)



(S)



A. P and Q represent tetrahedral holes.

B. Q. R and S represent tetrahedral holes

C. P and Q represent octahedral holes.

D. P,Q and S represents octahedral holes

Answer:

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132. In the crystal lattice of diamond carbon atoms adopt

A. fcc arrangement along with occupancy of 50% tetrahedral holes.

B. fcc arrangement along with occupancy of 25% tetrahedral holes.

C. fcc arrangement along with occupancy of 25% octahedral holes.

D. bcc arrangement

Answer:

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133. If the anions (A) form hexagonal closest packing and cations (C) occupy only 2/3 octahedral volids in it, then the general formula of the compound is:

A. CA

B. CA_2

C. C_2A_3

D. C_2A_2

Answer:

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134. In a multi layered close-packed structures.

A. there are twice as many tetrahedral holes as there are close-packed atoms.

B. there are as many tetrahedral holes as there are cloed packed atoms.

C. there are twice as many octahedral holes as there as close-packed atoms.

D. there are as many tetrahedral holes as there are octahedral holes.

Answer:

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135. The spinel structure $(AB_2O_4$ consists of an fcc array of O^{2-} ions in which the:

A. A caption occupies one-eighth of the tetrahedral holes and B cation occupies one-half of octahedral holes

B. A cation occupies one-fourth of the tetrahedral holes and the B cations the octahedral holes.

C. A cation occupies one-eighth of the octahedral hole and the B cations the tetrahedral holes.

D. A cation occupies one-fourth of the octahedral holes and B cations the tetrahedral holes.

Answer:

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136. The number of octahedral and terhedral sides in a cubical closed packed array of N spheres respectively is

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

B. 2N

C. 4N

D. N

Answer:

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137. A mineral having the formula AB_2 crystallizes in the p lattice, with A atoms occupying the lattice points. Select the correct statement(s).

A. 8,4, 100%

B.

C. 2,6,75%

D. 3,1,25%

Answer:

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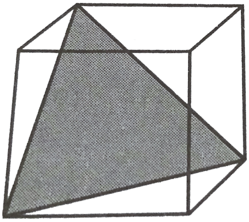
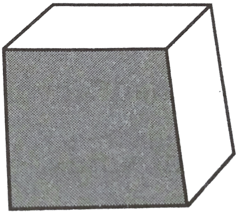
138. Following three planes (P_1, P_2, P_3) in an FCC unit cell are shown. Consider the following statements and choose the corrct option that follow:

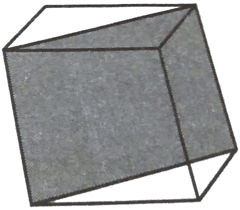
nd choose the correct option that fo



P$_1$



P$_2$



P$_3$

(P) P_1 contains no voids three dimensions.

(Q) P_2 contains only octahedral voids.

(R) P_3 contains both octahedral and tetrahedral voids.

A. All are true

B. Only P and Q are true

C. P and R are true

D. Only R is true

Answer:

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139. Given an alloy of Cu, Ag and in which Cu atoms consists the CCP arrangement. If the hyphothetical formula of the alloy is Cu_4Ag_3Au. What are the probable locations of Ag and Au atoms?

A. Ag-all Tetrahedral voids, Au-all Octahedral voids.

B. $Ag\left(\frac{3}{8}\right)th$ Tetrahedral voids, $\left(Au\left(\frac{1}{4}\right)th\right.$ Octahedral voids.

C. $Ag\left(\frac{1}{2}\right)$ Octahedral voids, $Au\left(\frac{1}{2}\right)$ Tetrahedral voids

D. Ag-all Octahedral voids, Au-all Tetrahedral voids.

Answer:

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140. What is the packing fraction close packed cylinders?

A. 0.9069

B. 0.74

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

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

Answer:

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141. In the closest packing of atoms

A. the size of tetrahedral voids is greater than their of octahedral void

B. the size of tetrahedral void is smaller than that of octahedral void

C. the size of tetrahedral void is smaller o equal to that of octahedral void

D. the size of tetrahedral void may be greater equal to that of octahedral void depending upon the size of atoms.

Answer:

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142. Correct statement for ccp is:

A. Each octahedral void is surrounded by a spheres and each sphere is surrounded by octahedral voids.

B. Each octahedral void is surrounded by a spheres and each sphere is surrounded by a octahedral voids.

C. Each octahedral void is surrounded by a spheres and each sphere is surrounded by a octahedral voids.

D. Each octahedral void is surrounded by a spheres and each sphere is surrounded by 12 octahedral voids.

Answer:

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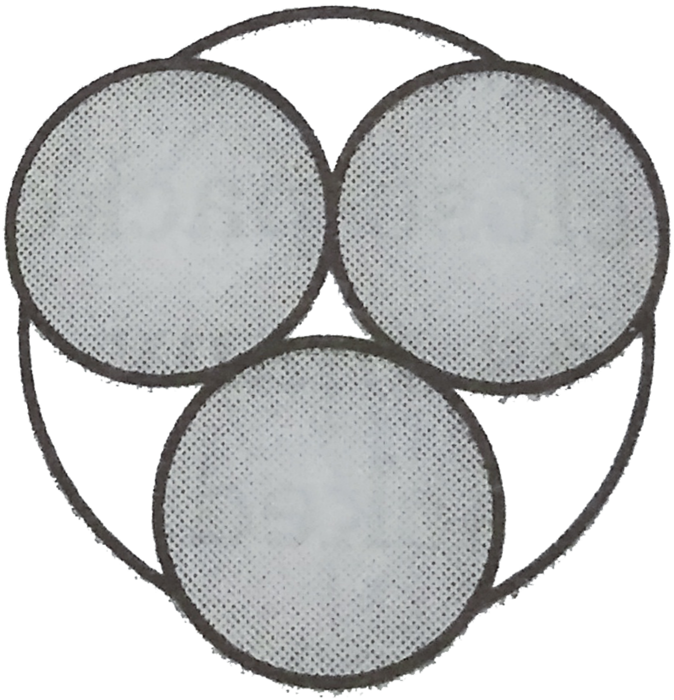
143. The empty space between the shaded balls and hallow balls as shown in the diagram is called:



A. hexagonal void

B. octahedral void

C. tetrahedral void

D. double triangular void

Answer:

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144. In a FCC unit cell

x = distance between two nearest O.V.

y = distance between two nearest T.V.

z= distance between nearest O.V. and T.V.

Select the correct order of distance,

A. x=y=z

B. x lt y ltz

C. x gt y lt z

D. x gt y gt z

Answer:

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145. Length of body diagonal in FCC unit cell is $\alpha\text{Å}$. Distance between two octahedral voids in it is:

A. $\left(\alpha\frac{\sqrt{3}}{4}\right)$

B. $\left(\frac{\alpha}{\sqrt{2}}\right.$

C. $\left(\frac{\alpha}{\sqrt{6}}\right.$

D. $\left(\frac{\alpha}{\sqrt{3}}\right.$

Answer:

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146. The shortest distance between an octahedral and tetrahedral void in F.C.C. metallic lattice in terms of radius of F.C.C. packed atom would be:

A. $\left(\sqrt{\frac{2}{3}}\right)R$

B. $\left(\sqrt{3\frac{R}{2}}\right)$

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

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

Answer:

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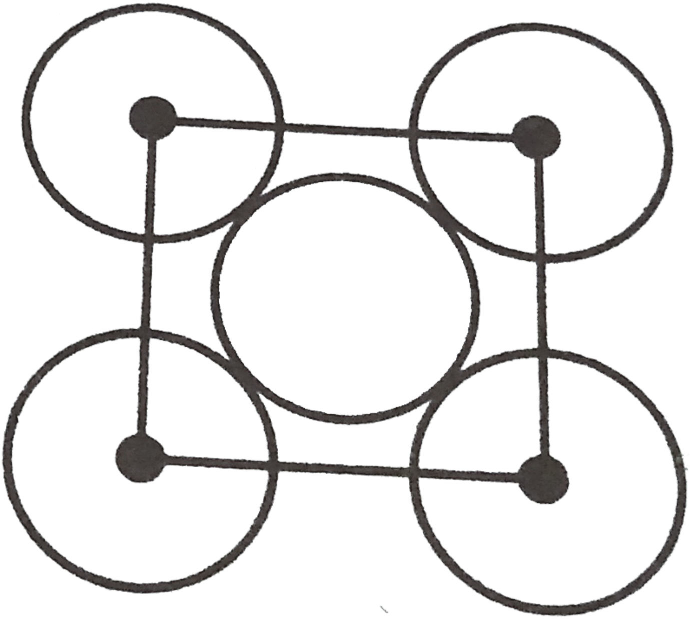
147. The packing efficiency of the two dimensional square unit cell shown below is:



A. 39.127%

B. 0.6802

C. 0.7405

D. 0.7854

Answer:

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148. Let the height of hcp unit cell is 'h'. The height of octahedral voids from the base is:

A. $\left(\frac{h}{2}\right)$

B. $\left(\frac{h}{3}\right), \left(2\frac{h}{3}\right)$

C. $\left(\frac{h}{8}\right), \left(7\frac{h}{8}\right)$

D. $\left(\frac{h}{4}\right), \left(3\frac{h}{4}\right)$

Answer:

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149. In NaCl if $r_{Na+} = 100 \pm$, then maximum size of r_{Cl-} will be:

A. $241.5 \pm$

B. $261.5 \pm$

C. $251.5 \pm$

D. $271.5 \pm$

Answer:

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150. How many unit cells are present in a cube-shaped crystal of NaCl of mass 1.00g?

A. 2.57×10^{21}

B. 5.14×10^{21}

C. 1.28×10^{21}

D. 1.71×10^{21}

Answer:

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151. The unit cell cube length for LiCl(just like NaCl structures) is 5.14Å. Assuming anion-anion contact, the ionic radius for chloride ion is:

A. 1.815Å

B. 2.8Å

C. 3.8Å

D. 4.815Å

Answer:

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152. The numberof next nearest neighbours of Cs^{+} in a lattice of CsCl is given by:

A. 6

B. 8

C. 4

D. 12

Answer:

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153. 4.2 gm of carbonate of an alkaline earth metal is dissolved in excess of HCl solution by which 1.12L CO_2 gas (measured at 273K and 1 atm) is evolved. If the pure metal crystallises as BCC crystal, then the only correct statement regarding the metal is:

[N_(A) $= 6 \times 10^{23}$]

A. The metal is calcium

B. There are 3×10^{22} unit cell in 1.2 gm metal.

C. The density of metal is 1.24 gm/cm^3 , if the edge-length of unit cell is 4Å.

D. The metal forms amphoteric oxide.

Answer:

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154. CsBr has bcc like structures with edge length 4.3Å. The shortest inter ionic distance in between Cs^+ and Br^- is:

A. 3.72Å

B. 1.86Å

C. 7.44Å

D. 4.3Å

Answer:

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155. BaO has a rock-salt type structure. When subjected to high pressure, the ratio of the coordination number of Ba^{+2} ion to O^{-2} changes to:

A. $4:8$

B. $8:4$

C. $8:8$

D. $4:4$

Answer:

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156. For an ionic solid of the general formula AB and coordination number 6, the value of ther radius ratio will be:

A. less than 0.025

B. in between 0.025 and 0.414

C. between 0.414 and 0.732

D. greater than 0.732

Answer:

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157. The radius of Ag^{+} ion is 126 pm and that of I^{-} ion is 216 pm. The coordination number of Ag^{+} ion is:

A. 2

B. 4

C. 6

D. 8

Answer:

Watch Video Solution

158. The tetrahedral voids formed by ccp arrangement of Cl^{-} ions in rock salt structure are:

A. occupied by Na^{+} ions

B. occupied by Cl^{-} ions

C. occupied by either Na^{+} or Cl^{-}

D. vacant

Answer:

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159. Which of the expressions is correct in the case of a sodium chloride unit cell (edge length = alpha):

A. $r_c + r_a = \frac{\alpha}{2})$

B. $r_c + r_a = a)$

C. $r_c + r_a = 2a$

D. $r_c + r_a = 2^{\frac{1}{2}} a$

Answer:

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160. MgO exists in a rock- salt type unit cell .Each Mg^{+2} ion will be is contact with be in contact with

A. $4O^{-2} ions$

B. $6O^{-2} ions$

C. $8O^{-2}$ions

D. $2O^{-2}$ions

Answer:

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161. How many units cells are there in 1.00g cube shpaed ideal crystal of AB `(M_(W) = 60) which has a NaCl type lattice?

A. 6.02×10^{23}

B. 1.00×10^{22}

C. 2.50×10^{21}

D. 6.02×10^{24}

Answer:

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162. The ionic radii of Rb^{+} and I^{-} are 1.46 and 2.16Å. The most probable type of structure exhibited by it is:

A. CsCl type

B. NaCl type

C. ZnS type

D. CaF_2 type

Answer:

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163. The edge length of a face contact with each other ionic substance is 508 pm. If the radius of the cation is 110pm, the radius of the anion is:

A. 288pm

B. 398 pm

C. 618pm

D. 144pm

Answer:

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164. Which of the following statements is correct in the rock-salt structure of ionic compounds?

A. Co-ordination number of cation is four whereas that of anion is six

B. Co-ordinatioin number of cation is six whereas that of anion is four

C. Co-ordination number of each cation and anion is four

D. Co-ordination number of each cation and anion is six

Answer:

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165. In the radii of A^{+} and B^{-} are 95 pm and 181 pm respectively, then the coordination number of A^{+} will be:

A. 12

B. 8

C. 6

D. 4

Answer:

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166. In a sodium chloride structure, the percentage of the octahedral voids occupied by cation is:

A. 1

B. 0.74

C. 0.33

D. 0.26

Answer:

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167. The coordination number of cation and anion in fluorite CaF_2 and rutile TiO_2 are respectively:

A. $8:4 \text{ and } 6:3$

B. $6:3 \text{ and } 4:4$

C. $6:6 \text{ and } 8:8$

D. $4:2 \text{ and } 2:4$

Answer:

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168. If the positions of Na^+ and Cl^- is:

A. unchanged

B. changes to $8:8$ coordination from $6:6$

C. additivity of ionic radii for edge length is lost

D. none of the above

Answer:

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169. The compound AB crystallizs in a cubic lattice in which both A and B atoms have coordination number of 8. To what crystal class does the unit cell belong?

A. CsCl structure

B. NaCl structure

C. ZnS structure

D. Al_2O_3 structures

Answer:

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170. The distance between adjacent, oppositely charged ions is rubidium chloride is 13.285Å, $\in potassiumchl$ or $ideis$3.139Å $\in sodiumbromideis2.981\text{Å}$. And in potassium bromide is 3.293Å. The distance between adjacent oppositely charged ions in rubidium bromide is:

A. 3.147Å

B. 3.385Å

C. 3.393Å

D. 3.439Å

Answer:

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171. Edge length of M^+X (fcc structure) is 7.2Å. Assuming $(M^+ - X^-)$ contact along the cell edge, radius of X^- ion is $(r_{M+} = 1.6\text{Å})$:

A. $2.0Å$

B. $5.6Å$

C. $2.8Å$

D. $38Å$

Answer:

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172. Zinc sulphide exists in two different forms-zinc blende and wurtzite. Both occurs as $4:4$ coordination compounds. Choose the correct option from among the following:

A. zinc blende has a bcc structure and wurtzite an fcc structure

B. zinc blende has an fcc structure and wurtizite an hcp structure

C. zinc blende as well as wurtzite have an hcp structure.

D. zinc blende as well as wurtizite have a ccp structure.

Answer:

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173. Caesium chloride on heating to 760K changes into:

A. CsCl(g)

B. NaCl structure

C. antifluorite structure

D. ZnS structure

Answer:

Watch Video Solution

174. Antifluorite structure is derived from fluorite structure by:

A. heating fluorite crystal lattice

B. subjecting fluorite structure to high pressure

C. interchanging the positions of positive and negative ions in the lattice

D. none of the above

Answer:

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175. Iron forms a sulphide with the formula Fe_7S_8. Iron exist in both +2 and +3 oxidatioin states. The ratio of Fe(II) atoms to Fe(III) atoms is:

A. $3:2$

B. $2:3$

C. $2:5$

D. $5:2$

Answer:

Watch Video Solution

176. Which of the following set of compounds will show metal deficiency defect?

A. ZnS and KCl

B. FeO and ZnS

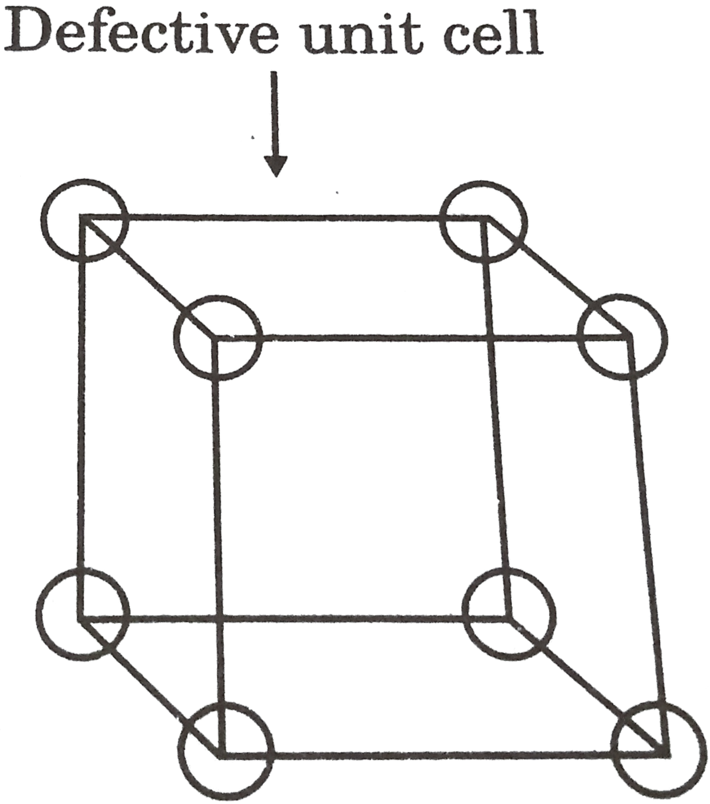
C. FeO and FeS

D. FeS and NaCl

Answer:

Watch Video Solution

177. In a defective crystal of Fe which shows bcc arrangements, some of the unit cells have following arragement. Apart from these are no other defects. Identify the option which is correct.



A. Effective number of atoms in the complete crystal structure will be 1 instead of 2.

B. Density of defective crystal will lie in between half the original density to original density.

C. The crystal will now have structure similar to simple cubic.

D. Co-ordination number of atoms will become 6.

Answer:

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178. Mole percentage of Fe^{2+} in a non-stoichiometric oxide of iroon, $Fe_{0.96}O$, will be:

A. 0.88

B. 0.12

C. 0.9167

D. 0.8448

Answer:

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179. Which of the following statements regarding crystal defects is not correct?

A. Schottky defects are type of vacancy defects.

B. Addition of As in Si results iin formation of n-type semiconductors.

C. Packing fraction remains unaffected in Frenkel defects.

D. if NaCl is doped with Al,3 vacancies are created.

Answer:

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180. Zinc oxide, white in colour at room temperature, acquires yellow colour on heating due to:

A. Zn being a transition element

B. trapping of electrons at the site vacated by oxide ions

C. both (a) and (b)

D.

Answer:

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181. in wustite $(Fe_{0.93}O_{1.00})$ what % of iron is present in form of Fe(III)?

A. 0.1505

B. 0.18

C. 0.24

D. 0.12

Answer:

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182. Which of the following statements regarding defects in crystalline solids is correct?

A. Schottky defects exist in non-ionic substances and does not affect density of substance.

B. Frenkel defects increases the dielectric constant.

C. Introduction of impuriy defect in Si by insertion of Al will create n-type semiconductors.

D. The formationi of wustite is an example of metal excess defect.

Answer:

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183. Which of the statements regarding defects in crystal is not correct?

A. Impurity defects in silicon by doping arsenic causes electronic defects.

B. LiCl crystals appear yellow because of metal excess defects.

C. Formatioin of wustite is because of metal deficient defect.

D. AgBr crystal can show both dislocation defect and Schottky defect.

Answer:

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184. Which of the following options regarding poing defects is correct?

A. If crystallization occurs suddenly, then density of point defects will be less.

B. In case of point defect, entropy of system increases and that of surroundings decreases.

C. At higher temperature, lesser defects will be observed.

D. All point defects decreases density of crystal.

Answer:

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185. Which of the following statements is not correct?

A. In an antiflourite structure anions form fcc and cations occupy all the tetrahedral voids.

B. CsCl structures is $8:8$ type structure.

C. In Rock salt structures both cations and anions are present in octahedral voids formed by oppositely charged ions.

D. Density of the crystal always increases due to substitution defect.

Answer:

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186. Which of the following options regarding options regarding defects in a crystal is correct?

A. Schottky defect is a dislocation defect.

B. Impurity defect in metals will always increase the density of metal.

C. As temperature increases, order of the crystal will decreases.

D. LiCl crystals appear pink due to metal excess defect in which excess cations will be present in interstitial voids.

Answer:

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187. One mole crystal of a metal halide of the type MX with molecular weight 119g having face centred cubic structure with unit cell length $6.58 Å$ was recrystallized. The density of the recrystallized crystal was found to be $2.44 g cm^{-3}$. The type of defect introduced during the recrystallization is:

A. additional M^{+} and $X(-)$ ions at interstitial sites

B. Schottky defect

C. F-center

D. Frenkel defect

Answer:

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188. In a solid lattice the cation has left a lattice sirte and is located at an interstital position , the lattice defect is

A. interstitial defect

B. vacancy defect

C. frenkel defect

D. schottky defect

Answer:

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189. A crystal of NaCl, which has sodium ionis and chloride ions missing from the lattice point, is solid to exhibit:

A. Surface defect

B. vacancy defect

C. frenkel defect

D. schottky defect

Answer:

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190. What type of crystal defect is indicated in the diagram given below

$$\begin{array}{llllll} Na^{\oplus} & Cl^{\ominus} & Na^{\oplus} & Cl^{\ominus} & Na^{\oplus} & Cl^{\ominus} \\ Cl^{\ominus} & \square & Cl^{\ominus} & Na^{\oplus} & \square & Cl^{\ominus} \\ Na^{\oplus} & Cl^{\ominus} & \square & Cl^{\ominus} & Na^{\oplus} & Cl^{\ominus} \\ Cl^{\ominus} & Na^{\oplus} & Cl^{\ominus} & Na^{\oplus} & \square & Na^{\oplus} \end{array}$$

A. Frenkel defect

B. Schottky defect

C. Interstitial defect

D. Frenkel and Schottky defect.

Answer:

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191. In the Schottky defect:

A. Cations are missing from the lattice and occupy the interstitial sites.

B. equal number of cations and anions are missing their place

C. anions are missing and electrons are present in their place

D. equal number of extra catioins and electrons are present in the interstital sites.

Answer:

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192. F-Centres are:

A. the electrons trapped in anionic vacancies

B. the electrons trapped in cation vacancies

C. non-equivalent sites of stoichometric compound

D. all of the above

Answer:

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193. Which of the following statements are correct in context of point defects in a crystal?

A. AgCl has anion Frenkel defect and CaF_2 has Schottky defects

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

C. AgCl as well as CaF_2 have anion Frenkel defects.

D. AgCl as well as CaF_2 has Schottky defects

Answer:

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194. Strontium chloride has a flurite structure, which of the statement is true for the structure of strontium chloride ?

A. The atrontium ions are in a body - centered cubic arrangement

B. The strontium ions are in a face - centered cubic arrangement

C. Each chloride ion is a at the center of a cube of 8 strontium ions

D. Each strontium ions is at the center of a tertrahedral ions

Answer:

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195. $NaCl$ shows Schottky defects and $AgCl$ shows Frekel defects. Their electrical conductivity is due to the

A. Motion of ions and not the motion of electrons

B. Motion of electrons and not the motion of ions

C. lower co- ordination number of NaCl

D. higher coordination number of AgCl

Answer:

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196. The yellow colour of ZnO and Conducting nature produced on heating is due to

A. interstitial cation persent in metal excess defect

B. Extra positive ions persent in an interstitial site

C. Trapped eletrons

D. trapped anions

Answer:

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197. Assertion : An important feature of fluorite structure is that cations being large ib size occupy FCC lattice points, the formula unit AB_2 (A cation, B anion)

Reason: There are 6 cations and 12 anions per FCC unit cell of the flucrite structure

A. Statement -1 is True, Statement -2 is true : Statement -2 is a 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. Trapped eletrons

D. Statement -1 and Statement -2 both are False

Answer:

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198. Assertion :In $NaCI$crystal each Na^{+} ion is tourching $6CI^{-}$ ion but these CI^{-} ion do not touch each other

Reason:The radius ratio is greater than 0.414 required forexact fitting

A. Statement -1 is True, Statement -2 is true : Statement -2 is a correct explanation for Statement -2

B. Statement -1 is True, Statement -2 is True , Statement -2 is NOT a correct explanation for Statement -2

C. Trapped eletrons

D. Statement -1 and Statement -2 both are False

Answer:

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199. Assertion : ZnO becomes yellow when it is beated

Reason: $NaCI$ becomes yellow when heater in the presence of Na vapours due to anion vacancy

A. Statement -1 is True, Statement -2 is true : Statement -2 is a correct explanation for Statement -3

B. Statement -1 is True, Statement -2 is True , Statement -2 is NOT a correct explanation for Statement -3

C. Trapped eletrons

D. Statement -1 and Statement -2 both are False

Answer:

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200. Assertion : In $AgCI$ crystal, frenkel defect can be observed

Reason: Ag^{+} is a small sized cation

A. Statement -1 is True, Statement -2 is true : Statement -2 is a correct explanation for Statement -4

B. Statement -1 is True, Statement -2 is True , Statement -2 is NOT a correct explanation for Statement -4

C. Trapped eletrons

D. Statement -1 and Statement -2 both are False

Answer:

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201. Assertion : Na_2O adopes structure similar to that of CaF_2 but positions and negative ions are reversed

Reason : The structure ofNa_2O is also called spinal structure

A. Statement -1 is True, Statement -2 is true : Statement -2 is a correct explanation for Statement -5

B. Statement -1 is True, Statement -2 is True , Statement -2 is NOT a correct explanation for Statement -5

C. Trapped eletrons

D. Statement -1 and Statement -2 both are False

Answer:

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202. Assertion : Stoichimetric compounds obey the law of constact composition

Reason: Schottky and frenkel defect are observed in Stoichimetric compounds

A. Statement -1 is True, Statement -2 is true : Statement -2 is a correct explanation for Statement -6

B. Statement -1 is True, Statement -2 is True , Statement -2 is NOT a correct explanation for Statement -6

C. Trapped eletrons

D. Statement -1 and Statement -2 both are False

Answer:

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203. Assertion : In point defect density of solid maydecrease and increase

Reason : Formation $Fe_{0.93}O$is called non-stoichiometric defect

A. Statement -1 is True, Statement -2 is true : Statement -2 is a correct explanation for Statement -7

B. Statement -1 is True, Statement -2 is True , Statement -2 is NOT a correct explanation for Statement -7

C. Trapped eletrons

D. Statement -1 and Statement -2 both are False

Answer:

204. Assertion: In frekel defect in an ionic crystal, an ion is dispalced from its normal site to an interstitial site.

Reason: There is both a vacancy and an intersitial ion.

A. Statement -1 is True, Statement -2 is true : Statement -2 is a correct explanation for Statement -8

B. Statement -1 is True, Statement -2 is True , Statement -2 is NOT a correct explanation for Statement -8

C. Trapped eletrons

D. Statement -1 and Statement -2 both are False

Answer:

205. Statement -1 An ionic structure is composed of oppositely charged ions

Statement -2 If the larger ions are close packed then the smaller ions may occupy either the octahedral holes or the tertrachedral holes or the depending on their size

A. Statement -1 is True, Statement -2 is true : Statement -2 is a correct explanation for Statement -9

B. Statement -1 is True, Statement -2 is True , Statement -2 is NOT a correct explanation for Statement -9

C. Trapped eletrons

D. Statement -1 and Statement -2 both are False

Answer:

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206. Statement -1 Radius ratios provide a rough idea to what structures are gemetrically possible

Statement -2 Radius ratio often perdict the correct structure, but they do not always perdict the correct structure

A. Statement -1 is True, Statement -2 is true : Statement -2 is a correct explanation for Statement -10

B. Statement -1 is True, Statement -2 is True , Statement -2 is NOT a correct explanation for Statement -10

C. Trapped eletrons

D. Statement -1 and Statement -2 both are False

Answer:

207. Statement -1 Crystal defect are saomtimes called thermodnamic defect

Statement -2 The number of defect genreally depends on the temperature

A. Statement -1 is True, Statement -2 is true : Statement -2 is a correct explanation for Statement -11

B. Statement -1 is True, Statement -2 is True , Statement -2 is NOT a correct explanation for Statement -11

C. Trapped eletrons

D. Statement -1 and Statement -2 both are False

Answer:

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208. Statement -1 The energy needed to from a Schottly defect is usually less then to from a Frenkel defect

Statement -2 Frenkel defect in a compounds leads to a high dielectric constant

A. Statement -1 is True, Statement -2 is true : Statement -2 is a correct explanation for Statement -12

B. Statement -1 is True, Statement -2 is True , Statement -2 is NOT a correct explanation for Statement -12

C. Trapped eletrons

D. Statement -1 and Statement -2 both are False

Answer:

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209. Statement -1 Generally cation go to void and anion from the lattice

Statement -2 in CaF_2 CA occupied void and F from the lattice

A. Statement -1 is True, Statement -2 is true : Statement -2 is a correct explanation for Statement -15

B. Statement -1 is True, Statement -2 is True , Statement -2 is NOT a correct explanation for Statement -15

C. Trapped eletrons

D. Statement -1 and Statement -2 both are False

Answer:

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210. Statement -1 In HCP structure the contribution of hexagonal face corner per atom is $\frac{1}{12}$

Statement -2 it is shared by 6 different unit cells

A. Statement -1 is True, Statement -2 is true : Statement -2 is a correct explanation for Statement -16

B. Statement -1 is True, Statement -2 is True , Statement -2 is NOT a correct explanation for Statement -16

C. Trapped eletrons

D. Statement -1 and Statement -2 both are False

Answer:

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211. Statement-1 C.N of Cs^+ ion in CsCl structure is 8

Statement -2 CsCl crystallizes in BBC structure

A. Statement -1 is True, Statement -2 is true : Statement -2 is a correct explanation for Statement -17

B. Statement -1 is True, Statement -2 is True , Statement -2 is NOT a correct explanation for Statement -17

C. Trapped eletrons

D. Statement -1 and Statement -2 both are False

Answer:

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212. Statement -1 In BCC structure, the corrdination number of nearest neihbours of each atom is 8

Statement -2 Na, K Cr, Fe and Ba crystallise in a body centered cubic structure

A. Statement -1 is True, Statement -2 is true : Statement -2 is a correct explanation for Statement -19

B. Statement -1 is True, Statement -2 is True , Statement -2 is NOT a correct explanation for Statement -19

C. Trapped eletrons

D. Statement -1 and Statement -2 both are False

Answer:

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213. Statement -1 All crystal have defect

Statement -2 Sometimes vacancise in the crystal structure occur ot there are impurities at atomic positive or particle at interstitial sites in between atomic positions

A. Statement -1 is True, Statement -2 is true : Statement -2 is a correct explanation for Statement -21

B. Statement -1 is True, Statement -2 is True , Statement -2 is NOT a correct explanation for Statement -21

C. Trapped eletrons

D. Statement -1 and Statement -2 both are False

Answer:

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214. Statement -1 If $\alpha$is the unit cell length of a cubic lattice, the atomic radius is $\frac{\alpha}{2}$ for a simple cubic cell $\left(\frac{\sqrt{2a}}{4}\right.$ for a body centered cubic cell, and $\left(\frac{\sqrt{2a}}{4}\right.$ face- centered cell

Statement -2 From a knowledge of the dimensions of the unit cell and Avogadro's number we can calculate the crystal density

A. Statement -1 is True, Statement -2 is true : Statement -2 is a correct explanation for Statement -22

B. Statement -1 is True, Statement -2 is True , Statement -2 is NOT a correct explanation for Statement -22

C. Trapped eletrons

D. Statement -1 and Statement -2 both are False

Answer:

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215. Statement -1 The erutile structure is not close packes

Statement -2 Each Ti^{4+} ion is octahedrally surrounded by six O^{2-} ion has three `Ti^(4+) ions round it in a plane triangular arrangement

A. Statement -1 is True, Statement -2 is true : Statement -2 is a correct explanation for Statement -23

B. Statement -1 is True, Statement -2 is True , Statement -2 is NOT a correct explanation for Statement -23

C. Trapped eletrons

D. Statement -1 and Statement -2 both are False

Answer:

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216. Statement -1 At absolute zero, crystal tend to have a perfectly ordered arrangement

Statement -2 As the temperature increase the amount of thermal vibration of ions if their lattice sites increase abd when the vibration of a particular ion becomes large enough, it may jump out of its lattice site , causing a point defect

A. Statement -1 is True, Statement -2 is true : Statement -2 is a correct explanation for Statement -24

B. Statement -1 is True, Statement -2 is True , Statement -2 is NOT a correct explanation for Statement -24

C. Trapped eletrons

D. Statement -1 and Statement -2 both are False

Answer:

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217. Statement -1 Migration to the smaller ion usually the cation into the appropriate hole is favoured at low temperature

Statement -2 Moving a small ion requries less energy

A. Statement -1 is True, Statement -2 is true : Statement -2 is a correct explanation for Statement -25

B. Statement -1 is True, Statement -2 is True , Statement -2 is NOT a correct explanation for Statement -25

C. Trapped eletrons

D. Statement -1 and Statement -2 both are False

Answer:

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218. Which of the following crystal will have at least two axial angle 90°

A. NaCl

B. Rhombic sulphur

C. Monoclinic sulphur

D. Graphite

Answer:

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219. An ionic compound consists of only $A^{9}+1)$, $B^{+2}$and C^{-3} ions Which of the following option s is / are correct w.r.t their possible structure ?

A. Anions from cubic close packing and monovalent cation occupy all octahedral void and bivalent cation occupy half of tertrahedral void

B. Bivalent cation from hexagonal close packing and monovalent cations occupy all octahedral voids and aniios occupy half of tertradral voids

C. Monovalent cation occupy alternate corners of a simlpe cube and Bivalent cation occupy remaining alternate centre of the cube

D. Bivalent cation body from cubic close packing anions occupy from tertrahedral voids and monovalent cation occupy all octhahedral voids

Answer:

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220. Which of the following statements is/are correct with respect to crystal showing rock salt structure?

A. The crystal will have a tendency to show Frenkel defect.

B. Packing efficiency of different compounds showing rock salt structure may be different.

C. Distance between two nearest cations will be same as distance between two nearset anions.

D. Distnace beween cation at the body centre and any of the closest tetrahedral coid will be $\frac{\sqrt{3}}{2} \times$ (sum of ionic radius of cation and anion).

Answer:

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221. Which of the following options(s) is/are incorrect with respect to cubic crystals of indentical particles?

A. If the radius of particle is $\sqrt{6}\text{Å}$ then the edge-length of unit cell may be $\sqrt{2}\text{Å}$.

B. The coordination numbers for particle at body centre and particle at corner in BCC crystal is different.

C. If the radius of particle is $2\sqrt{2}\text{Å}$ then the length of body diagonal in FCC unit cell is $8\sqrt{2}\text{Å}$.

D. Cubic crystal may have end centered unit cell.

Answer:

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222. Identify the statements which is/are correct.

A. LiCl crystal is pink because of metal excess defect.

B. Formation of non-stoichiometric compound can ocuur because of metal deficient defects.

C. Impurity defect in silicon by doping arsenic causes electronic defects.

D. AgBr crystal can show both Schottky as wall as dislocation defect.

Answer:

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223. An element A (Atomic weight = 12) having bcc structure has unit cell edge length 400 pm. Identify the correct option(s). (Given : $N_A = \quad \times 10^{23}$)

A. The density of solid element is $6.35 gm / cm^3$.

B. There are 6×10^{22} unit cells in 24gm of the solid element.

C. The atomic radius ios about $1.732 Å$.

D. In 25 gm of solid element, the volume ocuupied by atoms is nearly $2.72 cm^3$ only.

Answer:

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224. Which of the following statements are incorrect with respect to crystalline defects?

A. n-type semiconductor always increases density of crystal while p-type semiconductor decreases density

B. Dislocation defect does not change the density of defects.

C. Increases in temperature increases density of the defects.

D. Ionic substance crystallzing as CsCl structure wikll have greater tendency for Schottky defect as compound to Frenkel defect.

Answer:

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

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

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

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

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

Answer:

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226. Which of the following is/are ture about HCP and CCP lattice?

A. Number of tetrahedral voids are twice of octahedral holes

B. 12 tetrahedral and 6 octahedral voids are present in one HCP unit cell

C. C.N. of HCP unit cell is 12

D. If atom of tetrahedral voids displace into octahedral voids, then is Schottky defect.

Answer:

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227. Which of the following statement(s) for crystal having Schottky defect is/are correct?

A. Schottky defect arises due to abesence of cations and anions from position whioch they are expected to occupy

B. The density of crystal having schottky is smaller than that of perfect crystal

C. Schottky defect are more common in co-valent compound with hight co-ordination number

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

Answer:

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228. The co-ordination number of FCC structure for metals is 12, since:

A. each atoms touches 4 others in same layer, 3 in layer above and 3 in layer below

B. each atoms touches 4 others in same layer, 4 in layer above and 4 in layer below

C. each atoms touches 6 others in same layer, 3 in layer above and 3 in layer below

D. each atoms touches 3 others in same layer, 6 in layer above and 6 in layer below

Answer:

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229. Lead metal has a density of $11.34\frac{g}{c}m^3$ and crystallizes in a face-centered lattice. Choose the correct alternatives.

A. The volume of one unit cell is $1.214 \times 10^{-22} cm^3$

B. The volume of one unit cell is $1.214 \times 10^{-19} cm^3$

C. The atomic radius of lead is 125pm

D. The atomic radius of lead is 155.1pm

Answer:

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230. The correct statement regarding defects in crystalling solids.

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

B. Frenkel defect is a dislication defect

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

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

Answer:

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231. One of the mineral cintaining calciumm, titanium (iv) and oxygen is termed as pervoskite and has the following structure. Ca^{+2} ions occupy the corners of the cube, O^{2-} occupy the face center and Ti^{+4} is present at the centre of the cube. Based in this information answer the question that follow:

[Atomic weight: $Ca = 40, O = 16, Ti = 48$]

The ratio by mass of $Ca : Ti : O$ in pervoskite is given by :

A. $1 : 1 : 3$

B. $2.5 : 3 : 3$

C. $3 : 2 : 1$

D. $1 : 1 : 1$

Answer:

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232. One of the mineral cintaining calciumm, titanium (iv) and oxygen is termed as pervoskite and has the following structure. Ca^{+2} ions occupy the corners of the cube, O^{2-} occupy the face center and Ti^{+4} is present at the centre of the cube. Based in this information answer the question that follow:

[Atomic weight: $Ca = 40, O = 16, Ti = 48$]

Which of the following cannot have pervoskite structure?

A. Ba Ti O_3

B. La $Ni_{0.5}Ir_{0.5}O_3$

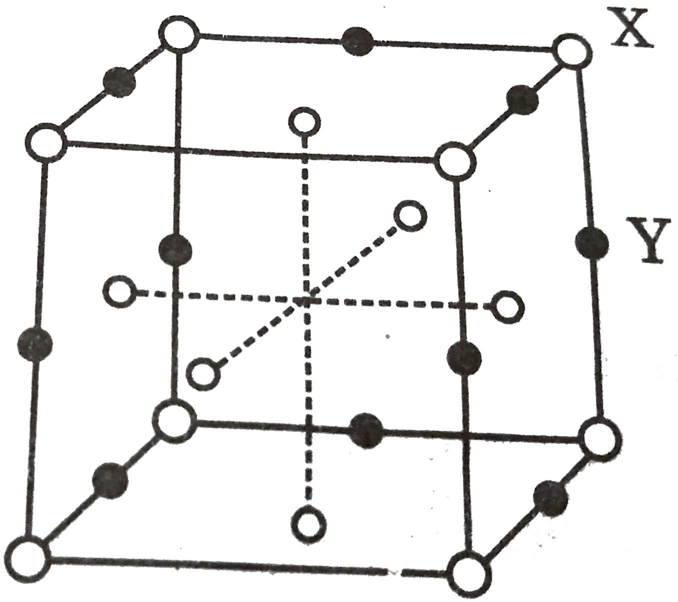
C. $PbFe_{1/2}Nb_{1/2}O_3$

D. $MgAl_2O_4$

Answer:

Watch Video Solution

233. Consider the figure given for solid XY. Answer the following questions :



The site Y respresents :

A. tetrahedral void

B. octahedral void

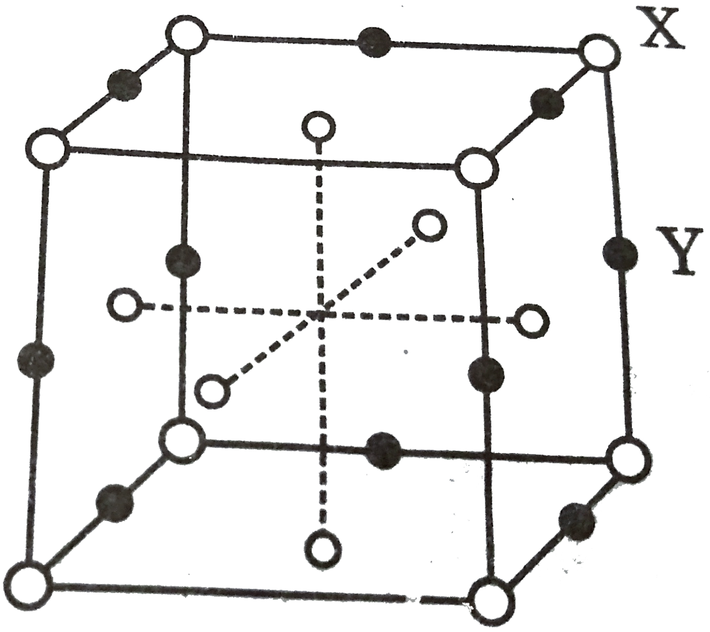
C. triangular void

D. cubical void

Answer:

Watch Video Solution

234. Consider the figure given for solid XY. Answer the following questions :



The number of XY units per unit cell is:

A. 4

B. 3

C. 2

D. 8

Answer:

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235. When an atom or an ion is missing from its nomal lattice site a lattice vacanecy (Schottky defect) is created. In stoichmeteric ionic crystals, a vacancy of one ion has to be accompanied by the vacancy of the oppositely charge ion in order to maintain electrical neutrality.

In a Frenken defect an ion leaves its position in the lattice and occupies an interstitial void. This id the Frenkel defect commonly found along with the Schottky defects and interstitial. In pure alkali halides. Frenked defects are not found since the ions cannot get into the interstitial sites. Frenkel defects are found in silver halides because of the small size of the Ag^{+} ion. Unike Schottky defects, Frenkel defect do not change the density of the solids. in certain ionic solids (e.g., AgBr) both schottky and Frenkel defect occur.

The Defects idiscussed above do not disturb the stoichiometery of the crystalline material. there is large variety of non-stoichiometric inorganic solids which contains an excess or deficienty of one of the elements. Such solids showing deviations from the ideal stoichiometric composition from an important group of solids. For example in the vanadium oxide, VO_x, x can be anywehere between 0.6 and 1.3 there are solids such as difficult to prepare in the soichiometric omposition thus, the ideal composition in compounds such as FeO is difficult to obtain (normally we get a compositiion of $Fe(0.95)$O but it may range from $Fe_{0.93}$O to $Fe_{0.96}O$). Non-stoichiometric behavious is most commonly found for transition metal compounds through is also known for some lathanoids and actinoids.

Zinc oxide loses oxygen reversible at high temperature and turns yellow in colour. the excess metal is accomodated interstitial, giving rise to electrons trapped in the neighbourhood, the enchanced electrical conductivity of the non-stoichiometric ZnO arises from these electrons.

Anion vacancies in alkali halides are produced by heating the alkali halid crystals in an atmosphere of the alkali metal vapour. when the metal atoms deposit on the surface they diffuse into the cystal and after ionisation the alkali metal ion occupies cationic vacancy whereas electron occupies anionic vacancy. Electrons trapped i anion vacancies are referred to as F-centers (From Farbe the German word for colouf) that gives rise to interesting colour in alkali halides. Thus, the excess of potassium i KCl makes the crystal appear violet and the excess of lithium in LiCl makes it pink.

When LiCl is heated into the vapour of lithium, the crystal acquires Pink colour. This is due to :

A. Schottky defects

B. Frenkel defects

C. Metal excess defects leading to F-centers

D. Electronic defect

Answer:

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Strongly heated ZnO crystal can conduct electricity. This is due to :

A. movement of extra Zn^{2+} ions present in the interstitial sites

B. movement of electrons in the anoin vacancies

C. movement of both Zn^{2+} ions and electrons.

D. none of the above

Answer:

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AgCl is crystallised from molten AgCl containing a little $CdCl_2$. The solid obtained will have:

A. cationic vacancies equal to number of C^{2+} ions incorporated

B. cationic vacancies equal to double the number of Cd^{2+} ions

C. anionic vacancies

D. neither cationic nor anionic vacancies

Answer:

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238. When an atom or an ion is missing from its nomal lattice site a lattice vacanecy (Schottky defect) is created. In stoichmeteric ionic crystals, a vacancy of one ion has to be accompanied by the vacancy of the oppositely charge ion in order to maintain electrical neutrality.

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Which of the following is most appropritate crystal to show Fremkel defect ?

A. CsCl

B. NaCl

C. AgBr

D. $CaCl_2$

Answer:

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239. In a ideal crystal there nust be regular repeating arrangement of the constuting particles and its entropy must be zero at absolute zero at absolute zero temperature. However, it is impossible to obtain an ideal crystal and it suffers from certain defects called imperfections. In pure crystal these defects arise either due to disorder or dislocation of the movement of the particles even at absolute zero temperature. Such defect increases with rise in temperature. In addition ti this, certain defects arise due to the pressure of some impurities. Such defects not only modify the existing properties of the crystalline solid but also impart certain new characteritics to them.

In pure crystal, e.g, silicon or germanium at 0K, the electrons are prsent in fully occupied lowest energy states and are not xpected to conduct any electricity. However at temperature above 0K, some electron leave their bonds and become free to move in the crystal lattice, giving rise to and become free to move in the crystal lattice, giving rise to electrical conductivity. The electron deficient bonds, called holes (+vely charged) and thermally mobile electrons move in opposite direction under the electric field.

Stoichiometric ppoint defects include (a) Schottky defects, which arise due to missing of both cations and anions from their lattice sites without disturbing the stoichiometry and

(b) Frenked defects, which arise due to misplacement of certian ions in the crystal lattice. The former defect gives rise to no change of density.

Another type of defects are non-stoichometry defects where the cetions and anion are not present in the stoichiometry ratio. In metal excess defect, metal ions or positive ions are in excess as compared to anions of non-metals stoichiometrycally. On the other hand in metal deficiency defect, the cations are in lesser proportion than stoichiometric value. Since the crystal is neutral electrically, the balance of charge is maintained by free electrons or extra positive charges. The metal excess defects gives rise to conduction of electricity due to the presence of free electrons. Also crystals having metal excess defects are paramagnetic and coloured due to the presence of electrons in the anion vacancies.

Impurity defects arise when some foreign atoms are present at the lattice sites in place of the host atoms or at the vacant interstitial sites.

When 15 group elements like P or are doped into Si or Ge, the added impurity atoms occupy the lattice sites forming four covalent bonds with 4 Si/Ge atoms leaving an extra electron free to move. Such a crystal is said to be n-type semi conductor because the conduction of electricity is due to movement of extra unbounded electrons.

If doping of a covalent crystal of 14 group elements are caused by addition of small amounts of elements are caused by addition of small amounts of elements of group 13, e.g, Al or Ga with three valence electrons, one covalent bond formed will be electron deficient and acts as a positive hole. The presence of such holes in the crystal leads to electrical conductivity and the the crystal is said to be p-type semiconductor.

Lattice defect per $10^{15} NaCl$ is 1. What is the number of lattice defects in 1 mole of NaCl?

A. 6.02×10^{23}

B. 6.02×10^8

C. 10^{14}

D. none of these

Answer:

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The type of semiconduction shown by crystal capable of showing Schottky defect, will be :

A. p-type

B. n-type

C. both

D. none of these

Answer:

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In the crystal of $Fe_{0.93}$ O, the percentage of $Fe(III)$ will be:

A. 0.15

B. 0.85

C. 0.3

D. 0.78

Answer:

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Which of the following statements is correct about the conduction of electricity in pure crystal of silicon at room temperature?

A. The conduction is due to electrons present in fully occupied lowest energy states.

B. The conduction is due to only some electrons capable of leaving the bonds at room temperature

C. The conduction is only due to the holes formed following release of electrons

D. The conduction is due to the movement of both the electrons released and holes fromed

Answer:

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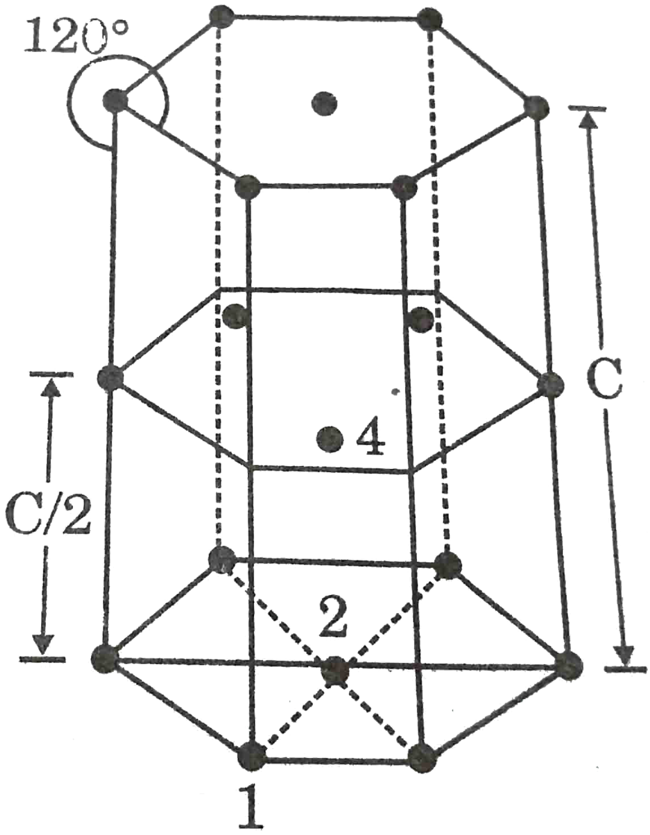
243. In hexagonal system of crystals, a frequently encountered arrangement of atoms is described as a hexagonal prism. Here, the top and bottom of the cell are regular hexagons and three atoms are sandwiched in between them. A space -filling model of this structure, called hexagonal close-packed (HCP), is consituted of a sphere on a flat surface surrouneded in the same plane by six identical spheres as closely possible. Three sphere are then palces over the first layer so that they touch each other and represent second layer is covered with third layer that is identical to the bottom layer in relative position. Assume radius of enery sphere to be r.



The number of atoms in the HPC unit cell is :

A. 4

B. 6

C. 12

D. 17

Answer:

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244. In a hexaonal system system of cycstals, a frequently encountered arrangement of atoms is described as a hexagonal prism. Here, the top and bottom of the cell are refular hexagons, and three atoms are sandwiched in between them. A space-cilling model of this structure, called hexagonal close-paked is constituted of a sphere on a flat surface surrounded in the same plane by six identical spheres as closely as possible. Three spherres are then placed overt the first layer so that they toych each other and represent the second layer so that they toych each other and present the second layer. Each one of the three spheres touches three spheres of the bottom layer. Finally, the second layer is convered with a third layer identical to the bottom layer in relative position. Assume the radius of every sphere to be r.

The voume of this hcp unit cell is

A. $24\sqrt{2r}^{3}$

B. $16\sqrt{2r}^{2}$

C. $12\sqrt{2r}^3$

D. $\frac{64}{3\sqrt{3}}r^3$

Answer:

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The empty space in this hcp unit cell is

A. 0.74

B. 47.6%

C. 47.6%

D. 0.26

Answer:

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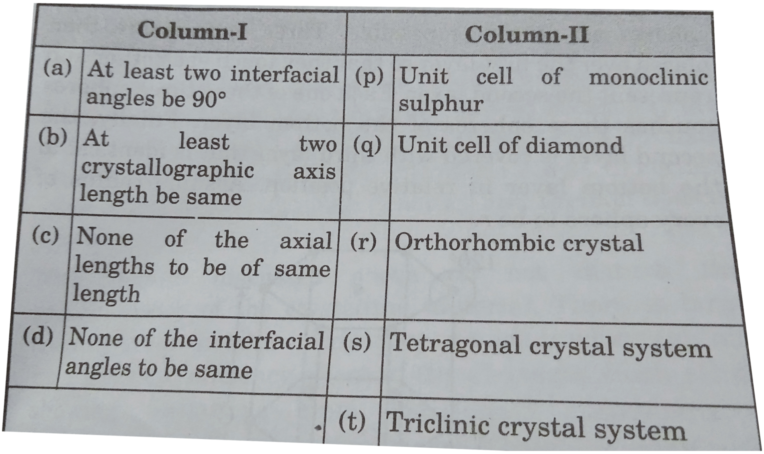
246. Match list-I with list-II and select the correct answer by using the codes given below:



	Column-I		Column-II
(a)	At least two interfacial angles be 90°	(p)	Unit cell of monoclinic sulphur
(b)	At least two crystallographic axis length be same	(q)	Unit cell of diamond
(c)	None of the axial lengths to be of same length	(r)	Orthorhombic crystal
(d)	*None of the interfacial angles to be same*	(s)	Tetragonal crystal system
		(t)	Triclinic crystal system

A. $\begin{array}{cccc} A & B & C & D \\ 1 & 2 & 3 & 4 \end{array}$

B. $\begin{array}{cccc} A & B & C & D \\ 3 & 2 & 1 & 4 \end{array}$

C. $\begin{array}{cccc} A & B & C & D \\ 2 & 1 & 4 & 3 \end{array}$

D. $\begin{array}{cccc} A & B & C & D \\ 1 & 3 & 4 & 2 \end{array}$

Answer:

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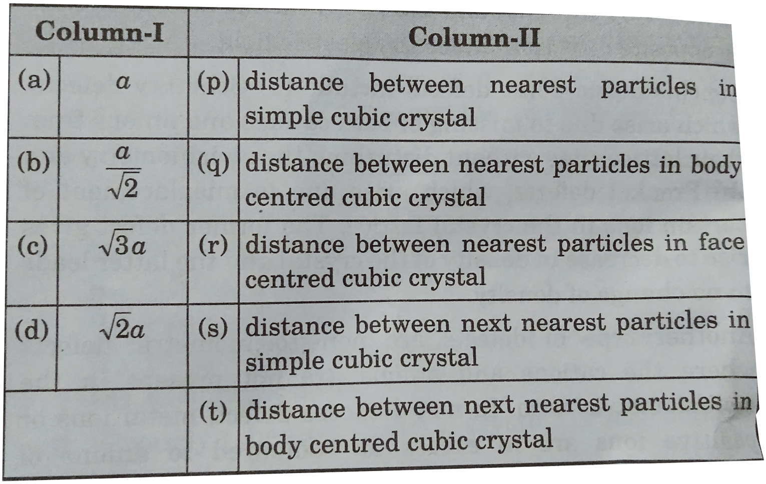
247. Match the following columns:



Column-I		Column-II	
(a)	a	(p)	distance between nearest particles in simple cubic crystal
(b)	$\frac{a}{\sqrt{2}}$	(q)	distance between nearest particles in body centred cubic crystal
(c)	$\sqrt{3}a$	(r)	distance between nearest particles in face centred cubic crystal
(d)	$\sqrt{2}a$	(s)	distance between next nearest particles in simple cubic crystal
		(t)	distance between next nearest particles in body centred cubic crystal

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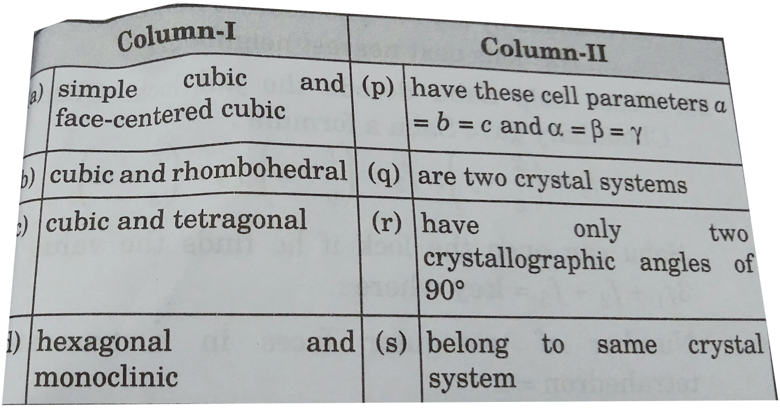
248. Match the crystal system/unit, cells mentioned in Column-I with their characteristic features mentioned in Column-II.



	Column-I		Column-II
a)	simple cubic and face-centered 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 crystallographic angles of 90°
d)	hexagonal and monoclinic	(s)	belong to same crystal system

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249. 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 $1.54 \times 10^{-8} cm$, what percentage of solid argon is apparentaly empty space ? $(At. Wt. of Ar = 40)$

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250. Calculate packing fraction of CsCl structure. Use : $\sqrt{3} = 1.732, \pi = \frac{22}{7}$ Assume no distortion in the crystal. Express your answer after multiplying your answer with 1050 $\therefore$ If your answer is $\frac{1}{1.05}$ you should write 1000.

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251. Calculate radius of an atom (in Å) the crystal which has a density equal to $\frac{3.2\pi}{3} gm / ml$ and the edge length of the cubic unit cell is 5Å if atomic mass of the metal is 40π.

[Take: $N_A = 6 \times 10^{23}$]

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252. An ionic compound $\left(A^{+}B^{-}\right)$ crystallizes in rock salt structure. If the ionic radii of A^{+} and B^{-} is 200 pm and 400 pm respectively, then calculate distance between nearest cations in Å.

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253. The difference in coordination numbers of hexagonal close packing in 3D and square close packing in 2-D, of identical spheres is:

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254. Calculate the edge length of the unit cell of sodium chloride given density of NaCl is $2.17 \times 10^3 kgm^{-3}$ and molecular weight $58.5 \times 10^{-3} kgmol^{-1}$.

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255. The density of solid argon is $\frac{2}{3}\left(\mathrm{amu}/\mathrm{Å}^3\right)$ at 40K. If the Argon atom is assumed to be sphere to radius $\frac{3}{\pi^{1/3}}$Å, what percentage of solid Argon is apparently withput anything ?

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256. A mineral of iron contains an oxide containing 72.36% iron by mass and has a density of 5.2 g/cc. its unit cell is cubic with edge length of 839 pm. What is the total number of atoms (ions) present in each unit cell ? (Fe -56, O-16)

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257. An ionic solid AB_2 isomorphous to the rutile structure (a tetragonal system with effective number of formula units = 2) has edge lengths of the unit cell of 4Å, 4Å and 7Å. Calculate the density of the substance if its formula weight is 80. Take $N_A = 6 \times 10^{23}$ and express your answer in mg/cc using four significant digits.

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258. In an ionic solid $r_{(+)} = 1.6A$ and $r_{(-)} = 1.864A$. Use the radius ratio to determine the edge length of the cubic unit cell in A.

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259. There are 5.6×10^{24} unit cells in 1 kg of metal for which the density is $7.5g/cc$. Calculate the side length of the cubic unit cell of the lattice of the metal. (Use $\left(\frac{100}{42}\right)^{1/3} = 2.877$) Express your answer in $\mathring{A}$, by applying appropriate approximation.

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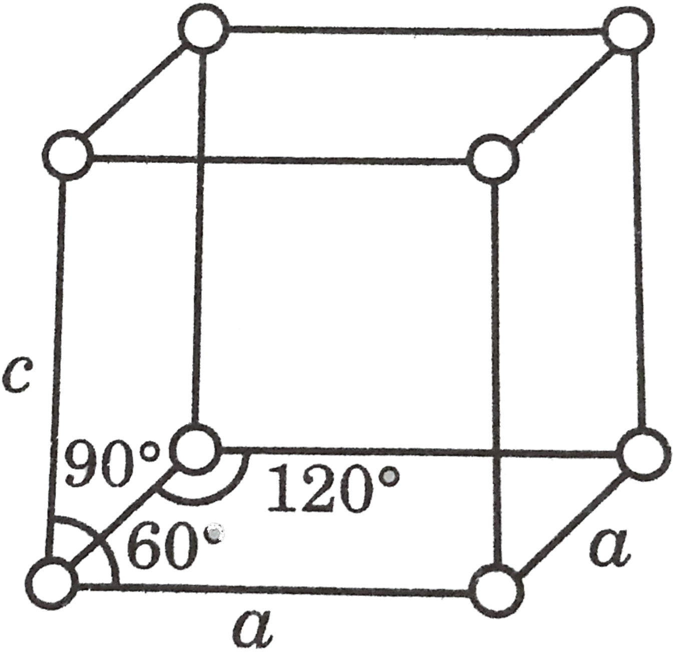
260. Ice crystallizes in a hexagonal lattice. At the low temperature at which the structure was determined, the lattice constants were $a = 4.53\mathring{A}$ and $c = 7.41\mathring{A}$ (as shown in fig.) How many H_2O molecules are contained in a unit cell ? (Density of ice $= 0.92 gm / cc$)



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261. In the sodium chloride structure each $Na_{\oplus}$ ion is surrounded by six $Cl^{\ominus}$ ions nearest neighbours and .... $Na^{\oplus}$ ions next nearest neighbours.

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262. Please help Sabu decode the jail lock. Chacha Choudhary gave Sabu a formula :

$$f_1 = \left(\frac{x}{z} \times y\right), f_2 = \left(\frac{f}{v} \times u\right), f_3 = \left(\frac{r}{s} \times w\right)$$

Sabu can open the lock if he finds the value of $3f_1 + f_2 + f_3 =$ key where:

Number of triangular faces in a truncated tetrahedron = x

Number of hexagonal faces in a truncated tetrahedron = x

Number of corners in a truncated tetrahedron = z Number of square faces in a truncated octahedron = t

Number of hexagonal faces in a truncated octahedron = u

Number of corners in a truncated octahedron = u

Number of triangular faces in a truchcated cube = w

Number of octangonal faces in a truncated cube = r Number of corners in a truncated cube = s What is the KEY ?

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263. Argon crystallizes in FCC arrangement and density of solid and liquid argon is 3/7 and 3gm/cc respectively. Find percentage of empty space in liquid Ar.

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264. In a FCC unit cell of A atom (AT wt. = 150) having side length 10Å. Number of atom per unit cell is Z, number of next nearest neighbour is X and packing efficiency is $y\,\%$ find value of $\frac{yz}{(x^2+1)}$.

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265. If number of nearest neighbours, next nearest (2nd nearest) neighbour and next to next nearest (3rd nearest) neighbours are x,y and z respectively for body centered cubic unit cell, then calculate value of $\frac{xy}{z}$.

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266. Number of crystal systems having, only 2 types of Bravais lattices = x,

Number of crystal systems having, at least 2 interfacial angles equal = y,

All the three interfacial angles and all the three axes lengths equal = z

Then find $y-(x+z)$.

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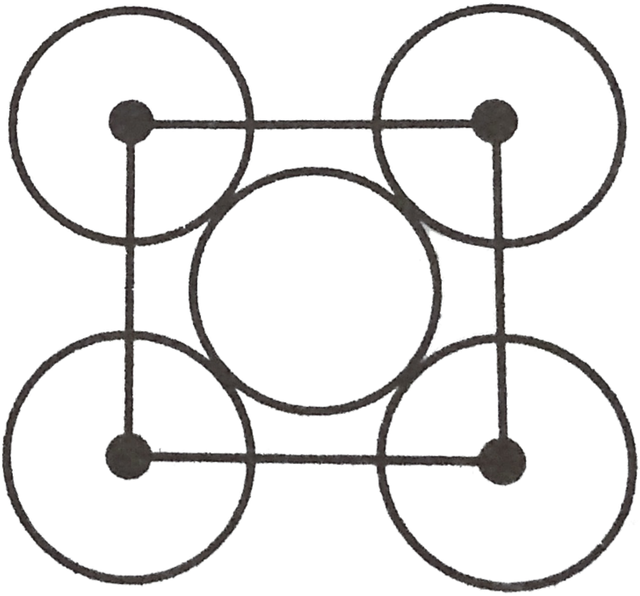
267. If packing fraction of two dimension unit cell shown in figure is A, then calculate value of 1000 A.



[Tale $\pi = 3.2, \sqrt{2} = 1.4$] Fill your answer as sum of digits (excluding decimal places) till you get the single digit answer.

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