

## **CHEMISTRY**

# **BOOKS - NARENDER AVASTHI CHEMISTRY (HINGLISH)**

# **SOLID STATE**

#### Exercise

- 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 Watch Video Solution 2. Which one is called pseudo solid? A. $CaF_2$ B. Glass C. NaCl D. All Answer: B Watch Video Solution

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



4. Graphite is an example of:

A. ionic solid

B. covalent solid

C. metallic solid

D. none of these

Answer: B



- 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. X-ray diffraction technique

B. neutrons bombardment

C. protons bombardment

D. none of these

Answer: A

**8.** if a=b
eq c and  $lpha=eta=\gamma=90^\circ$  , 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. 
$$a=b=c, lpha=eta=\gamma=90^\circ$$

B.  $a=b
eq c, lpha=eta=\gamma=90^\circ$ 

C.  $a 
eq b 
eq c, lpha 
eq eta 
eq \gamma 
eq 90^\circ$ 

D. 
$$a 
eq b 
eq c, lpha = eta = 90^\circ \gamma 
eq 120^\circ$$

#### **Answer: C**



**10.** If all three iterfacial angeles defining the unit cell, are equal in magniture, the crystal cannot be:

A. rhombohedral

B. cubic

C. hexagonal

D. tetragonal

Answer: C

**11.** In a hexagoanl crystal:

A. 
$$lpha=eta=\gamma
eq90^\circ, a=b=c$$

B. 
$$lpha=eta=\gamma=90^\circ, a=b
eq c$$

C. 
$$lpha=eta=\gamma=90^\circ, a
eq b
eq c$$

D. 
$$lpha=eta=90^\circ, \gamma=120^\circ, a=b
eq c$$

#### Answer: D

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**12.** Orthorhombic crystal has the following unit cell parameters:

A. 
$$a=b=c, lpha=eta=\gamma=90^\circ$$

B. 
$$a=b
eq c, lpha=eta=\gamma=90^\circ$$

C. 
$$a 
eq b 
eq c, lpha = eta = \gamma = 90^\circ,$$

D. 
$$a=b
eq c, lpha=eta=90^\circ, \gamma=120^\circ$$

#### Answer: C

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**13.** Which of the crystal systems has maximum number of Bravais lacttices?

A. Cubic

**B.** Hexagonal

C. Triclinic

D. Orthohombic

**Answer: D** 



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

A. Tertragonal, Cubic

B. triclinic , Cubic

C. Rhombohedral, Hexagonal

D. Orthohombic, Cubic

#### Answer: B



15. Tetragonal crystal system has the following unit cell dimensions

A. cubic

B. tertragonal

C. monoclinic

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

**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



**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. 
$$\frac{a}{2}$$
,  $\frac{a}{2\sqrt{2}}$   
B.  $\frac{a}{\sqrt{2}}$ ,  $\frac{a}{2}$   
C.  $\frac{a}{2\sqrt{2}}$ ,  $\frac{a}{2}$   
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//2

B.  $a/\sqrt{2}$ 

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

D.  $3\sqrt{2}/4$ 

Answer: C

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

simple cubic is

A. 0.48

B. 0.52

C. 0.55

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. 0.32 B. 0.48 C. 0.68

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:

 $\mathsf{A.}\ 0.32$ 

B.0.48

 $\mathsf{C}.\,0.68$ 

 $\mathsf{D}.\,0.74$ 

Answer: D

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

A. simple cubic

B. Body centred cubic

C. Face centred cubic

D. Simple tertragonal

Answer: C



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

A. Body centred cubic

B. Face centred cubic

C. Face centred cubic

D. Simple tertragonal

#### Answer: C



**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. 0.144NM

B. 0.156NM

C. 0.118NM

D. 0.102nm

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



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



**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. 4,8

B. 2,8

C. 2,6

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

#### Answer: C

D. 2,5

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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:  $(useN_A=6 imes10^{23})$ 

A. primitive

B. body centred

C. Face centred

D. end centred

**Answer: D** 



**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 ?

(Atomic massW = 184)

A. simple cubic

B. Body centred cubic

C. Face centred cubic

D. none of these

#### Answer: B



**37.** The density of argon (face centered cubic cell) is  $1.83g/cm^3at20^{\circ}C$ . What is the length of an edge a unit cell? (Atomic mass: Ar = 40)

A. 0.599nm

B. 0.569nm

C. 0.525nm

D. 0.551nm

Answer: C



**38.** The density of nickel (face centered cubic cell) is  $8.94g/cm^3at20^{\circ}C$ . What is the radius of the atom? (Atomic mass: Ni = 59)

A. 0.124nm

B. 0.136nm

C. 0.149nm

D. 0.110nm

Answer: A



**39.** The density of krypton (face centered cubic cell) is  $3.19g/cm^3$ . What is the radius of the atom? (Atomic mass: Kr = 84) A. 0.198nm

B. 0.221nm

C. 0.206nm

D. 0.225nm

Answer: A



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

A. 20.9

B. 20.4

C. 19.6

Answer: D



**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



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

A. 87.6

B. 79.9

C. 85.5

D. 83.9

#### Answer: D



**43.** The elements crystallizes in a body centered cubic lattice and the edge of the unit cell is 0.351nm. The density is  $0.533g/cm^3$ . 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.  $0.4 imes N_A$ 

B.  $0.1 imes N_A$ 

 $\mathsf{C.4} \times \mathit{N_A}$ 

D. none of these

#### Answer: D

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

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

type:

A. Hexagonal closse-packing

B. Cubic close-packing

C. Body-cebtred cubic packing

D. Malleablity is not related to type of paacking

#### Answer: B

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

A. 12 B. 4 C. 8 D. 6

Answer: A



**49.** 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

 $\mathsf{C}.\,x^2\!:\!y$ 

D. y:  $x^2$ 

#### Answer: B



**50.** The atomic radius of strontium (Sr) is 215pm and it crystallizes

with a cubic. Closest packing . Edge length of the cube is :

A. 4.30pm

B. 608.2pm

C. 496.53pm

D. none of these

**Answer: B** 



**51.** By X-ray diffraction it is found tht nickel  $(at mass = 59gmol^{-1})$ , crystakkuzes with 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.  $6.05 imes 10^{23}$ 

 $\text{B.}\,6.11\times10^{23}$ 

 ${\sf C}.\,6.02 imes10^{23}$
D.  $6.023 imes 10^{23}$ 

Answer: B



52. 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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**53.** 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 lt B

C. A gt B

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

## Answer: A

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

A. Hexagonal

B. tertragonal

C. Face centred cubic

D. primitive cubic

Answer: C

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55. 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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**56.** The unit cell present in ABAB, closest packing of atoms is:

A. Hexagonal

B. tertragonal

C. face centered cubic

D. primitive cubic

Answer: A

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57. 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

Answer: D

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**58.** 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



**59.** 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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**60.** Which of the following figures represets the cross-section of an octahedral site?



## Answer: D



**61.** In which of the following paris of structures, tetrahedral as well as octahedrak 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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**62.** The number of octahedral void in bcc structure is:

A. 0

B. 1

C. 2

D. 4

Answer: A

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**63.** 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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**64.** 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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**65.** An ionic compound is expected to have body centred type cubic unit cell if  $r_c/r_a$ :

A. is greater than 0.732

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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**66.** In the closed packing of atoms A  $(radius: r_a)$ , the radius of atom B that can be fitted into tetrahedral void is:

A.  $0.155r_a$ 

 $\mathsf{B.}\, 0.255 r_a$ 

 $\mathsf{C.}\,0.414r_a$ 

 $\mathsf{D}.\,0.732r_a$ 

Answer: B



A.  $1.155r_a$ 

 $\mathrm{B.}\,0.255r_a$ 

C.  $0.414r_a$ 

 $\mathsf{D}.\,0.732r_a$ 

## Answer: C



68. 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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69. 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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70. In the closest packing of atoms

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

void

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

void

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

void

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

**71.** The the ionic compound AB the ratio  $r_{A+}: r_{B-}is0.414$ . 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

72. 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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73. 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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**74.** 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

**75.** 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  $(r^+/r^-)$  this contact is prevented

A. 0.225

B. 0.414

C. 0.632

D. 0.732

Answer: D

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**76.** 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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77. 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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78. 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



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

(1). 
$$MgO: r_c = 0.65$$
Å,  $r_a = 1.40$ Å

(2). 
$$MgS$$
:  $r_c = 0.65$ Å,  $r_a = 1.84$ Å

A. 6,4

B. 4,6

C. 3,4

D. 6,8

#### Answer: A



**80.** 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.  $A_7 B_{12}$ 

C.  $A_7 B_{24}$ 

D.  $A_{24}B_7$ 

Answer: C



**81.** 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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**82.** 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.  $AB_2O_4$ 

 $\mathsf{C.}\,A_2B_2O_2$ 

D.  $A_4B_2O_2$ 

Answer: B

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**83.** 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

 $\mathsf{B.}\, CA_2$ 

 $\mathsf{C.}\,C_2A_3$ 

D.  $C_3A_2$ 

## Answer: C

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**84.** 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.  $AB_2O_3$
- $\mathsf{C.}\,A_{\,\circ}\,BO_4$
- D.  $AB_4O_4$

## Answer: A

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**85.** 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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**86.** 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



**87.** 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



**88.** 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



**89.** 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



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

A. 
$$r_c + r_a = a$$

 $\mathsf{B.}\, r_c + r_a = 2a$ 

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

D.

Answer: B

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**91.** 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



**92.** 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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**93.** 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



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

A.  $8Cl^{-}ions$ 

B.  $12Na^+ions$ 

 $\mathsf{C.}\,12Cl^{-}ions$ 

D.  $24Cl^{-}ions$ 

Answer: B

**95.** 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.  $27 \text{pm}^3$ 

 ${\tt B.\,64pm^3}$ 

 $C. 125 pm^3$ 

D.  $216 \text{pm}^3$ 

Answer: D



**96.** 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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**97.** Select the incorrect statement in a CsCl crystal:

A.  $Cs^+$  forms a simple cubic lattice,  $Cl^-$  forms a simple cubinc

lattice

B.  $Cl^-$  occupies body centre of  $Cs^+$ 

C.  $Cs^+$  occupies body centre of  $Cl^-$ 

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



99. 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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**100.** For a solid with the structure shown in Fig, the coordination number of the points of the points A and , respectively are


A. 6,8

B. 8,8

C. 6,6

D. 4,6

## Answer: C



101. An ionic compound AB has fluorite type structres. If the radius

 $B^{-}is200$ pm, then the ideal radius of A^(+)` would be:

A. 82.8pm

B. 146.4pm

C. 40pm

D. 45pm

Answer: D

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

A. NaCl

B. ZnS

 $\mathsf{C.}\, CaF_2$ 

D.  $Na_2O$ 

Answer: D

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**103.** 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



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

A. 3.72pm

B. 1.86pm

C. 7.44pm

D. 4.3pm

Answer: A

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**105.** If the radius of  $Cl^1 ion 181$  pm, and the radius of Na<sup>(+)</sup> ion is

101pm then the edge length of unit cel l is:

A. 282pm

B. 285.71pm

C. 512pm

D. 564pm

Answer: D



**106.** Ammonium chloride, crystalliazes in a body centered cubic latteice iwh 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. 116pm

B. 154pm

C. 174pm

D. 206pm

Answer: B

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**107.** Salt AB has a zinc blende structre. The radius of  $A^{2+}$  and  $B^{2-}$  ion are 0.7Å and 0. Å respectively. The edge length of AB unit cell is:

A.  $2.5\text{\AA}$ 

B. 5.09Å

C. 5Å

D. 5.77Å

#### Answer: D

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108. Transition metals, when they form interestitial compounds, the

non-metals (H,B,C,N) ar accodated in:

A. voids or holes in cubic-packed structure

B. tetrahedral voids

C. octahedral voids

D. all of these

#### Answer: D



**109.** 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



110. Which of the folloiwng statement for cyrstals having Schottly

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 common 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



111. Which is correct statement?

A. When temperature increases then number of defects

decreases.

B. Schottky defect occurs when radius of cation is smalller

C. Frenkel defect occurs when radius of cation is smaller

D. none of these

#### Answer: C

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**112.** Frenkel defects asre observed where the differnce in size of cation and anion is large

A. The density of crystals having Frenkel defect is less than that

of a pure percfect crystal

B. In an ionic crystal having Frenkel defect may also contian

Schottky defrect

C. Usually alkali halides do not Frenkel defect

D. Usually alkali halides do not have Frenkel defect

Answer: B

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113. 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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114. Which of the following defects does KBr show?

A. Frenkel

B. Schottky defect occurs when radius of cation is smalller

C. Metal excess

D. Metal deficiency

Answer: B

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**115.** 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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**116.** 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



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

A. AgBr

B. AgCl

C. CsCl

D. ZnS

### Answer: C

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**118.** 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



**119.** 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. 77.07pm

B. 154.14pm

C. 251.7pm

D. 89pm

Answer: B

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

A.  $10^{-5} imes N_A$ 

B.  $10^{-7} imes N_A$ 

C.  $2 imes 10^{-7} imes N_A$ 

D. none of these



**121.** The composition of a sample of Wustite is  $Fe_{0.93}O_{1.00}$ . What percentage 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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**122.** A certain sample of cuprous sulphide is found to have composition  $Cu_{1.8}S$ , because of imcroporation 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

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123. Ferrimagnetism is in:

A. 
$$\uparrow$$
  $\uparrow$   $\uparrow$   $\uparrow$   $\uparrow$ 

B.  $\uparrow \downarrow \uparrow \downarrow$ 

# C. $\uparrow$ $\uparrow$ $\uparrow$ $\downarrow$ $\downarrow$

D. none of these

Answer: C

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**124.**  $Fe_3O_4$  is ferrimagnetic at room temperature but at 850K it becomes::

A. diamagnetic

B. ferromagnetic

C. non-magnetic

D. paramagnetic

Answer: D



**125.** 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



126.  $TIAI(SO_4)_2$ .  $xH_2O$  is bcc with 'a' =1.22 nm. If the density of the solid is 2.32g/cc, then the value of x is (Given : $N_A=6 imes10^{23}$ ) ,

at . Mass : TI = 204, AI = 27, S = 32).

A. 2

B. 4

C. 47

D. 70

#### Answer: C

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127. 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



**128.** The packing efficiency of a simple cubic crystal with an interstitcal atom exctly fitting at the boby center is :

A. 0.48

B. 0.52

C. 0.73

D. 0.91

Answer: C

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

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

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

C. 3.5g/cc

D. 1.75*b* /

Answer: D



**130.** Sodium (Na =23) crystallizen in bcc arrangement with the interfacial separation between the atoms at the edge 53.6pm. The density of sodium crystal is:

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

B. 2.46g/cc

C. 1.19g/cc

D. None of these

Answer: C

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**131.** 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. 35.64

B.64.36

**C**. 74

D. None of these

#### Answer: B

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**132.** 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. 
$$\frac{7\sqrt{3\pi}}{64}$$
  
B.  $\frac{7\sqrt{3}}{128}$   
C.  $\frac{7.\pi}{24}$ 

D. None of these

### Answer: D



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



Answer: A



**134.** 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



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



The formula of compound is :

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

B.  $AB_2C_3$ 

 $\mathsf{C.}\,A_2B_2C_5$ 

D.  $ABC_5$ 

Answer: B



**136.** 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/mol and atomic mass (B) = 50g/mol]

A. 33.3

B. 4.33

C. 2.33

D. 5.33

Answer: B



**137.** 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.  $1/\sqrt{3}$ Å

B.  $\sqrt{2}$ Å

C.  $\sqrt{3}$ Å

D.  $1/\sqrt{2}$ Å

#### Answer: C



**138.** 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.  $N_A$ 

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

C.  $4N_A$ 

D. None of these

#### Answer: D

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139. 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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**140.** A crystal of lead (II) sulphide has NaCl structure . 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. 
$$209.6 imes10^{-24} cm$$

B.  $207.8 imes 10^{-23} cm$ 

C.  $22.3 imes 10^{-23} cm$ 

D.  $209.8 imes 10^{-23} cm$ 

Answer: A



141. 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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**142.** 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



143. 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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144. 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  $N_A=6 imes10^{23}$ )?

A. 2.0g/cc

B. 2.66g/cc

 $\mathsf{C.}\, 3.06g/\operatorname{cc}$ 

D. None of these

Answer: B

145. An element X (At. Wt. =224) forms FCC lattice. If the edge length of lattice is  $4 imes10^{-8}$  cm and the observed density is  $2.4 imes10^{3kg/m^3}$ . Then the percentage occupancy of lattice point by element X is :  $(N_A=6x10^{23})$ 

A. 96

B. 98

C. 99.9

D. None of these

Answer: A



**146.** 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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**147.** 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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148.  $A_2B$  molecules (molar mass = 259.8g/ml) crystallises in a hexagonal lattice as shown in figure .The lattic constants were a = 5Å and b = 8Å. If denstiy of crystal is  $5g/cm^3$  then how many molecules are contained in given unit cell ? (  $~{
m Use}N_A=6 imes 10^{23})$ 



# A. 6

B. 4

C. 3

D. 2

Answer: D

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

A. 2.46/cc

B. 0.41g/cc

C. 1g/cc

D. 1.41g/cc

Answer: B



**150.** How many efficitive  $Na^+$  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



**151.** 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.  $X_4Y_3$ 

 $\mathsf{B.}\, X_5Y_5$ 

 $\mathsf{C.}\, X_4Y_5$ 

D. None of these

#### Answer: B

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

$$\begin{array}{l} \mathsf{C.}\,P.\,F.\,\,=\,\,\displaystyle\frac{\frac{4}{3}\pi\Big(\frac{5}{2}r_{+}^{3}\,+\,r_{-}^{3}\Big)}{16\sqrt{2}r_{-}^{3}}\\\\ \mathsf{D.}\,P.\,F.\,\,=\,\displaystyle\frac{\frac{4}{3}\pi\Big(\frac{7}{2}r_{+}^{3}\,+\,r_{-}^{3}\Big)}{16\sqrt{2}r_{-}^{3}} \end{array}$$

#### Answer: B

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**153.** 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.  $XYZ_2$ 

 $\mathsf{B.} X_2 Y Z_2$ 

 $\mathsf{C.}\, X_8 Y T_4 Z_5$ 

D.

**154.** 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

 $\mathsf{B.}\,A_5B_7$ 

 $\mathsf{C.}\,A_7B_5$ 

D.  $ABC_8$ 

Answer: A



**155.** 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.  $ABC_2$ 

 $\mathsf{C.}\,A_4B_4C$ 

D.  $ABC_8$ 

Answer: B



**156.** Given length of side of hexagonal unit cell is  $\frac{100}{\sqrt{2}}$  pm . The volumes of hexagonal unit cell is (inpm<sup>3</sup>):

A.  $8 imes 10^6$ B.  $1.5 imes 10^6$ C.  $64 imes 10^6$ 

D.  $36 imes 10^6$ 

Answer: B

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

$$P. E = rac{\text{Volume of the atoms(s) present in a unit cell}}{\text{Volume of unit cell}} = rac{Z imes rac{4}{3} \pi r^3}{a^3}$$
  
and % of empty space = 100 - P. F.  $imes$  100

where Z= effective number of stoms in s cube .

r= radius of a an atoms

a = edge lenght of the cube

 $\%\,$  of energy space in body centered cubic cell unit is nearly :

A. 52.36

B. 68

C. 32

D. 26

## Answer: C

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

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

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



159. Density of a unit cell is respresented as

Effective no. of atoms (s) $\times$ Mass of a unit cell

Volume of a unit cell

 $\frac{Z.\ M}{N_A.\ a^3}$ 

 $\rho$  :

where , mass of unit cell =mass of effectuive no . of atoms(s) or ion

(s).

M= At . mass// formula

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

a= edge lemght of unit cell

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

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

A. 40.7nm

 $\mathsf{B.}\, 0.2035nm$ 

 $\mathsf{C}.\,0.101nm$ 

 $\mathsf{D.}\,4.07nm$ 

Answer: A

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160. 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 , mass of unit cell =mass of effectuive no . of atoms(s) or ion
(s). M = At . mass // formula

 $N_{4}$ = Avogadro' s no .  $\Rightarrow 6.0323 imes 10^{23}$ 

a= edge lemght of unit cell

An elemetn crystallizes in a steucture having fcc unit cell of an edge

200 pm . Calculate the density , if 100 g of this element contains  $12 imes 10^{23}$  atoms :

A.  $41.66g/cm^3$ 

B.  $4.166g/cm^3$ 

C.  $10.25g/cm^3$ 

D.  $1.025g/cm^3$ 

Answer: A

# 161. Density of a unit cell is respresented as

ho =	Effective no. of atoms (s) $ imes$ Mass of a unit cell	_	Z. M
	Volume of a unit cell		$N_A. a^3$
where , mass of unit cell =mass of effectuive no . of atoms(s) or ion			
(s).			

M= At . mass// formula

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

a= edge lemght of unit cell

The density of KBr is  $2.75g/cm^{-3}$  . 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

**162.** 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.

The fromule of the spinel is :

A.  $Mg_2AlO_4$ 

 $\mathsf{B.}\, MgAl_2O_4$ 

 $\mathsf{C.}\, Mg_3Al_2O_6$ 

**163.** 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.

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

A. tetrahedral

B. octahedral

C. both (a) amd(b)

**164.** 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.

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

A. tetrahedral

B. octahedral

C. both (a) amd(b)

**165.** 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

### Answer: A

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**166.** 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.

which defect decrease density of the crystal ?

A. Frenkel defect

B. Schootky defect

C. both (a) amd(b)

D. None of these

#### Answer: B



**167.** 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<sup>+</sup> Anion : B<sup>-</sup>

- A. Schootky defect
- B. Frenkel defect
- C. Mental excess defect
- D. None of these

#### Answer: B



**168.** 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<sup>+</sup> Anion : B<sup>-</sup>

A. Schootky defect

B. Frenkel defect

C. Both defect

D. None of these

#### Answer: D

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**169.** 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



**170.** 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

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Silicon that has been dopend 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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**171.** 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.

Silicon that has been dopend 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



172. Mentallic Gold crystallise in fcc lattice and the length of cubic

unit cell is 407 pm.

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

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

A. 4.86

B. 9.72

C. 19.48

D. 19.44

### Answer: D



173. Metallic gold crystallises in face centred cubic lattice with edge-

length 4.07Å. Closest distance between gold atoms is:

A. 407pm

 $\mathsf{B.}\,407\sqrt{1}$ 

C. 
$$\frac{407}{\sqrt{2}}$$
  
D.  $407\frac{\sqrt{3}}{2}$ 

Answer: A

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174. 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  $(N_A=6 imes10^{23})$ 

The mass of diamond unit cell is:

A.  $96a\mu$ 

B. 96gm

C.  $144a\mu$ 

D. 144gm

#### Answer: A



175. 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  $\left(N_A=6 imes10^{23}
ight)$ 

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

A. 154

B. 1422.63

C. 711.32

D. 355.66

176. 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  $(N_A=6 imes10^{23})$ 

The density of daimond unit cell is  $\left( {
m in} ~~gm\,/\,cm^3 
ight)$ 

A. 28.48

B. 0.0556

C. 0.445

D. 3.56

Answer: D



**177.** Select the correct statement (s).

A. Co-ordination no. of an atom at a lattice point in sample cubic

arrangement is 6

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

C. Co-ordination no. of an atom at lattice point in hcp

arrangment is 6

D. Co-ordination no.of an atmo at octahedral site is 6

#### Answer: A::B



178. 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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179. Position of octahedral voids in fcc structure is//are

A. edge centers

B. face centers

C. body centers

D. corners

Answer: A::C

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

A. co-ordination no. Of  $Na^+$  is 6

B. co-ordination no. Of  $Cl^-$  is 8

C. length of the unit cell is 552 "pm"

D. length of the unit cell is 380"pm"

## Answer: A::C



181. Select the correct statement (s) :
A. The co-ordinaton number of each type of ions a CsCl crystal is

twelve

B. A metal that crystallizes in a bcc structure has a co-ordination

number of twelve

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

other units cells

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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**182.** 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

Answer: A::C



**183.** Select the correct statement (s) for the rock -salt structure (NaCl):

A. The tetrahedral voids are smaller than the octhedral sites

B. The octahedral voids are occupied by cations and the

tetraherdral sites are empty

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

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

Answer: A::B



high

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

# Answer: A::B::D

**185.** 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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186. select the correct statement (s)

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

B. A cubic contains centre of symmetry , planes of symmetry as

well as axes of symmetry

C. For triclinic system  $a 
eq b 
eq c \, \, {
m and} \, \, lpha 
eq eta 
eq \gamma 
eq 90^\circ$ 

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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187. select the correct statement (s)

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

B. If radius ratio  $\left( r_{c} \, / \, r_{a} 
ight) < 0.225$  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



188. 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

189. 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



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

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**191.** Amorphous soilds :

A. do not have sharp melting points .

B. are isotrophic

C. have same physical propertical in all direction

D. are supercooled liquids

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



192. 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  $a {\sqrt{3}\over 2}$  , where 'a' = egde

length of unit cell

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

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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**193.** Compound  $X_2Y$  have antiflurate structure . What is /are correct statement ?

is 8

A. The miimum distance between  $X^+$  is  $rac{a}{2}$  , 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 :



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

8

# Answer: A::C

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194. 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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**195.** Given : Radius of  $A^{2+} = 100 \pm$  : Radius of  $C^+$  = 240 "pm" , RadiusofB^(2-0 " pm", RadiusofD^(-) =480 `"pm" . Which is/are corret statement ?

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

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

C. Coordiantion number of  $C^+$  in comp AB is 6.

D. Coordiantion number of  $C^+$  in comp AB is 8.

#### Answer: A::C



- (B) Cubic and Rhombohedral(C) Monoclinic and Triclinic
- (R)  $a \neq b \neq c$ (S) a = b = c
- (D) Cubic and Orthorhombic
  - Watch Video Solution





198.	Match	the
150.	Match	CITC

# following

# columns

#### Column-I

	(Shape	of Compound)
$(\Lambda)$	Lincor	

(A)	Linear	(P)	6
(B)	Triangular planar	(Q)	4
(C)	Square planar	(R)	2
(D)	Octahedral	(S)	3

#### Column-II

(Co-ordination No.)





200.	Match	the
200.	macen	cire

#### Column-I

- (A) Co-ordination no. of Ca  $^{2+}$  and F  $^ \,$  (P)  $\,$  8, 4 in fluorite structure
- (B) C.No. of Zn  $^{2\ast}$  and S  $^{2\ast}$  in zinc ~(Q)~~8,8 blende structure
- (C) C.No. of Cs<sup>-</sup> and Cl<sup>-</sup> in CsCl (bcc (R) 4, 8 type) structure
- (D) C.No. of Li<sup>+</sup> and O<sup>2-</sup> in antifluorite (S) 4, 4 structure

#### Column-II

columns

following

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# 201. Match the following columns

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

# 202. Match the

# following

# columns



					Co	olu	mn-	11
(P)	N	1	1	1	1	4		
(Q)	1	ļ	t	ł	1	ł	]	
R)	1	t	ţ	ţ	ł	4	The second second	
S)	1	ţ	ł	Î	ł	ł		

# Watch Video Solution

# 203.

# Match

the

# following

# columns

#### Column-I (Structure)

- (A) Rock salt (NaCl)
- (B) CsCl

(C) Zinc blende (ZnS)

(D) Anti fluorite (Na<sub>2</sub>O)

### Column-II (Edge length of unit cell)

- (P)  $a = (r_{\text{Cation}} + r_{\text{Anion}})$
- (Q)  $a = \frac{4}{\sqrt{3}} (r_{\text{Cation}} + r_{\text{Anton}})$
- (R)  $a = \frac{2}{\sqrt{3}} (r_{\text{Cation}} + r_{\text{Anion}})$
- (S)  $a = 2(r_{\text{Cation}} + r_{\text{Anion}})$

# **204.** Match the following columns

#### Column-I (Structure)

- (A) Rock salt
- (B) Zinc blende
- (C) Fluorite
- (D) Anti fluorite (Na<sub>2</sub>O)

#### Column-II (Voids occupied)

- (P) 100% tetrahedral voids occupied by cation
- (Q) 100% tetrahedral voids occupied by anion
- (R) 100% octahedral voids occupied by cation
- (S) 50% tetrahedral voids occupied by cation

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**206.** 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

Β.

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

**207.** STATEMENT -1 : Amorphous solids are isotrophic

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

208. 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

**209.** 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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**210.** 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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**211.** Statement-1 C.N of  $Cs^+$  ion in CsCl structure is 8

Statement -2 CsCl crystallizes in BBC 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

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

TRUE

Answer: D

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**212.** 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. 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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**213.** STATEMENT -1 : FeO is non-stoichiometric with formula  $Fe_{0.95}O$ . STATEMENT -2 : Some  $Fe^{2+}$  ions are replaced by  $Fe^{3+}$  as  $3Fe^{3+} = 2Fe^{3+}$  to mainatain

electrons neutrally.

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

Reason : The size of the tetrhedral voids is half of that of the ochedral 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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215. 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 -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

**216.** 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

# **217. SEVEN CRYSTAL SYSTEMS**

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218. In seven pssible crystal system hoe many crystal system have

more than one Bravais lattic?

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219. The number of atoms present per unit cell in simple, fcc and

bcc are ....., and ...., respectively.



220. In soild X atoms goes to coner of the cube and two alternate

face center . Calculate effective number of atom of X in unit cell ?



**223.** Calculate the following:

a. Number of Zns units in a unit cell of zine blende.

b. Number of  $CaF_2$  unit cell of  $CaF_2$ .

**224.** What is the co-ordination number of sodium in  $Na_2O$  ?



225. 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  $(N_A=6.02 imes10^{23}mol^{-1})$ 



**226.** What is the co-ordination number of  $Cl^-$  in CsCl structure ?

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227. In cubic system how many atoms arrangement exsit in nature ?



**230.** Calculate the value of `(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 .



# Level 1 Q 33 To Q 62

1. Which of the following layering pattern will have a void fraction

of 0.260?

A. ABCCBAABC

B. ABBAABBA

C. ABAABCABA

# D. ABCAABCA

Answer: C

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Level 3 One Or More Answers Are Correct

1. 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





Level 3 Subjective Problems

**1.** 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

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