CHEMISTRY

BOOKS - NARENDER AVASTHI CHEMISTRY (ENGLISH)

SOLID STATE

Level 1

1. which of the following statement is true for ionic solids?

A. Ionic solids are soluble in non-polar solvent

B. Under the electric field cation and anions acquire translatory motion in opposite directions

C. Structural units have strong electrostatic force of arrtraction

D. Structural units have dipole-dipole interactions

Answer: C

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2. Which one is called pseudo solid?

A. CaF_2

B. Glass

C. NaCl

D. All

Answer: B

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3. Solid which do not show the same physical properties in different directions are called:

A. pseudo solids

B. isotropic solids

C. polymorphic solids

D. anisotropic solids

Answer: D

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4. Graphite is an example of:

A. ionic solid

B. covalent solid

C. metallic solid

D. none of these

Answer: B

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5. Amorphous solids are

A. isotropic and supercooled liquids

B. anisotropic and supercooled liquids

C. isoenthalpic and superheated liquids

D. isotropic and superheated solids

Answer: A

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6. Which type of solid crystals will conduct heat and electricity?

A. ionic crystals

B. Covalent crystal

C. metallic crystals

D. molecular crystals

Answer: C

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7. The bond length and bond angles in molecules in the solid state are calculated by:

A. (a) X-ray diffraction technique

B. (b) neutrons bombardment

C. (c) protons bombardment

D. (d) none of these

Answer: A

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8. if $a = b \neq c$ and $\alpha = \beta = \gamma = 90^\circ$, the crystal system is

A. cubic

B. triclinic

C. hexagonal

D. tetragonal

Answer: D

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9. Triclinic crystal has the following the cell parameters:

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

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

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

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

Answer: C

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10. If all three interfacial angels defining the unit cell, are equal in magnitude, the crystal cannot be:

A. rhombohedral

B. cubic

C. hexagonal

D. tetragonal

Answer: C

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11. In a hexagonal crystal:

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

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

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

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

Answer: D

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12. Orthorhombic crystal has the following unit cell parameters:

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

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

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

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

Answer: C

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13. Which of the following crystal systems has maximum number of Bravais lattices?

A. (a) Cubic

B. (b) Hexagonal

C. (c) Triclinic

D. (d) Orthorhombic

Answer: D

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14. The most unsysmmetrical and symmeterical systems are, respectively:

A. Tertragonal, Cubic

B. triclinic , Cubic

C. Rhombohedral, Hexagonal

D. Orthohombic, Cubic

Answer: B

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

A. (a) cubic

B. (b) tetragonal

C. (c) monoclinic

D. (d) rhombohedral

Answer: B

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16. In the primitive cubic unit cell, the atoms are present at the:

A. corners of the unit cell

B. centre of the unit cell

C. centre of each face of the unit cell

D. one set of faces of the unit cell

Answer: A

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17. In the body centered unit cell, the lattice point are present at the:

A. corners of the unit cell only

B. corners and centre of the unit cell

C. corners and centre of each face of the unit cell

D. corners and at one set of faces of unit cell

Answer: B

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18. In the face centered per unit cell, the lattice points are present at the:

A. corners of unit cell only

B. corners and centre of the unit cell

C. corners and centre of each face of the unit cell

D. face centres of the unit cell

Answer: C

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19. The number of atom per unit in a simple cubic, face - centered cubic and body - centered cubic are ....respectively

A. 1,4,2

B. 1,2,4

C. 8,14,9

D. 8,4,2

Answer: A

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20. What would be the effective number of atoms per unit cell in end centred cubic uit cel, if this type of unit cell exist in nautre?

A. 1

B. 2

C. 3

D. 4

Answer: B

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21. In the body centered cubic unit cell and simple unit cell, the radius of atoms in terms of edge length (a) of the unit cell is respectively:

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

B. (b) $\frac{a}{\sqrt{2}}, \frac{a}{2}$

C. (c) $\frac{a}{2\sqrt{2}}, \frac{a}{2}$

D. (d) $\frac{3\sqrt{a}}{4}, \frac{a}{2}$

Answer: D

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22. In face -centered cubic unit cell, edge length is

A. (a) $4\frac{r}{\sqrt{3}}$

B. (b) $\frac{r}{\sqrt{2}}$

C. (c) $2\sqrt{2}r$

D. (d) $3\sqrt{2}\frac{r}{4}$

Answer: C

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23. The fraction of total volume occupied by the atom present in a simple cubic is

A. (a) 0.48

B. (b) 0.52

C. (c) 0.55

D. (d) 0.68

Answer: B

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24. The fraction of volume occupied by atoms in a body centered cubic unit cell is:

A. (a) 0.32

B. (b) 0.48

C. (c) 0.68

D. (d) 0.74

Answer: C

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25. The fraction of volume occupied by atoms in a face centered cubic unit cell is:

A. (a) 0.32

B. (b) 0.48

C. (c) 0.68

D. (d) 0.74

Answer: D

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26. Which of the following crystal lattice has the minimum empty space?

A. (a) simple cubic

B. (b) Body centred cubic

C. (c) Face centred cubic

D. (d) Simple tetragonal

Answer: C

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27. Which of the following has the smallest packing efficency for atoms of a single type?

A. Body centred cubic

B. simple cubic

C. Face centred cubic

D. none of these

Answer: C

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28. Polonium crystallizes in a simple cubic strtucture. The edge of the unit cell is 0.236nm. What is the radius of the polonium atoms:

A. 0.144 nm

B. 0.156 nm

C. 0.118 nm

D. 0.102 nm

Answer: C

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29. Lithium crystallizes as body centered cubic crystals. If the length of the side of unit cell is 350=pm, the atomic radius of lithium is:

A. 303.1pm

B. 606.2pm

C. 151.5pm

D. 123.7pm

Answer: C

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

A. 576.6pm

B. 287.8pm

C. 352.5pm

D. 704.9pm

Answer: B

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31. The neon atoms has a radius of 160pm. What is the edge of the unit cell of a face centered structure of neon?

A. 490pm

B. 320pm

C. 453pm

D. 481pm

Answer: C

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32. What are the number of atoms per unit cell and the number of nearest neighbours in a simple cubic structure?

A. 1,6

B. 4,12

C. 2,8

D. 2,6

Answer: A

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33. What are the number of atoms per unit cell and the number of nearest neighbours in a face centered cubic structure?

A. (a) 4,8

B. (b) 2,8

C. (c) 2,6

D. (d) 4,12

Answer: D

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34. What are the number of atoms per unit cell and the number of nearest neighbours in a body centered cubic structure?

A. 4,12

B. 1,6

C. 2,8

D. 2,5

Answer: C

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35. Each edge of a cubic unit cell is 400pm long. If atomic mass of the elements is 120 and its desity is $6.25g/cm^2$, the crystal lattice is: $(useN_A = 6 \times 10^{23})$

A. primitive

B. body centred

C. Face centred

D. end centred

Answer: D

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36. Tungsten has an atomic radius of 0.136nm. The density of tungsten is $19.4g/cm^3$. What is the crystal structure of tungsten ? $(\text{Atomic mass} W = 184)$

A. simple cubic

B. Body centred cubic

C. Face centred cubic

D. none of these

Answer: B

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37. The density of argon (face centered cubic cell) is $1.83g/cm^3 at 20^\circ C$. What is the length of an edge a unit cell? $(\text{Atomic mass}: Ar = 40)$

A. 0.599nm

B. 0.569nm

C. 0.525nm

D. 0.551nm

Answer: C

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38. The density of nickel (face centered cubic cell) is $8.94g/cm^3 at 20^\circ C$. What is the radius of the atom? $(\text{Atomic mass}: Ni = 59)$

A. 0.124nm

B. 0.136nm

C. 0.149nm

D. 0.110nm

Answer: A

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39. The density of krypton (face centered cubic cell) is $3.19g/cm^3$. What is the radius of the atom? $(\text{Atomic mass}: Kr = 84)$

A. 0.198nm

B. 0.221nm

C. 0.206nm

D. 0.225nm

Answer: A

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40. The face centered cubic cell of platinum ha an edge length of 0.392nm. Calculate the density of platinum $\left(g/cm^3\right)$: $(\text{Atomic mass}: Pt = 195)$

A. 20.9

B. 20.4

C. 19.6

D. 21.5

Answer: D

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41. Chromium metal crystallizes with a body-centred cubic lattice. The length of the unit cell edge is found to be 287pm. Calculate the atomic radius. What woulds be the density of chromium in gcm^{-3}?

A. 6.8

B. 7.6

C. 6.6

D. 7.23

Answer: D

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42. An elemetnts crystallizes in a face centered cubic lattice and the edge of the unit cell is 0.559nm. The density is $3.19 g / cm^3$. What is the atomic mass?

A. 87.6

B. 79.9

C. 85.5

D. 83.9

Answer: D

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43. The elements crystallizes in a body centered cubic lattice and the edge of the unit cell is 0.351nm. The density is $0.533 g / cm^3$. What is the atomic mas?

A. 12

B. 6.94

C. 9.01

D. 10.8

Answer: B

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44. An element $X(At, wt = 80g/mol)$ having fcc structure, calculate the number of unit cells in $8gofX$

A. $0.4 \times N_A$

B. $0.1 \times N_A$

C. $4 \times N_A$

D. $\frac{N_A}{40}$

Answer: D

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45. Moldydenum $\left(\text{At. mass}=96\text{g}//\text{mol}^{-1}\right)$ crystallizes as bcc crystal. If density of crystal is $10.3g/cm^3$, then radius of Mo atoms $\left(useN_A = 6 \times 10^{23}\right)$:

A. 111PM

B. 314PM

C. 135.96PM

D. none of these

Answer: C

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46. What is the condition number of an atom for an element crystallizing with a cubic lattice? Calculate the corresponding coordination number for the simple, fcc and bcc lattics:

A. 12sc, 12fcc, 8bc c

B. 6sc, 14fcc, 8bc c

C. 8sc, 12fcc, 6bc c

D. sc, 12fcc, 8bc c

Answer: D

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47. _____ layering pattern will have a void fraction of 0.260?

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48. The most malleable metals (Cu,Ag,Au) have close-packaing of the type:

A. Hexagonal closse-packing

B. Cubic close-packing

C. Body-centred cubic packing

D. Malleablity is not related to type of paacking

Answer: B

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49. The cordination number of a metal crystallising in a hexagonal close-packed structure is:

A. 12

B. 4

C. 8

D. 6

Answer: A

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50. If the ratio of coordination no. of A to that iof B is x:y, then the ratio of no. of atoms of A to that no, of atoms of B in the unit cell is

A. x:y

B. y:x

C. $x^2 : y$

D. $y : x^2$

Answer: B

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

A. 4.30 pm

B. 608.02 pm

C. 496.53 pm

D. none of these

Answer: B

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52. By X-ray diffraction it is found that nickel $\left(\text{at mass} = 59g\text{mol}^{-1}\right)$, crystallizes in ccp. The edge length of the

unit cell is 3.5Å. If density of Ni crystal is $9.0g/cm^3$, then value of Avogadro's number from the data is:

A. 6.05×10^{23}

B. 6.11×10^{23}

C. 6.02×10^{23}

D. 6.023×10^{23}

Answer: B

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53. Stacking of square close packed layers give rise to:

A. bcc structure

B. fcc structure

C. Simple cubic structure

D. hcp structur

Answer: C

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54. In a hexagonal close packed (hcp) structure of spheres, the fraction of the volume occupied by the sphere is A. In a cubic close packed structure the fraction is B. The relation for A and B is:

A. A=B

B. A < B

C. A > B

D. A is equal to the fraction in a simple cubic lattice.

Answer: A

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55. The unit cell present in ABCABC, closet packing of atoms is:

A. Hexagonal

B. tetragonal

C. Face centred cubic

D. primitive cubic

Answer: C

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56. The number of atoms present in a hexagonal close-packed unit cell is:

A. 4

B. 6

C. 8

D. 12

Answer: B

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57. The unit cell present in ABAB, closest packing of atoms is:

A. Hexagonal

B. tetragonal

C. face centered cubic

D. primitive cubic

Answer: A

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58. The number of terrahedral and octahedral holes in a hexagonal primitive unit cell are respectively:

(a)8,4

(b)6,12

(c)2,1

(d)12,6

A. 8,4

B. 6,12

C. 2,1

D. 12,6

Answer: D

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59. 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: C

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60. In the closet packing of atoms, there are:

A. one tetrahedral void and two octahedral voids per atom

B. two tetrahedral voids and one octahedral void per atom

C. two of each tertrahedral and octahedral voids per atom

D. one of each tetrahedral and octahedral voids per atom

Answer: B

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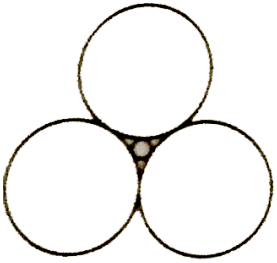
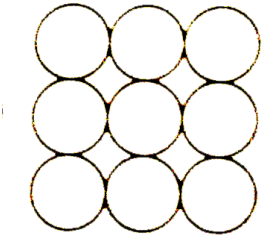
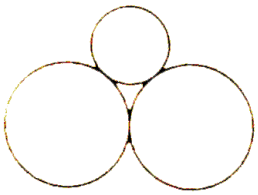
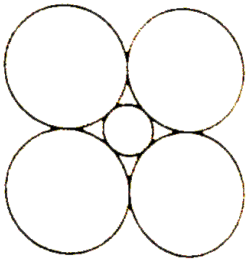
61. Which of the following figures represets the cross-section of an octahedral site?

A. 

B. 

C. 

D. 

Answer: D

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62. In which of the following pairs of structures, tetrahedral as well as octahedral holes are found?

A. bcc and fcc

B. hcp and simple cubic

C. hcp and ccp

D. bcc and hcp

Answer: C

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63. The number of octahedral void in bcc structure is:

(a)0

(b)1

(c)2

(d)4

A. (a) 0

B. (b) 1

C. (c) 2

D. (d) 4

Answer: A

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64. An ionic compound is expected to have octahedral structure if $r_c/r_a(r_c < r_a)$ lies in the range of:

A. 0.414 to 0.732

B. 0.732 to 0.82

C. 0.225 to 0.414

D. 0.155 to 0.225

Answer: A

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65. A ionic compound is expected to have tetrahedral structure if r_c / r_a:

A. lies in the range of 0.141 to 0.732

B. lies in the range of 0.225 to 0.414

C. lies in the range of 0.155 to 0.225

D. is more than 0.732

Answer: B

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66. An ionic compound is expected to have body centred type cubic unit cell if r_c / r_a:

(a)lies in range 0.732-1.00

(b)lies in the range of 0.141 to 0.732

(c)lies in the range of 0.255 to 0.414

(d)lies in the range of 0.155 to 0.225

A. lies in range 0.732-1.00

B. lies in the range of 0.141 to 0.732

C. lies in the range of 0.255 to 0.414

D. lies in the range of 0.155 to 0.225

Answer: A

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67. In the closed packing of atoms A $(\text{radius}: r_a)$, the radius of atom B that can be fitted into tetrahedral void is:

A. $0.155r_a$

B. $0.255r_a$

C. $0.414r_a$

D. $0.732r_a$

Answer: B

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68. In closest packing of A type of atoms (radius r_A) the radius of atom B that can be fitted into octabedral voids is

A. $1.155r_a$

B. $0.255r_a$

C. $0.414r_a$

D. $0.732r_a$

Answer: C

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69. How many nearest neighbours are there in an atom or ion for an octahedral hole of a closed packed structure?

A. 4

B. 6

C. 8

D. 12

Answer: D

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70. How many "nearst" and "next nearst" neighbours, respectively, does potassium have in bcc lattice?

A. 8,8

B. 8,6

C. 6,8

D. 6,6

Answer: B

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71. In the closest packing of atoms

A. (a) the size of tetrahedral void is greater than that of octahedral void

B. (b) the size of tertrahedral void is smaller than that of octahedral void

C. (c) the size of tertrahedral void is equal than that of octahedral void

D. (d) the size of tetraderal void may be or smaller or equal to that of octahedral void depending upon the size of atoms

Answer: B

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72. In the ionic compound AB the ratio $r_{A+} : r_{B-} is 0.414$. Indicate the correct statement among the following:

A. Cation form close packing and anion exactly fir into the octahedral voids

B. Anion form close packing and anion occupy precisely half of the tetrahedral voids

C. Anion form close packing and cation occupy precisely all the octahedral voids

D. Cation form close packing and anion fit into the octahedral voids loosely

Answer: C

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73. In the unit cell of KCl (NaCl type), Cl^(-) ions constitute ccp and K^+ ion fall into the octahedral holes. These holes are:

A. One at the centre and 6 at the centres of the faces

B. one at the centre and 12 at the centres of the edges

C. 8 at the centres of 8 small cubes forming the unit cell

D. none of these

Answer: B

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74. Which is incorrect statement?

A. In NaCl structure, tetrahedral voids are unoccupied

B. In ZnS structure, octahedral voids are unoccupied

C. In CaF_2 structure, all tetrahedral voids are occupied

D. In Na_2O structure, all tetrahedral voids are unoccupied

Answer: D

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75. In the radius of the anion in an ionic acid solid is 200pm, what would be the radius of the cation that fits exactly into a cubic hole:

A. 146.4pm

B. 82.8pm

C. 45pm

D. none of these

Answer: A

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76. The CsCl type structure is exhibited by alkali halides only when the radius of the cation is large enough to keep touching its eight nearst neighbour aniion. Below what minimum raiton of cation of anion radii $\left(r^{+}/r^{-}\right)$ this contact is prevented

A. 0.225

B. 0.414

C. 0.632

D. 0.732

Answer: D

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77. MgO crystallizes in a cubic type crystal system. The ionic radii for Mg^{2+} and O^{2-} are 0.066 abd 0.140nm respectively One can conclude that the Mg^{2+} ions occypy:

A. a cubic hole in a simple structure

B. every tetrahedral hole in a close packed structure

C. an octahedral hole in a cubic packed structure

D. every other tetrahedral hole in a close paked structure

Answer: C

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78. The unit cell of diamond is made up of:

A. 8 carbon atoms, 4 atoms ccp and two atoms occuypy half of octahedral voids

B. 8 carbon atom, 4 atoms constitute ccp and 4 atoms occupy all the octahedral voids

C. 8 carbon atoms, 4 atoms form fcc lattice and 4 atoms occupy half of the tetrahedral voids altenately

D. 12 carbon atoms. 4 atoms form fcc lattice and 8 atoms occupy all the tetrahedral holes

Answer: C

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79. In diamond, the coordination number of carbon is:

A. four and its unit cell has eight carbon atoms

B. four and its unit cell has six carbon atoms

C. six and its unit cell has four carbon atoms

D. four and its unit cell has four carbon atoms

Answer: A

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80. Predict coordination umber of the cation in crystals of the following compounds :

$(1). MgO: r_c = 0.65\text{Å}, r_a = 1.40\text{Å}$

$(2). MgS: r_c = 0.65\text{Å}, r_a = 1.84\text{Å}$

A. 6,4

B. 4,6

C. 3,4

D. 6,8

Answer: A

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

A. A_7B_6

B. A_7B_{12}

C. A_7B_{24}

D. $A_{24}B_7$

Answer: C

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82. CaS exists in a cubic close packed arrangement of S^{2-} ions in which Ca^{2+} ions occupy 1/2 of the available tetrahedral holes. How many Ca^{2+} and S^{2-} ions are contained in the unit cell?

A. 1,1

B. 2,4

C. 4,4

D. 4,2

Answer: C

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83. In the spinel structur, oxides ions are cubical-closet packed whereas 1/8th of tetrahedral voids are occupied by A^{2+} cation and 1/2 of octahedral voids are occupied by B^{+} cations. The general formula of the compound having spinel structure is:

A. $A_2B_2O_4$

B. AB_2O_4

C. $A_2B_2O_2$

D. $A_4B_2O_2$

Answer: B

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84. If the anion (A) form hexagonal closet packing and cation (C) occupy only 2/3 octahedral voids in it, then the general formula of

the comound is:

A. CA

B. CA_2

C. C_2A_3

D. C_3A_2

Answer: C

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85. In a solid, oxide ions are arrnged in ccp, cations A occupy A occupy $\left(\frac{1}{8}\right)^t h$ of the tetrahedral voids and cation B occupy $\left(\frac{1}{4}\right)^{th}$ of the octahedral voids. The formula of the compound is:

A. ABO_4

B. AB_2O_3

C. $A_{\circ}BO_4$

D. AB_4O_4

Answer: A

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86. In a face centered cubic arrangement of A and B atoms whose A atoms are at the corner of the unit cell and B atoms at the face centers. One of the B atoms missing from one of the face in unit cell. The simplest formula of compounding is:

A. AB_3

B. A_8B_5

C. A_2B_5

D. $AB_{2/5}$

Answer: C

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87. An alloy of Cu, Ag and Au is found to have copper constituting the $c.c.p.$ lattice. If Ag atom occupy the edge centres and Au atom is present at body centre, the formula of this alloy is :

A. Cu_4Ag_2Au

B. Cu_4Ag_4Au

C. Cu_4Ag_3Au

D. $CuAgAu$

Answer: C

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

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

B. Co-ordination number of cation is six and anion is four

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

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

Answer: D

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89. Which of the following statement is correct for the body-centred cubic structure of an ionic compound?

A. Co-ordination number of each cation and anion is two

B. Co-ordination number of each cation and anion in four

C. Co-ordination number of each cation and anion in six

D. Co-ordination number of each cation and anion in eight

Answer: D

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90. Which of following statements is correct in the zinc-blende-type structure of an ionic compound?

A. Co-ordination number of each cation and anion is two

B. Co-ordination number of each cation and anion in four

C. Co-ordination number of each cation and anion in six

D. Co-ordination number of each cation and anion in eight

Answer: B

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91. Which of the following expressions is correct in the case of a sodium chloride unit cell (edge length, a)?

A. $r_c + r_a = a$

B. $r_c + r_a = 2a$

C. $r_c + r_a = \sqrt{2}a$

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

Answer: B

Watch Video Solution

92. In an idaeal closet rock salt structure (edge length a) which of the following expression is correct?

A. $r_a = \sqrt{2}a$

B. $r_a = a/\sqrt{2}$

C. $r_a = a/2\sqrt{2}$

D. $r_a = a/4$

Answer: C

Watch Video Solution

93. Which of the following expression is correct in case of a CsCl unit cell (edge length, a)?

A. $r_c + r_a = a$

B. $r_c + r_a = a/\sqrt{2}$

C. $r_c + r_a = \sqrt{3}a/2$

D. $r_c + r_a = a/2$

Answer: C

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94. In NaCl the centres of two nearst like-charged ions are present at a distance of:

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

B. $\frac{1}{2}a$

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

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

Answer: A

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95. In sodium chloride crystal, the number of next nearst neighbours of each Na^+ ion is:

A. $8Cl^- ions$

B. $12Na^+ ions$

C. $12Cl^- ions$

D. $24Cl^- ions$

Answer: B

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96. In an ionic compound A^+X^-, the radii of A^+ and X^- ions ar 1.0pm and 2.0om, respectively. The volume of the unit cell of the crystal AX will be:

A. 27pm^3

B. 64pm^3

C. 125pm^3

D. 216pm^3

Answer: D

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97. The coordination number of cation and anion in fluorite CaF_2 and anti-fluroite Na_2O are respectively:

A. 8:4 and 6:3

B. 6:3 and 4:4

C. 8:4 and 4:8

D. 4:8 and 8:4

Answer: C

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98. Select the incorrect statement in a CsCl crystal:

A. (a) Cs^+ forms a simple cubic lattice, Cl^- forms a simple cubic lattice

B. (b) Cl^- occupies body centre of Cs^+

C. (c) Cs^+ occupies body centre of Cl^-

D. (d) It is impossible for Cl^- to occupy body centre of Cs^+ because the body centre void of Cs^+ is smaller than Cl^-

Answer: D

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99. The radius of a divaent cation A^{2+} is 94pm and of divalent anion B^{2-} is 146pm. The compound AB has:

A. Rock salt structure

B. Zinc blende structure

C. Antifluorite structure

D. CsCl type structure

Answer: A

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100. A binary solid (AB) has a rock salt structure. If the edge length is 400pm, radius of cation is 80pm the radius of anion is:

A. 100pm

B. 120pm

C. 250pm

D. 325pm

Answer: B

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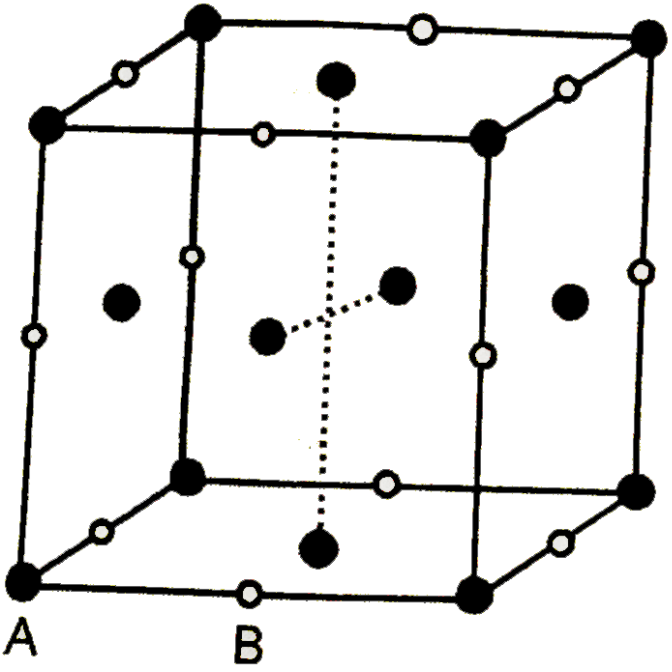
101. For a solid with the structure shown in Fig, the coordination number of the points of the points A and B, respectively are



A. 6,8

B. 8,8

C. 6,6

D. 4,6

Answer: C

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102. An ionic compound AB has fluorite type structures. If the radius $B^- is 200$pm, then the ideal radius of A^+ would be:

A. (a) 82.8pm

B. (b) 146.4pm

C. (c) 40pm

D. (d) 45pm

Answer: D

Watch Video Solution

103. In which of the following structures, the anion has maximum coordination number?

A. (a) NaCl

B. (b) ZnS

C. (c) CaF_2

D. (d) Na_2O

Answer: D

Watch Video Solution

104. CsCl has bcc structure with Cs^+ at the centre and Cl^- ion at each corner. If r_{Cs^+} is 1.69Å and r_{Cl^-} is 1.81Å what is the edge length of the cube?

A. 3.50Å

B. 3.80Å

C. 4.04Å

D. 4.50Å

Answer: C

Watch Video Solution

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

A. (a) 3.72

B. (b) 1.86

C. (c) 7.44

D. (d) 4.3

Answer: A

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106. If the radius of $Cl^{1}ion181\mathrm{pm}$, and the radius ofNa^+` ion is 101pm then the edge length of unit cel l is:

A. 282pm

B. 285.71pm

C. 512pm

D. 564pm

Answer: D

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107. Ammonium chloride, crystallizes in a body centered cubic lattice with edge length of unit cell equal to 387pm. If the size of Cl^- ion is 181pm, the size of NH_4^+ ion would be:

A. (a) 116pm

B. (b) 154pm

C. (c) 174pm

D. (d) 206pm

Answer: B

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108. Salt AB has a zinc blend structure. The radius of A^{2+} and B^{2-} ion are 0.7Å and 1.8Å respectively. The edge length of AB unit cell is:

A. (a) 2.5Å

B. (b) 5.09Å

C. (c) 5Å

D. (d) 5.77Å

Answer: D

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109. Transition metals, when they form interstitial compounds, the non-metals (H,B,C,N) are accommodated in:

A. voids or holes in cubic-packed structure

B. tetrahedral voids

C. octahedral voids

D. all of these

Answer: D

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110. In a diamond, each carbon atom is bonded to four other carbon atoms tetrahedrally. Alternate tetrahedral voids are occupied by carbon atoms. The number of carbon atoms per unit cell is:

A. 4

B. 6

C. 8

D. 12

Answer: C

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111. Which of the following statement for crystals having Schottky defect is not correct?

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

B. schooty defect ar emore commmon in ionic compound with high co-ordination number

C. The dinsity of the crystals having schottky defect is larger than that of the perfect crystal

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

Answer: C

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112. Which is correct statement?

A. When temperature increases then number of defects decreases.

B. Schottky defect occurs when radius of cation is smallller

C. Frenkel defect occurs when radius of cation is smaller

D. none of these

Answer: C

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113. Which of the following statements for crystals having frenkel defects is not correct?

A. The density of crystals having Frenkel defect is less than that of a pure percfect crystal

B. IFrenkel defects asre observed where the differnce in size of cation and anion is large

C. In an ionic crystal having Frenkel defect may also contian Schottky defrect

D. Usually alkali halides do not have Frenkel defect

Answer: B

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114. When anion leaves the normal lattice site and electron occupies interstitial sites in its crystal lattice, It is called:

A. Schottky defect

B. Frenkel defect

C. Metal excess defect

D. Stoichiometric defect

Answer: C

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115. Which of the following defects does KBr show?

A. Frenkel

B. Schottky defect

C. Metal excess

D. Metal deficiency

Answer: B

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116. Dopping of AgCl crystals with $CdCl_2$ results in:

A. Schottky defect

B. Frenkel defect

C. Substitutional cation vacancy

D. Formation of F-centres

Answer: C

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117. $NaCl$ 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 coordination number of NaCl

D. higher coordinaiton number of AgCl

Answer: A

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118. Which one of the following crystal does not exhibit Frenkel defect?

A. AgBr

B. AgCl

C. CsCl

D. ZnS

Answer: C

Watch Video Solution

119. Select the incorrect statement :

A. Stiochiometery of crystal remains uneffected dure to Schottky defect

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

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

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

Answer: D

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120. In a diamond, carbon atom occupy fcc lattice points as well as alternate tetrahedral voids. If edge length of the unit cell is 356pm, then diameter of carbon atom is:

A. (a) 77.07pm

B. (b) 154.14pm

C. (c) 251.7pm

D. (d) 89pm

Answer: B

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121. When NaCl is dopped with $10^{-5}\text{mole }\%\text{ of}SrCl_2$, what is the no. of cationic vacanies?

A. $10^{-5} \times N_A$

B. $10^{-7} \times N_A$

C. $2 \times 10^{-7} \times N_A$

D. none of these

Answer: B

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122. The composition of a sample of Wustite is $Fe_{0.93}O_{1.00}$. What fraction of the iron is present in the form of $Fe(III)$?

A. 0.1505

B. 0.25

C. 0.35

D. 0.45

Answer: A

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

A. 0.998

B. 0.1111

C. 0.8888

D. none of these

Answer: B

Watch Video Solution

124. Ferrimagnetism is in:

A. ↑ ↑ ↑ ↑ ↑

B. ↑ ↓ ↑ ↓

C. ↑ ↑ ↑ ↓ ↓

D. none of these

Answer: C

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125. Fe_3O_4 is ferrimagnetic at room temperature but at 850K it becomes::

A. diamagnetic

B. ferromagnetic

C. non-magnetic

D. paramagnetic

Answer: D

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Level 2

1. When heated above $916^\circ C$, iron changes its bcc crystalline from to fcc without the change in the radius of atom . The ratio of density of the crystal before heating and after heating is :

A. 1.069

B. 0.918

C. 0.725

D. 1.231

Answer: B

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2. $TIAI(SO_4)_2.\ xH_2O$ is bcc with 'a' =1.22 nm. If the density of the solid is $2.32g/cc$, then the value of x is (Given :$N_A = 6 \times 10^{23}$) , at . Mass : $TI = 204$, $AI = 27$, $S = 32$).

A. 2

B. 4

C. 47

D. 70

Answer: C

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3. In an atomic bcc lattie what fraction of edge is not covered by atoms?

A. 0.32

B. 0.16

C. 0.134

D. 0.268

Answer: C

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4. The packing efficiency of a simple cubic crystal with an interstitial atom exactly fitting at the body center is :

A. (a) 0.48

B. (b) 0.52

C. (c) 0.73

D. (d) 0.91

Answer: C

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5. An atomic solid crystalliuzen in a body centre cubic lattice and the inner surface of the atoms at the adjacent corner are separated by $60.3\mathrm{pm}$ .If the atomic mass of A is 48, then density of the solid , is nearly :

A. $2.7g/\mathrm{cc}$

B. $50.7g/\mathrm{cc}$

C. $3.5g/\mathrm{cc}$

D. $1.75g/\mathrm{cc}$

Answer: D

Watch Video Solution

6. Sodium (Na =23) crystallizen in bcc arrangement with the interfacial separation between the atoms at the edge $53.6\mathrm{pm}$. The density of sodium crystal is:

A. $2.07g/\mathrm{cc}$

B. $2.46g/\mathrm{cc}$

C. $1.19g/\mathrm{cc}$

D. None of these

Answer: C

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7. The density of solid Ar (Ar=40 g/mole) is 1.68 g/ml at 40 K. if the argon atom is assumed to be a sphere of radius $1.50 \times 10^{-8}cm$, then % of solid Ar is apparently empty space?

A. (a) 35.64

B. (b) 64.36

C. (c) 74

D. (d) None of these

Answer: B

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8. A bcc lattice is made up of hollow spheres of B. Spheres of solids A are present in hollow spheres of B. The radius of A is half of the radius of B. The ratio of total volume of spheres of B unoccupied by A in a unit cell and volume of unit cell is $A \times \frac{\pi\sqrt{3}}{64}$. Find the value of A.

A. 8

B. 7

C. 24

D. None of these

Answer: D

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9. First three nearest neighboure distance for primitive cubic lattice are respectively (edge length of unit cell = a):

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

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

C. $a\sqrt{2a}, 2a$

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

Answer: A

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10. First three nearestneighbour distances for body centered cubic lattice are respectively :

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

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

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

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

Answer: C

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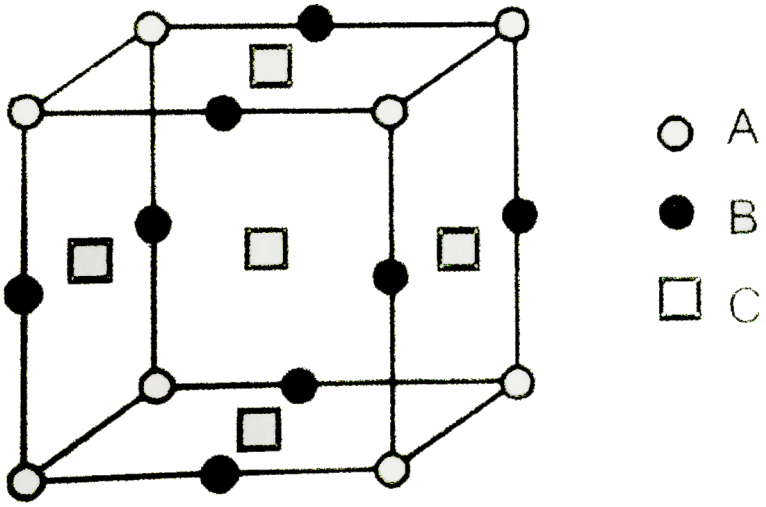
11. Given : The unit cell structure o fcompound is show below .



The formula of compound is :

A. $A_8B_{12}C_{15}$

B. AB_2C_3

C. $A_2B_2C_5$

D. ABC_5

Answer: B

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12. The density of apure substance 'A' whose atoms are in cubic close pack arragement is $1g/cc$. If the all the tetrahedral voids are occu[pioed by 'B' atom , What is the density of resulting solid in g/cc.["Atomic mass" =$(A) = 30g/\mathrm{mol}$ and atomic mass $(B) = 50g/\mathrm{mol}$]

A. 33.3

B. 4.33

C. 2.33

D. 5.33

Answer: B

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13. In a planar tetra - atomic molecule, XY_3,X is at the centroid of the equilateral triangle formed by the atoms , Y. If the X-Y bond distance is 1Å, what is the distance between the centres of any two Y atoms ?

a. $1/\sqrt{3}\text{Å}$

b. $\sqrt{2}\text{Å}$

c. $\sqrt{3}\text{Å}$

d. $1/\sqrt{2}\text{Å}$

A. $1/\sqrt{3}\text{Å}$

B. $\sqrt{2}\text{Å}$

C. $\sqrt{3}\text{Å}$

D. $1/\sqrt{2}\text{Å}$

Answer: C

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14. How many unit cells are present in 5.0 gm of crystal AB (formula mass of AB =40) having rock salt type structure ? (N_A = Avogadro 's no.)

A. N_A

B. $\frac{N_A}{10}$

C. $4N_A$

D. None of these

Answer: D

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15. The density of CaF_2 (flourtie structure) is $3.18g/cm^3$. The length of the side of the unit cell is :

A. 253 pm

B. 344 pm

C. 546 pm

D. 273 pm

Answer: C

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16. A crystal of lead (II) sulphide has NaCl strcuture . In this crystal the shorest distance between a Pb^{2+} ion and S^{2-} ion is 297 pm . What is the volume the of unit cell in lead sulphide ?

A. $209.6 \times 10^{-24} cm$

B. $207.8 \times 10^{-23} cm$

C. $22.3 \times 10^{-23} cm$

D. $209.8 \times 10^{-23} cm$

Answer: A

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17. CdO has $NaCl$ like structure with density $8.27g/cc$. If the ionic radius of O^{2-} is $1.24A^{\circ}$ determine the ionic radius of Cd^{2+}:

A. $1.5Å$

B. $1.1Å$

C. $1.9Å$

D. $1.5Å$

Answer: B

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18. KCl crystallizes int the same type of lattic as done NaCl . Given that $r_{Na^+}/r_{Cl^-} = 0.50$ and $r_{Na^+}/r_{K^+} = 0.70$, Calcualte the ratio of the side of the unit cell for KCl to that for NaCl:

A. 1.143

B. 1.224

C. 1.414

D. 0.875

Answer: A

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19. Ferrous oxide has a cubie structure and edge length of the uint cell is 5.0Å . Assuming the density o ferrous oxide to be $3.84g/cm^3$

, the no. Of Fe^{2+} and O^{2-} ions present in each unit cell be : (use $N_A = 6 \times 10^{23}$):

A. $4Fe^{2+}$ and $4O^{2-}$

B. $2Fe^{2+}$ and $2O^{2-}$

C. $1Fe^{2+}$ and $1O^{2-}$

D. $3Fe^{2+}$ and $4O^{2-}$

Answer: A

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20. If an element (at. Mass =50) crystallise in fc lattie ,with a= 0.50 nm . What is the denstiy of unit cell if it conatins 0.25% Schottuy defects (use $N_A = 6 \times 10^{23}$)?

A. $2.0g/\text{cc}$

B. $2.66g/cc$

C. $3.06g/cc$

D. None of these

Answer: B

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21. An element X (At. Wt. =24) 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 : $\left(N_A = 6x10^{23}\right)$

A. 96

B. 98

C. 99.9

D. None of these

Answer: A

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22. In fcc lattice ,A, B, C,D atoms are arranged at corner , face centre , ocatahedral void and tetrahedral void respectively , then the body diagonal contains :

A. $2A, C, 2D$

B. $2A, 2B, 2C$

C. $2A, 2B, D$

D. $2A, 2D$

Answer: A

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23. The distance between an ocatahral and tetrahedral void in fcc lattice would be:

A. $\sqrt{3}a$

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

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

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

Answer: D

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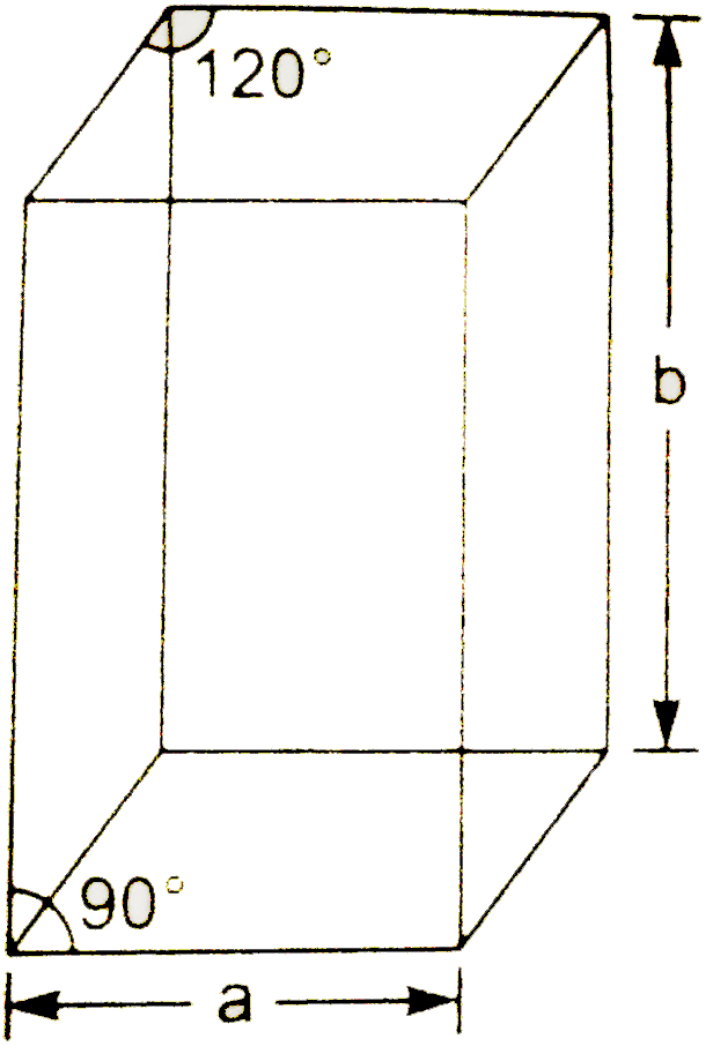
24. A_2B molecules$(\text{ molar mass } = 259.8g/\text{ml})$ crystallises in a hexagonal lattice as shown in figure .The lattic constants were $a = 5\text{Å}$ and $b = 8\text{Å}$. If denstiy of crystal is $5g/cm^3$ then how many molecules are contained in given unit cell ? $\left(\text{ Use}N_A = 6 \times 10^{23}\right)$



(a)6

(b)4

(c)3

(d)2

A. 6

B. 4

C. 3

D. 2

Answer: D

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25. Graphite has h.c.p arrangements of carbon atoms and the parallel planes are 3.35Å apart . Determine density of graphite :

A. $2.12g/\text{cc}$

B. $0.41g/\text{cc}$

C. $1g/\text{cc}$

D. $1.41g/\text{cc}$

Answer: B

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26. How many effiective Na^+ and Cl^- ions are present respectively in a uint cell of NaCl solid (Rock salt structure) if all ions along line connecting opposite face centres are absent ?

A. 3,3

B. $\frac{7}{2}, 4$

C. $\frac{7}{2}, \frac{7}{2}$

D. $4, \frac{7}{2}$

Answer: A

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27. A crystal is made of particles X and Y.X form fcc packing and Y occupies all the octahedral voids . If all the particles along one body diagonal are removed then the formula of the crystal would de :

A. X_4Y_3

B. X_5Y_5

C. X_5Y_4

D. None of these

Answer: B

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28. Select right expression for determinig packing fraction (P.F.) of NaCl unit cell (assume ideal) , if ions along an edge diagonal are absent :

A. $P.F. = \frac{\frac{4}{3}\pi\left(r_+^3 + r_-^3\right)}{16\sqrt{2}r_-^3}$

B. $P.F. = \frac{\frac{5}{2}\pi\left(r_+^3 + 4r_-^3\right)}{16\sqrt{2}r_-^3}$

C. $P.F. = \frac{\frac{4}{3}\pi\left(\frac{5}{2}r_+^3 + 4r_-^3\right)}{16\sqrt{2}r_-^3}$

D. $P.F. = \frac{\frac{4}{3}\pi\left(\frac{7}{2}r_+^3 + r_-^3\right)}{16\sqrt{2}r_-^3}$

Answer: B

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29. A crystal is made of particles X,Y and Z.X form fcc packing . Y occupies all the octahedral void of X and Z occupies all the tetrahedral voids of X . If all the particles along one body diagonal are removed then the formula of the crystal would be:

A. XYZ_2

B. X_2YZ_2

C. $X_8YT_4Z_5$

D. $X_5Y_4Z_8$

Answer: D

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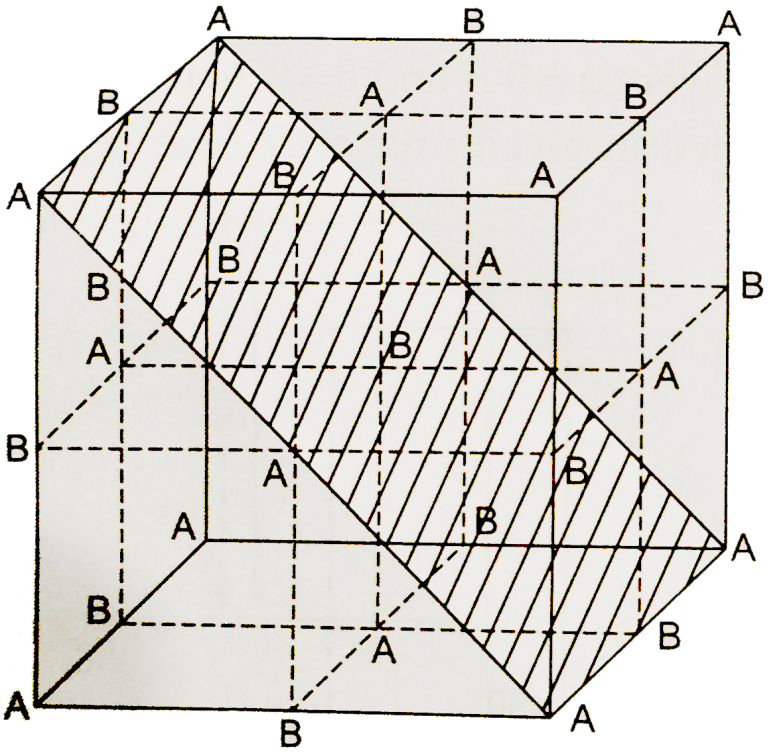
30. A crystal is made of particles A and B . From fcc packing and B occupies all the octahedral voids . If all the particle along the plane as shown in figure are removed , then, the formula of the crystal

would be :



A. AB

B. A_5B_7

C. A_7B_5

D. ABC_8

Answer: A

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31. In the rock salt AB, if C introduced in tetrahedral voids such that no distoration occurss, then fromula of resultant compound is :

A. ABC

B. ABC_2

C. A_4B_4C

D. ABC_8

Answer: B

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32. Given length of side of hexagonal unit cell is $\frac{100}{\sqrt{2}}$ pm . The volume of hexagonal unit cell is $\left(\text{inpm}^3\right)$:

A. 8×10^6

B. 1.5×10^6

C. 64×10^6

D. 36×10^6

Answer: B

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Level 3 Passage 1

1. packing fraction of a unit cell is drfined as the fraction of the total volume of the unit cell occupied by the atom(s).

$$P.E = \frac{\text{Volume of the atoms(s) present in a unit cell}}{\text{Volume of unit cell}} = \frac{Z \times \frac{4}{3}\pi r^3}{a^3}$$

and $\%$ of empty space = $100 - P.F. \times 100$

where Z= effective number of stoms in s cube .

r= radius of a an atoms

a = edge lenght of the cube

% empty space in body centered cubic cell unit is nearly :

A. 52.36

B. 47.6

C. 32

D. 26

Answer: C

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Passge 2

1. packing fraction of a unit cell is drfined as the fraction of the total volume of the unit cell occupied by the atom(s).

$$P.E = \frac{\text{Volume of the atoms(s) present in a unit cell}}{\text{Volume of unit cell}} = \frac{Z \times \frac{4}{3}\pi r^3}{a^3}$$

and $\%$ of empty space = $100 - P.F. \times 100$

where Z= effective number of stoms in s cube .

r= radius of a an atoms

a = edge lenght of the cube

Packing fraction in face centered cubic unit cell is :

A. 0.7406

B. 0.6802

C. 0.5236

D. None of these

Answer: A

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2. Density of a unit cell is respresented as

$$\rho = \frac{\text{Effective no. of atoms (s)} \times \text{Mass of a unit cell}}{\text{Volume of a unit cell}} = \frac{Z.M}{N_A.a^3}$$

where , Z = effective no . of atoms(s) or ion (s) per unit cell.

M= At . mass// formula

N_A= Avogadro' s no . $\Rightarrow 6.0323 \times 10^{23}$

a= edge length of unit cell

Silver crystallizes in a fcc lattice and has a density of $10.6g/cm^3$.

What is the length of a edge of the unit cell ?

A. $40.07nm$

B. $0.2035nm$

C. $0.101nm$

D. $4.07nm$

Answer: A

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3. Density of a unit cell is respresented as

$$\rho = \frac{\text{Effective no. of atoms (s)} \times \text{Mass of a unit cell}}{\text{Volume of a unit cell}} = \frac{Z.M}{N_A.a^3}$$

where , Z =mass of effective no . of atoms(s) or ion (s).

M= At . mass// formula

N_A= Avogadro' s no . $\Rightarrow 6.0323 \times 10^{23}$

a= edge length of unit cell

An element crystallizes in a structure having fcc unit cell of an edge 200 pm . Calculate the density , if 100 g of this element contains 12×10^{23} atoms :

A. $41.66 g/cm^3$

B. $4.166 g/cm^3$

C. $10.25 g/cm^3$

D. $1.025 g/cm^3$

Answer: A

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4. Density of a unit cell is respresented as

$$\rho = \frac{\text{Effective no. of atoms (s)} \times \text{Mass of a unit cell}}{\text{Volume of a unit cell}} = \frac{Z.M}{N_A.a^3}$$

where , Z = effective no . of atoms(s) or ion (s).

M= At . mass// formula

N_A= Avogadro' s no . $\Rightarrow 6.0323 \times 10^{23}$

a= edge length of unit cell

The density of KBr is $2.75 g/cm^{-3}$. The length of the edge of the unit cell is 645 pm .To which type of cubic crystal , KBr belongs ?

A. Simple cubic

B. bcc

C. fcc

D. None of these

Answer: C

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Passge 3

1. A spinel is an important class of oxide consisting two types of metal ions with the oxide ions arranged in ccp layers . The normal spinel has one -eight of the tetrahedral holes occupied by one type of metal ions and one- half of the octahedral holes occupied by another type of metal ion. Such a spinel is formed by Mg^{2+}, Al^{3+} and O^{2-} . The neutrality of the crystal is being maintained.

The formula of the spinel is :

A. (a) Mg_2AlO_4

B. (b) $MgAl_2O_4$

C. (c) $Mg_3Al_2O_6$

D. (d) None of these

Answer: B

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2. A spinel is an important class of oxide consisting two types of metal ions with the oxide ions arranged in ccp layers . The normal spinel has one -eight of the tetrahedral holes occupied by one type of metal ions and one- half of the octahedral holes occupied by another type of metal ion. Such a spine is formed by Mg^{2+}, Al^{3+} and O^{2-} . The neutrality of the crystal is being maintained.

Type of hole occupied by Al^{3+} ions is:

A. (a) tetrahedral

B. (b) octahedral

C. (c) both (a) and (b)

D. (d) None of these

Answer: B

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3. A spinel is an important class of oxide consisting two types of metal ions with the oxide ions arranged in ccp layers . The normal spinel has one -eight of the tetrahedral holes occupied by one type of metal ions and one- half of the octaherdral holes occupied by another type of metal ion. Such a spine is formed by Mg^{2+}, Al^{3+} and O^{2-} . The neutrality of the crystal is being maintained.

Type of hole occupied by Mg^{2+} ions is:

A. tetrahedral

B. octahedral

C. both (a) amd(b)

D. None of these

Answer: A

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4. A spinel is an important class of oxide consisting two types of metal ions withs the oxide ions arranged in ccp layers . The normal spinel has one -eight of the tetrahendral holes occupied by one type of metal ions and one- half of the octaherdral holes occupied by another type of metal ion. Such a spine is formed by Mg^{2+}, Al^{3+} and O^{2-} . The netutrality of the crystal is benig maintained.

If oxide ion is replaced by $X^{-8/3}$, the number of anionic vacancy per unit cells is :

A. 1

B. 2

C. 3

D. $3/4$

Answer: A

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Passage 4

1. Ionic lattic has two major points defects ,(1) Schottky (2) Frenkel defects . Schottkly defects occurs due to the cations - anion pair's missing from the lattice sites . Frenkel defects occurs when cation leaves its lattice site and fits into an interstitial space. The neutrality of the crystal is being maintained and we considered all losses from interstitial positions.

which defect decrease density of the crystal ?

A. Frenkel defect

B. Schootky defect

C. both (a) and (b)

D. None of these

Answer: B

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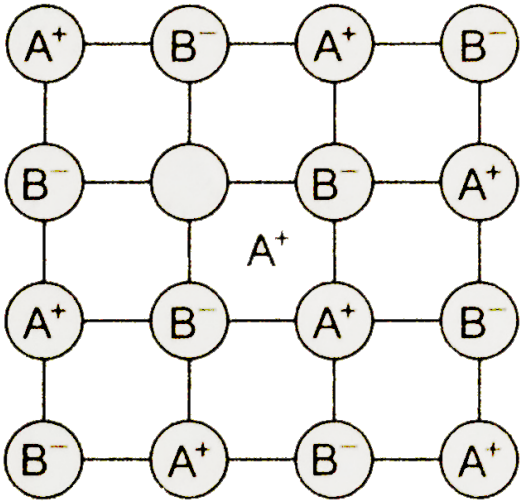
2. Ionic lattic has two major points defects ,(1) Schottky (2) Frenkel defects . Schottkly defects occurs due to the cations - anion pair's missing from the lattice sites . Frenkel defects occurs levels its lattic site and fits into an intersitial space. The neturaity of the crystal is benig maintained and we considerd all losses from interstitical positions.

Structure shown here represents :



Cation : A^+
Anion : B^-

A. Schootky defect

B. Frenkel defect

C. Mental excess defect

D. None of these

Answer: B

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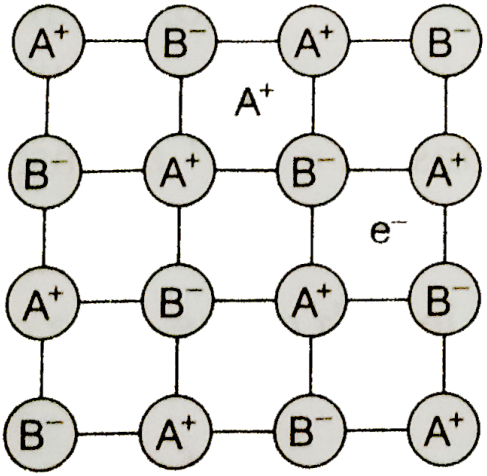
3. Ionic lattic has two major points defects ,(1) Schottky (2) Frenkel defects . Schottkly defects occurs due to the cations - anion pair's missing from the lattice sites . Frenkel defects occurs levels its lattic site and fits into an intersitial space. The neturaity of the crystal is benig maintained and we considerd all losses from interstitical positions.

Structure shown here represents :



Cation : A^+
Anion : B^-

A. Schootky defect

B. Frenkel defect

C. Both defect

D. None of these

Answer: D

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Passage 5

1. Doping mens introduction of small amount of impurities like phosphorus , arsenic or boron into the pure crystal . In pure silicon , ther are four valenices used in bonding with other four adjacent silicon crystal is doped with a group -15 element (with five valence electron) such as P, As , or Bi , the structure of the crystal lattic remains unchanged . Out of the five valence electron of group -15 doped element four element are used in normal covalent bonding with silicon while fiffth electron is delcoasiled and thus conducts electricity

Doping a silicon crystal with a group -13 element (with three valence electrons) such as B, Al, Ga or In products a semiconductor with three electrons in in dopant . The place where fourth electron is missing is called an electron vacancy or hole . Such hole can move throught the crystal like a positive charge giving rise conduction of electricity.

No. of valene electrons in silicon are :

A. 3

B. 4

C. 5

D. 6

Answer: B

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2. Silicon that has been doped with group - 15 elements is called :

A. p- type semicondouctor

B. n-type semiconductor

C. electron vancany or hole

D. None of these

Answer: B

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3. Silicon that has been doped with group - 13 elements is called :

A. p- type semicondouctor

B. n-type semiconductor

C. electron vancany or hole

D. None of these

Answer: A

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Passage 6

1. Mentallic Gold crystallise in fcc lattice and the length of cubic unit cell is 407 pm.

(Given : Atomic mass of Gold =197, $N_A = 6 \times 10^{23}$)

The density if it have $0.2\,\%$ Schottky defect is $\left(\text{ in gm}/cm^3 \right)$

A. 4.86

B. 9.72

C. 19.48

D. 19.44

Answer: D

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

A. 407pm

B. $\frac{407}{\sqrt{1}}$ pm

C. $\frac{407}{\sqrt{2}}$ pm

D. $407\frac{\sqrt{3}}{2}\text{pm}$

Answer: A

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Passage 7

1. In diamond structure ,carbon atoms form fcc lattic and $50\,\%$ tetrahedral voids occupied by acrbon atoms . Evergy carbon atoms is surrounded tetrachedral by four carbon atom with bond length 154 pm . Germanium , silicon and grey tin also crystallise in same way as diamond $\left(N_A = 6 \times 10^{23}\right)$

The mass of diamond unit cell is:

A. 96 amu

B. $96g$

C. 144 amu

D. $144g$

Answer: A

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2. In diamond structure ,carbon atoms form fcc lattic and $50\,\%$ tetrahedral voids occupied by acrbon atoms . Evergy carbon atoms is surrounded tetrachedral by four carbon atom with bond length 154 pm . Germanium , silicon and tin also crystallise in same way as diamond $\left(N_A = 6 \times 10^{23}\right)$

The side length of diamond unit cell is (in pm):

A. 154

B. 1422.63

C. 711.32

D. 355.66

Answer: D

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3. In diamond structure ,carbon atoms form fcc lattic and $50\,\%$ tetrahedral voids occupied by acrbon atoms . Evergy carbon atoms is surrounded tetrachedral by four carbon atom with bond length 154 pm . Germanium , silicon and grey tin also crystallise in same way as diamond $\left(N_A = 6 \times 10^{23}\right)$

The side length of diamond unit cell (in pm):

a. 154

b. 1422.63

c. 711.32

d. 355.66

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One Or More Anwer Is Correct

1. Select the correct statement (s).

A. (a) Co-ordination no. of an atom at a lattice point in sample cubic arrangement is 6

B. (b) Co- ordination no. of an atom at octahedral site 8.

C. (c) Co-ordination no. of an atom at lattice point in hcp arrangment is 6

D. (d) Co-ordination no. of an atom at octahedral site is 6

Answer: A::B

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2. Packing fraction of an identical solid sphere is 74% in :

A. simple cubic structure

B. fcc structure

C. hcp structure

D. bcc structure

Answer: B::C

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3. Position of octahedral voids in fcc structure is//are

A. edge centers

B. face centers

C. body centers

D. corners

Answer: A::C

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4. If the radius of Na^+ ion is $95pm$ and that of Cl^- ion is $181pm$, then :

A. (a) co-ordination no. Of Na^+ is 6

B. (b) co-ordination no. Of Cl^- is 8

C. (c) co-ordination no. Of Cl^- is 4

D. (d) co-ordination no. Of Na^+ is 8

Answer: A::C

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5. Select the correct statement (s) :

A. (a) The co-ordinaton number of each type of ions a CsCl crystal is 12

B. (b) A metal that crystallizes in a bcc structure has a co-ordination number of 12

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

D. (d) The length of the unit cell in NaCl in 552 "pm" (given that r_{Na}^{+}= 85 "pm" and r_{Cl}^{-}= 181 " pm")

Answer: C

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6. An hcp and a ccp structure for a given element would be expected to have

(a)The same co-ordinational number

(b)the same density

(c)the same packing fraction

(d)all of the above

A. The same co-ordinational number

B. the same density

C. the same packing fraction

D. all of the above

Answer: A::C

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7. Select the correct statement (s) for the rock -salt structure (NaCl)

:

A. (a) The tetrahedral voids are smaller than the octahedral sites

B. (b) The octahedral voids are occupied by cations and the tetrahedral sites are empty

C. (c) The radius ratio (r_c/r_a) is 0.225

D. (d) The radius ratio (r_c/r_a) is 0.732

Answer: A::B

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8. select the correct statement (s)

A. The ionic crstal of AgBr may have Schottky defect

B. The unit cell having crystal parameters, $a = b \neq c, \alpha = \beta = 90^\circ, \gamma = 120^\circ$ is hexagonal

C. In ionic compounds having Frenkel defect the ratio r^+/r^- is high

D. The co-ordination number of Na^+ ion in NaCl is 6

Answer: A::B::D

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9. Which of the following represents the closet packed arrangement of uniform solid spheres:

A. simple cubic unit cell

B. body centered cubic unit cell

C. face centered cubic unit cell

D. hcp unit cell

Answer: C::D

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10. select the correct statement (s)

A. (a) A cubic system possesses a total of 23 elements of symmetry

B. (b) A cubic contains centre of symmetry , planes of symmetry as well as axes of symmetry

C. (c) For triclinic system $a \neq b \neq c$ and $\alpha \neq \beta \neq \gamma \neq 90^{\circ}$

D. (d) The total no. of Bravais space lattic belonging ta all the seven crystals are 14

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

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11. : What are the categories into which polymers can be classified based on their structure?

A. Co-ordinational no. of Cs^+ and Cl^- are 8, 8 in CsCl crystal

B. If radius ratio $(r_c/r_a) < 0.225$ then shap of compound must be linear

C. If radius (r_c/r_a) lies between 0.414 to 0.732 then shope of ionic compound may be square planner $(Ex.\ PtCl_4^{2-})$

D. If radius ratio is less than than 0.155 then shape of compound is linaer

Answer: A::C::D

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12. select the correct statement (s)

A. CsCl change to NaCl structure on heating

B. NaCl changes to CsCl structure on applying pressure

C. Co-ordination number decreses on applyping pressure

D. Co-ordination number increses on heating

Answer: A::B

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13. select the correct statement (s)

A. A NaCl type AB crystal lattice can be interperted to be made up of two individual fcc type uint lattice of A^+ and B^- fused togther is such a manner that the corner of one unit lattic becomes the edge centre of the other

B. In a fcc unit , cell the body centre is an octahedral void

C. In an scc lattice, there can be no octahedral void

D. In an scc lattice,the body centre is the octaedral

Answer: A::B::C

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14. In a AB unit cell (Rock salt type) assuming A^+ forming fcc :

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15. Amorphous solids :

A. (a) do not have sharp melting points .

B. (b) are isotrophic

C. (c) have same physical properties in all direction

D. (d) are supercooled liquids

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

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16. Which is /are correct statement about zinc blende structure ?

(a) The number of first neighbours of S^{2-} is 4

(b) The maximum distance Zn^{2+} is $a\frac{\sqrt{3}}{2}$, where 'a' = egde length of unit cell

(c) If all tetrahedral voids are occupied by Zn^{2+} then C.N. of S^{2-} is 8

(d) If all tetrahedral voids are occupied by Zn^{2+} then C.N. change from 4:4 to 8:8.

A. The number of first neighbours of S^{2-} is 4

B. The maximum distance Zn^{2+} is $a\frac{\sqrt{3}}{2}$, where 'a' = egde length of unit cell

C. If all tetrahedral voids are occupied by Zn^{2+} then C.N. of S^{2-} is 8

D. If all tetrahedral voids are occupied by Zn^{2+} then C.N. change from 4: 4 to 8: 8.

Answer: A::B::C

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17. Compound X_2Y have antiflurate structure . What is /are correct statement ?

A. The miimum distance between X^+ is $\frac{a}{2}$, where 'a' =edge length of unit cell

B. The co-ordination number ratio of x and y 8:4

C. If X^+ removed from alternate tetrahedral void then CN is 4 : 4

D. If X^+ removed from alternate tetrahedral void then CN is 4 :

8

Answer: A::C

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18. Which is / are correct statement ?

A. Packing fraction in 2D-hcp is 0.785

B. Packing fraction in AAA..... Is 0.52

C. Packing fraction in ABAB..... is 0.74

D. Packing fraction in ABCABC..... Is 0.26

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

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19. Which is / are correct statement ?

A. In simple cubic close packed arrangement no octahedral void is present at edge centre.

B. In fcc unit cell octaherdral void and tetrahedral void are vacant .

C. Packing fraction : simple cubic cell $<$ bcc unit cell $<$ fcc unit cell.

D. Size of void : cubic $>$ octachedral void $>$ trtrahedral void.

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

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20. Given : Radius of $A^{2+} = 100 \pm$: Radius of C^{+} = 240 "pm" , $Radiusof$B^(200 " pm", $Radiusof$D^(-) =480 `"pm" . Which is/are

correct statement ?

A. Coordination number of A^{2+} in comp AB is 4

B. Coordination number of A^{2+} in comp AB is 6.

C. Coordination number of C^{+} in comp CD is 6.

D. Coordination number of C^{+} in comp AB is 8.

Answer: A::C

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Match The Column

1. Match Column-I to II

Column-I	Column-II
(A) Tetragonal and Hexagonal	(P) are two crystal systems
(B) Cubic and Rhombohedral	(Q) $\alpha = \beta = \gamma$
(C) Monoclinic and Triclinic	(R) $a \neq b \neq c$
(D) Cubic and Orthorhombic	(S) $a = b = c$

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2. Match the following columns

Column-I	**Column-II**
(A) If radius ratio $x = \left(\frac{r_c}{r_a}\right) < 0.155$	(P) Co-ordination no. is 8
(B) If $0.225 \le x < 0.414$	(Q) Co-ordination no. is 4
(C) If $0.414 \le x < 0.732$	(R) Co-ordination no. is 6
(D) If $0.732 \le x < 1$	(S) Co-ordination no. is 2

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3. Match column -I to II

Column-I (Shape of Compound)	**Column-II** (Co-ordination No.)
(A) Linear	(P) 6
(B) Triangular planar	(Q) 4
(C) Square planar	(R) 2
(D) Octahedral	(S) 3

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4. Match the following columns

Column-I	Column-II
(A) Rock salt structure	(P) general formula is AB
(B) Zinc blende structure	(Q) general formula is AB_3
(C) Fluorite structure	(R) general formula is A_2B
(D) Anti fluorite structure	(S) general formula is AB_2

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5. Match the following columns

Column-I		Column-II
(A) Co-ordination no. of Ca^{2+} and F^- in fluorite structure	(P)	8, 4
(B) C.No. of Zn^{2+} and S^{2-} in zinc blende structure	(Q)	8, 8
(C) C.No. of Cs^+ and Cl^- in CsCl (bcc type) structure	(R)	4, 8
(D) C.No. of Li^+ and O^{2-} in antifluorite structure	(S)	4, 4

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6. Match the column-I to II

Column-I [Bravais Lattice(s)]	Column-II (Crystal System)
(A) Primitive, face centered, body centered, end centered	(P) Cubic
(B) Primitive, face centered, body centered	(Q) Orthorhombic
(C) Primitive, body centered	(R) Hexagonal
(D) Primitive only	(S) Tetragonal

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7. Match the following columns

Column-I	Column-II
(A) Magnetic moment in a paramagnetic substance	(P) 
(B) Magnetic moment in a ferromagnetic	(Q) 
(C) Magnetic moment in a antiferromagnetic	(R) 
(D) Magnetic moment in a ferrimagnetic	(S) 

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8. Match the following columns

Column-I (Structure)	Column-II (Edge length of unit cell)
(A) Rock salt (NaCl)	(P) $a = (r_{Cation} + r_{Anion})$
(B) CsCl	(Q) $a = \frac{4}{\sqrt{3}}(r_{Cation} + r_{Anion})$
(C) Zinc blende (ZnS)	(R) $a = \frac{2}{\sqrt{3}}(r_{Cation} + r_{Anion})$
(D) Anti fluorite (Na_2O)	(S) $a = 2(r_{Cation} + r_{Anion})$

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9. Match the following columns

Column-I (Ideal structure)	Column-II (Packing fraction)
(A) Rock salt	(P) 0.729
(B) Zinc blende	(Q) 0.756
(C) Fluorite	(R) 0.793
(D) CsCl	(S) 0.748

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10. Match the following columns

Column-I (Structure)	Column-II (Voids occupied)
(A) Rock salt	(P) 100% tetrahedral voids occupied by cation
(B) Zinc blende	(Q) 100% tetrahedral voids occupied by anion
(C) Fluorite	(R) 100% octahedral voids occupied by cation
(D) Anti fluorite (Na_2O)	(S) 50% tetrahedral voids occupied by cation

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Assertion Reason Type Question

1. Statement I: In any ionic solid $[MX]$ with Schottky defect, the number of positive and negative ions are same.

Statement II: An equal number of cation and anion vacancies is present.

A. If both the statement are TRUE and STATEMENT -2 is the correct explanation of STATEMENT -1

B. If both the statement are TRUE and STATEMENT -2 is the not correct explanation of STATEMENT -1

C. If STATEMENT -1 is the correcct and TRUE and STATEMENT -2 is FALSE

D. If STATEMENT -1 is the correcct and FALSE and STATEMENT -2 is TRUE

Answer: A

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2. STATEMENT -1 : Amorphous solids are isotropic

STATEMENT -2 : Amorphous solids lack a regular three-dimensional arrangement of atoms.

A. If both the statement are TRUE and STATEMENT -2 is the correct explanation of STATEMENT -1

B. If both the statement are TRUE and STATEMENT -2 is NOT the correct explanation of STATEMENT -1

C. If STATEMENT -1 is the correcct and TRUE and STATEMENT -2 is FALSE

D. If STATEMENT -1 is the correcct and FALSE and STATEMENT -2 is TRUE

Answer: A

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3. STATEMENT -1 : Diamond is a covalent solid .

STATEMENT -2 The co-ordination number of each carbon atom is diamond is 4

A. If both the statement are TRUE and STATEMENT -2 is the correct explanation of STATEMENT -1

B. If both the statement are TRUE and STATEMENT -2 is NOT the correct explanation of STATEMENT -1

C. If STATEMENT -1 is the correcct and TRUE and STATEMENT -2 is FALSE

D. If STATEMENT -1 is the correcct and FALSE and STATEMENT -2 is TRUE

Answer: B

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4. STATEMENT -1 : In NaCl structure , Na^+ ion occupy octahedral holes and Cl^- ions

occupy ccp.

STATEMENT -2 : The distance of the nearest neighours in NaCl structure is $a/2$ where a

is the edge length of the cube .

A. If both the statement are TRUE and STATEMENT -2 is the correct explanation of STATEMENT -1

B. If both the statement are TRUE and STATEMENT -2 is NOT the correct explanation of STATEMENT -1

C. If STATEMENT -1 is the correcct and TRUE and STATEMENT -2 is FALSE

D. If STATEMENT -1 is the correcct and FALSE and STATEMENT -2 is TRUE

Answer: B

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5. STATEMENT -1 : For fluorite structure , the F^- ions occupy tetrahedral void and Ca^{2+} ions in ccp

STATEMENT-2 : The radius ratio of fluorte structure is 0.414

A. If both the statement are TRUE and STATEMENT -2 is the correct explanation of STATEMENT -1

B. If both the statement are TRUE and STATEMENT -2 is NOT the correct explanation of STATEMENT -1

C. If STATEMENT -1 is the correcct and TRUE and STATEMENT -2 is FALSE

D. If STATEMENT -1 is the correcct and FALSE and STATEMENT -2 is TRUE

Answer: C

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

Statement -2 CsCl crystallizes in BCC structure

A. If both the statement are TRUE and STATEMENT -2 is the correct explanation of STATEMENT -1

B. If both the statement are TRUE and STATEMENT -2 is NOT the correct explanation of STATEMENT -1

C. If STATEMENT -1 is the correcct and TRUE and STATEMENT -2 is FALSE

D. If STATEMENT -1 is the correcct and FALSE and STATEMENT -2 is TRUE

Answer: D

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7. Assertion (A) : The electrical conductivity of a semiconductor increases with increase in temperature.

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

A. (a) If both the statement are TRUE and STATEMENT -2 is the correct explanation of STATEMENT -1

B. (b) If both the statement are TRUE and STATEMENT -2 is NOT the correct explanation of STATEMENT -1

C. (c) If STATEMENT -1 is TRUE and STATEMENT -2 is FALSE

D. (d) If STATEMENT -1 is FALSE and STATEMENT -2 is TRUE

Answer: A

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8. STATEMENT -1 : FeO is non-stoichiometric with formula $Fe_{0.95}O$.

STATEMENT -2 : Some Fe^{2+} ions are replaced by Fe^{3+} as $3Fe^{2+}$ = $2Fe^{3+}$ to maintain electrons neutrality .

A. (a) If both the statement are TRUE and STATEMENT -2 is the correct explanation of STATEMENT -1

B. (b) If both the statement are TRUE and STATEMENT -2 is NOT the correct explanation of STATEMENT -1

C. (c) If STATEMENT -1 is TRUE and STATEMENT -2 is FALSE

D. (d) If STATEMENT -1 is FALSE and STATEMENT -2 is TRUE

Answer: A

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9. Assertion : The number of tetrahedral voids is double the number of octahedral voids

Reason : The size of the tetrahedral voids is half of that of the octahedral void

A. If both the statement are TRUE and STATEMENT -2 is the correct explanation of STATEMENT -1

B. If both the statement are TRUE and STATEMENT -2 is NOT the correct explanation of STATEMENT -1

C. If STATEMENT -1 is the correcct and TRUE and STATEMENT -2 is FALSE

D. If STATEMENT -1 is the correcct and FALSE and STATEMENT -2 is TRUE

Answer: C

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10. Statement : Due to Frenkel defect the density of the crystalline solid remains same.

Explanation : In Frenkel defect, no cations or anions leave the lattice.

A. If both the statement are TRUE and STATEMENT -2 is the correct explanation of STATEMENT -1

B. If both the statement are TRUE and STATEMENT -2 is NOT the correct explanation of STATEMENT -1

C. If STATEMENT -1is TRUE and STATEMENT -2 is FALSE

D. If STATEMENT -1 is FALSE and STATEMENT -2 is TRUE

Answer: A

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

Reason (R) : On heating, the randomization of spins occurs.

A. If both the statement are TRUE and STATEMENT -2 is the correct explanation of STATEMENT -1

B. If both the statement are TRUE and STATEMENT -2 is NOT the correct explanation of STATEMENT -1

C. If STATEMENT -1 is the correcct and TRUE and STATEMENT -2 is FALSE

D. If STATEMENT -1 is the correcct and FALSE and STATEMENT -2 is TRUE

Answer: A

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Subjective Problems

1. In seven possible crystal system how many crystal system have more than one Bravais lattice ?

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2. The number of atoms present per unit cell in simple, fcc and bcc are ....., ..., and ....., respectively.

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3. In solid X atoms goes to corner of the cube and two alternate face center . Calculate effective number of atom of X in unit cell ?

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4. Find the distance (in pm) between the body centered atoms and one corner atom in an element $(a = 2.32\text{pm})$

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5. The structure of MgO is similar to NaCl. What is the co-ordination number of Mg?

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6. Calculate the following:

a. Number of ZnS units in a unit cell of zinc blend.

b. Number of CaF_2 units in a unit cell of CaF_2.

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7. What is the co-ordination number of sodium in Na_2O ?

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8. Lithium has a bcc structure .Its density is $530kgm^{-3}$ and its atomic mass is $6.94gmol^{-1}$ .Calculate the edge length of a unit cell of lithium metal $\left(N_A = 6.02 \times 10^{23}mol^{-1}\right)$

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9. What is the co-ordination number of Cl^- in CsCl structure ?

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10. In cubic system how many atomic arrangements exist in nature ?

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11. The ionic radii of A^+ and B^- are 1.7Å and 1.8Å respectively . Find the co-ordination number of A^+

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12. Ionic solid Na^+A^- crystallise in rock salt type structure . 2.592 gm of ionic solid salt NaA dissolved in water to make 2 litre solution . The pH of this solution is 8. If distance between cation and anion is 300 pm. Calculate density of ionic solid (P low =13,P low (HA)=13)

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13. Calculate the value of $\frac{Z}{10}$. Where

Z = co-ordination number of 2D-square close packing

+

Co-ordination number of 2D-hcp

+

Co-ordination number of 3D-square close packing

+

Co-ordination number of 3D, ABCABC.....packing

+

Co-ordiantional number of 3D, ABAB.....packing .

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