



CHEMISTRY

BOOKS - S DINESH & CO CHEMISTRY (HINGLISH)

STATES OF MATTER (SOLID STATE CHEMISTRY)



1. if a=b
eq c and $lpha=eta=\gamma=90^\circ$, the crystal system is

A. cubic

B. tetragonal

C. monoclinic

D. hexagonal

Answer: B

2. The interparticle forces in solid hydrogen are

A. hydrogen bonds

B. covalent bonds

C. co-ordinate bonds

D. van der Waal's forces

Answer: D

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3. NaCl crystal belongs to the crystal system

A. hexagonal

B. cubic

C. tetragonal

D. orthorhombic

Answer: B

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4. A solid melts slightly above 273 K and is a poor conductor of heat and electricity. To which of the following categories does it belong ?

A. ionic solid

B. covalent solid

C. metallic

D. molecular.

Answer: D

5. Which among the following will show anisotropy ?

A. Glass

B. Barium chloride

C. Wood

D. Paper

Answer: B

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6. In a crystal, all the lattice sites are found to be occupied by covalent

molecules. To which kind of solid does it belong ?

A. Ionic

B. Molecular

C. Covalent

D. None

Answer: B
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7. Which of the following adopts normal spinal structure ?
A. CsCl
B. $MgAl_2O_4$
C. FeO
D. CaF_2
Answer: B
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8. In a face centred cubic (f.c.c.) arrangement, the number of atoms per unit cell is

A. 8		
B. 2		
C. 1		
D. 4		

Answer: D

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9. In h.c.p arrangement, the co-ordination number is

A. 6

B. 12

C. 8

D. 10

Answer: B

10. The range of radius ratio (cationic to anionic) for an octahedral arrangement of ions in an ionic solid is

A. 0.155

B. 0.732

C. 0.414

D. 0.225

Answer: C

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11. How many types of Bravais lattices can occur in crystalline solids?

A. 7 types

B. 10 types

C. 14 types

D. 17 types

Answer: C

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12. Which of the following defects, if present, lowers the density of the crystal ?

A. Frenkel

B. Schottky

C. Edge dislocation

D. Constitution of F-centres.

Answer: B

13. The radius of the Na^+ is 95 pm and that of CI ion is 181 pm Predict the

coordination number of Na^+ ?

A. 4

B. 6

C. 8

D. unpredictable

Answer: B

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14. A binary silod (A^+B^-) has a zine blende stracture with B inos consititating the lattice and A^+ inos occupyiong 25 % of the terahedral holes. The formula of the solid is

A. AB

 $\mathsf{B.}\,A_2B$

 $\mathsf{C}.AB_2$

D. AB_4

Answer: C

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15. A binary solid $\left(A^+B^+
ight)$ has a rock sell structure .If the edge length is

 $400\,\pm\,$ and radius of cation is 75 pm the radius of amion attion is

A. 100 pm

B. 125 pm

C. 250 pm

D. 325 pm

Answer: B

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

A. 200 pm

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

C. 142.2 pm

D. $\sqrt{2}$ pm

Answer: A

17. For a solid with the following structure, the co-ordination number of



Answer: D

18. A solid XY has NaCl structure. If radius of X^+ is 100pm. What is the

radius of $Y^{\,-}\,$ ion ?

A. 120 pm

B. 136.6 to 241.6 pm

C. 280 pm

D. Unpredictable

Answer: B

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19. One among the following is an example of ferroelectric compound. It

is

A. Quartz

B. Lead chromate

C. Barium titanate

D. Tourmaline

Answer: C

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20. A solid is made of two element X and Y .The atoms Z are in CCP arrangement while the atoms X occupy all the terahedral sites .What is the formula of the compound ?

A. XZ

 $\mathsf{B.}\, XZ_2$

 $\mathsf{C}.\, X_2 Z$

D. Unpredicatable

Answer: C

21. The number of atoms in a cubic based unit cell having one atom on each corner and two atoms on each body diagonal is

A. 8	
B. 6	
C. 4	
٩D	

Answer: D

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22. For tetrahedral co-ordination the radius ratio (r^+/r^-) should be

 $A.\,0.414 - 0.732$

 $\mathsf{B.}\ > 0.732$

 $C.\,0.156 - 0.225$

 $D.\,0.225 - 0.414$

Answer: D



23. Certain crystals produce electric signals on application of pressure

.This phenomenon is called

A. Pyroelectricity

B. Ferroelectricity

C. Piezoelectricity

D. Ferrielectricity

Answer: C

24. For the structure of solid given below, if the lattice points represent A^+ ions and the B^- ioins occupy the tetrahedral voids, then coordination number of A is :



- A. 2
- B. 4
- C. 6

D. 8



A. Tetrahedral void

B. Cubic void

C. Octahedral void

D. None of these

Answer: C



26. TICI has structure similar to CsCl, the coordination number of roman
Tl^+ is
A. 4
B. 6
C. 10
D. 8
Answer: D
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27. When NaCl crystal is doped with $MgCl_2$,the nature of defect

produced is

A. Interstitial defect

B. Schottky defect

C. Frenkel defect

D. None of these

Answer: B

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

A. p-type

B. n-type

C. n,p-type

D. intrinsic

Answer: B

29. In a close packed array of N spheres, the number of tetrahedral holes

are

A. N/2

B.4 N

C. 2 N

D. N

Answer: C

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30. In the calcium fluoride structure, the coodination number of the cation and the anion are, respectively,

B. 8,4

C. 4, 4

D.4,8

Answer: B

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31. The ionic radii of Rb^+ and I^- are 1.46 and $2.16 {
m \AA}$. The most probable

type of structure exhibited by it is:

A. CsCl type

B. NaCl type

C. ZnS type

D. CaF_2 type

Answer: B

32. The space occupied by b.c.c. arrangement is approximately

A. 50~%

 $\mathbf{B.\,68~\%}$

 $\mathsf{C}.\,74\,\%$

D. 56~%

Answer: B

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33. Which compound has largest lattice energy?

A. LiBr

B. LiCl

C. Lil

D. LiF

Answer: D



35. In the fcc arrangement of A and B atoms whose A atoms are at corners of the unit cell and B are at the face centres one of the A atom is

missing from one corner in each unit cell. What is the simplest formula of the compound?

A. A_7B_3

 $\mathsf{B.}\,AB_3$

C. $A_7 B_{24}$

D. $A_{7/8}B_3$

Answer: C

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36. The number of atoms in a unit cell of a cubic crystal system is 2, the

arrangement of atoms is (A) body centred cubic

A. body centred cubic

B. face centred cubic

C. end centred cubic

D. simple cubic

Answer: A



37. The maximum percentage of available volume that can be filled in a face centred cubic system by an atom is

A. 74%

 $\mathbf{B.\,68~\%}$

 $\mathsf{C.}\,34\,\%$

D. 26~%

Answer: A

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Multiple Choice Questions

1. A metal crystallises as body centred cubic lattice with the edge length of unit cell equal to 0.304um. If the molar mass of the metal is 50.3 g`mol^(-1),its density is

- A. 5.945g cm^{-3}
- B. 2.9725g cm⁻³
- C. 8.9175g cm $^{-3}$
- D. 4.458g cm⁻³

Answer: A

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2. Aluminium has fcc structure. The length of the unit cell is 409 pm. If the density of the metal is 2.7q cm^{-3} , the molar mass of Al atom is

A. 28 g mol^{-1}

B. 30 g mol^{-1}

C. 26.80 g mol^{-1}

D. 25 g mol^{-1}

Answer: C

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3. An element 'X' crystallises as face centred cubic lattice with edge length of 460 pm. The density of the element X, when molar mass of X atom is 60 g mol^{-1} is

- A. 4.096 cm^{-3}
- B. 2.048 cm^{-3}
- C. 6.144 cm^{-3}
- D. 3.072 g cm^{-3}

Answer: A

4. Potassium fluoride (KF) has NaCl structure . Its density is $2.48gcm^{-3}$ and its molar mass is $58gmol^{-1}$. Compute the distance between K^+ and $F^-ions \in KF$.

A. 134.35pm

B. 268.7 pm

C. 403.05 pm

D. 201.52 pm

Answer: B

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5. If the density of NaCl =2.165g cm^{-3} and the distance between Na^+ and

 Cl^- = 281 pm, Avogadro's number is equal to

A. $7 imes 10^{23} mol^{-1}$

 $\mathrm{B.8} \times 10^{23} mol^{-1}$

C. $6 imes 10^{23} mol^{-1}$

D. $4 imes 10^{23} mol^{-1}$

Answer: C

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6. Aluminium metal has face centred cubic (f.c.c) structure. The number of

'Al' atoms per unit cell of the lattice is

A. 2

B. 1

C. 4

D. 6

Answer: C

7. A body centred cubic lattice is composed of anions Q and cations P, where ions occupy the corners and ions P occupy the centre, the formula of the compound is

A. PQ

 $\mathsf{B}.\,PQ_2$

 $\mathsf{C}.\,P_2Q$

D. PQ_3

Answer: A

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8. In a crystal of an ionic compound, the ions B form the close packed lattice and the ions A occupy all the tetrahedral voids. The formula of the compound is

A. AB_2

 $\mathsf{B.}\,A_2B$

C. AB

D. AB_3

Answer: B

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9. A solid A^+B^- has NaCl close packed structure. The radius of the cation when the radius of the anion is 250 pm is

A. 103.5 pm

B. 207 pm

C. 69 pm

D. 276 pm

Answer: A

10. The coordination number of $\left(Sr^{2\,+}
ight)$ =113 pm and $rig(F^{\,-}ig)$ =136 pm, is



Answer: B

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11. An element has a bcc structure with a celledge of 288 pm. The density of the element is $7.2gcm^{-3}$. How many atins are present in 208g of the element?

A. $24.16 imes10^{25}$

B. 24.16 \times 10^{23}

C. $24.16 imes 10^{24}$

D. $24.16 imes10^{26}$

Answer: B

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12. The edge length of the unit cell of NaCl crystal lattice is 5.623Å, density is 2.16 g cm^{-3} and the molar mass of NaCl is 58.5 g mol⁻¹. The number of moles per unit cell is

A. 4

B. 3

C. 1

D. 2

Answer: A



13. A metallic element has a cubic lattice. Each edge of the unit cell is 2Å. The density of the metal is 2.5 g cm^{-3} .The unit cells in 200g of the metal

are

A. $1 imes 10^{25}$

 ${\sf B}.1 imes 10^{24}$

 ${\rm C.1}\times10^{22}$

 ${\rm D.1}\times10^{20}$

Answer: A



14. A metallic element crystallizes in simple cubic lattice. Each edge length of the unit cell is 3 Å.The density of the element is 8g/cc. Number of unit cells in 108 g of metal is

A. $1.33 imes 10^{20}$ B. $2.7 imes 10^{22}$

 ${\rm C.5\times10^{23}}$

D. $2 imes 10^{24}$

Answer: C

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15. The edge length of a cube is $400~\mathrm{pm}$.its body diagonal would be

A. 566 pm

B. 600 pm

C. 500 pm

D. 693 pm

Answer: D
16. In a cubic lattice each edge of the unit cell is 400 pm. Atomic weigth of the element is 60 and its density is625g/c. *c*. Avogadro number = 6×10^{23} . The crystal lattice is

A. Face centred

B. Primitive

C. Body centred

D. End centred

Answer: A

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17. Vilume occupied for a cubic close packed lattice of sphere is

A. 60~%

 $\mathbf{B.}\,52.4~\%$

 $\mathsf{C.}\,68\,\%$

D. 74~%

Answer: D

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18. A compound formed by elements A and B crystallises in cubic structure in which A atoms are at the corners of the cube while B atoms are at the centre of cubic. Formula of the compound is

A. A_2B_3

B. AB_2

 $\mathsf{C}.AB_3$

D. AB

Answer: D

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19. An alloy of copper, silver and gold is found to have copper forming the simple cubic close packed lattice. If the silver atoms occupy the face centres and gold is present at the body centre, then the formula of the alloy will be

A. Cu_4Ag_4Au

B. Cu_4Ag_2Au

C. CuAgAu

D. $CuAg_3Au$

Answer: D

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20. A solid A^+B^- has a body centred cubic structure. The distance of closest approach between the two ions is 0.767Å. The edge length of the unit cell is

A. $\sqrt{3}/\sqrt{2}$ pm

B. 142=2 pm

 $C.\sqrt{2}$ pm

D. 81.63 pm

Answer: D

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21. Sodium metal crystallizes in body centred cubic lattice with the cell edge a=4.28Å. What is the radius of the sodium atom ?

A. 1.86Å

B. 6.81Å

C. 8.61Å

D. 2.94Å

Answer: A

22. In diamond, each carbon atom is bonded to four other carbon atoms tetrahedrally. The number of carbon atoms per unit cell is

A. 4 B. 6 C. 12

Answer: D

D. 8

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23. Analysis shows that an oxide ore of nickel has formula $Ni_{0.98}O_{1.00}$. The

percentage of nickel as Ni^{3+} ions is nearly

B. 96

C. 4

D. 98

Answer: C

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24. The composition of a sample of wrustite is $Fe_{0.93}O_{1.00}$. Percentage of

iron present in the form of iron (III) is nearly

A. 85

B. 15

C.7.00

 $\mathsf{D}.\,93.00$

Answer: B

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25. A metal oxide crystallise in a hexagonal close packed array of oxide ions with two out of every three octahedral holes occupied by metal ions.The formula of metal oxide is

A. MO

 $\mathsf{B}.\,MO_2$

 $\mathsf{C}.\,M_2O$

D. M_2O_3

Answer: D

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26. The radius of the bromide ion is 0.182 nm. According to the radius ratio rule the largest cation that can fit in tetrahedral hole has radius

A. $7.53 imes 10^{-2} nm$

B. $1.82 imes 10^{-1} nm$

C. $7.53 imes10^{-1}nm$

D. $1.82 imes 10^{-2} nm$

Answer: A

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27. Aluminium crystallises in c.c.p. structure. Metallic radius of aluminium

is 125 pm. Edge length of the unit cell of aluminium is

A. 250 pm

B. 353.5 pm

C. 176 pm

D. 216.5 pm

Answer: B

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28. An element crystallises in a b.c.c. lattice. Nearest and next nearest neighbours are respectively

A. 8,8

B. 8,6

C. 6,8

D. 6,6

Answer: B

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29. 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. cesium chloride like structure

Answer: A

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30. Ice crystallises in hexagonal lattice having volume of unit cell is $132 \times 10^{-24} cm^3$. If density is 0.92g cm^3 at a given temperature, then number of water molecules per unit cell is

A. 1

B. 2

C. 3

D. 4

Answer: D

31. The C.N.of $A_{2\,+}$ in AB_2 is 8, then C.N. of B is

A. 8 B. 6 C. 4 D. 2

Answer: C

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32. Sodium metal crystallises in body centred cubic lattic with cell edge

 $4.29 {\rm \AA}$.What is the radius of sodium atom ?

A. 2.145\AA

B. 1.86Å

C. 1.315Å

D. None of these

Answer: B



33. If ionic radic radii of Cs^+ and Ce^- are 1.69Å and 181Årespectively, the edge length of unit cell is

A. 4.04\AA

 $\mathsf{B}.\,3.50\text{\AA}$

C. 7.00Å

D. None of these

Answer: A

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34. If atomic redius of barium is 2.176Å and it crystallises in b.c.c. unit cell, the edge length of unit cell is

A. 3.512Å

B. 2.483Å

C. 5.025Å

D. None of these

Answer: C

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35. Perovskite is mineral containing calcium, oxygen and titanium, in which oxygen atoms are at the face centres, calcium atoms are at the corners and titanium atoms at the centre of the cube. Oxidation number of titanium in the mineral is

B.+3

C. + 4

D. + 3/4

Answer: C

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Revision Questions From Competitive Exams

1. Which of the following is hcp crystal structure ?

A. NaCl

B. CsCl

C. Zn

D. RbCl

Answer: C

2. The pure crystalline substance on being heated gradually first forms a turbid liquid at constant temperature and still higher temperature turbidity completely disappears. The behaviour is a characteristic of substance forming

A. Allotropic crystal

B. Liquid crystals

C. Isomeric crystals

D. Isomorphous crystals

Answer: B

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3. The co - ordination number of a body - centred atom is :

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

Answer: A



4. An example of a body cube is

A. Magnesium

B. Zinc

C. Copper

D. Sodium

Answer: D

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5. The number of atoms in 100g of an fcc crystal with density = $10.0gcm^{-3}$ and cell edge equal to 200 pm is equal to

A. $3 imes 10^{25}$ B. $5 imes 10^{24}$ C. $1 imes 10^{25}$ D. $2 imes 10^{25}$

Answer: B

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6. Ionic solids with Schottky defects contain in their structure

A. equal number of cation and anion vacancies

B. interstitial anions and anion vacancies

C. cation vacancies only

D. cation vacancies and interstitial cations

Answer: A



Answer: A



8. Which of the following describes the hexagonal close packed arrangement of spheres ?

A. ABCABA

B. ABC ABC

C. ABABA

D. ABBABB

Answer: C

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9. In the crystals structures of sodium chloride, the arrangement of Cl^-

ions is

A. fcc

B. both fcc and bcc

C. bcc

D. none of these

Answer: A



10. Bragg's law for X-rays is

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

- B. $n\lambda=2d\sin heta$
- C. $2n\lambda = d\sin heta$

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

Answer: B



11. In a crystal $a
eq b
eq c, lpha = \gamma = 90^\circ ~~ ext{and} ~~eta
eq 90^\circ.$ It is

A. Monoclinic

B. Rhombic

C. Trigonal

D. Tetragonal

Answer: A

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12. How many atoms constitute one unit cell of a face-centred cubic crystal?

A. 4

B. 6

C. 3

D. 8

Answer: A

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

A. $10.376g/cm^3$

B. $5.1888g/cm^3$

C. $7.289g/cm^3$

D. $2.144g/cm^{3}$

Answer: B

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14. The intermetallic compound LiAg crystallizes in cubic lattice in which both lithium and silver have coordination number of 8. The crystal class is

A. Simple cube

- B. Body centred cube
- C. Face centred cube
- D. None of the above

Answer: B

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15. The Miller indices of a plane having intercepts $2a, 2b, \infty$ are

A. 110

B. 220

C. 100

D. 10

Answer: A

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16. How many kinds of space lattices are possible in a crystal?

A. 23

B. 7

C. 230

D. 14

Answer: D

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17. Potassium crystallizes with a

A. face centred cubic lattice

B. body centred cubic lattice

C. simple cubic lattice

D. ortho rhombic lattice

Answer: B

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18. The tatio of close packed atoms to tetrahedral holes in cubic close packing is

A.1:1

B. 1:2

C. 1:3

 $\mathsf{D}.\,2\!:\!1$

Answer: B

View Text Solution

19. The number of NaCl molecules in unit cell of its crystal is

A. 2		
B. 4		
C. 6		
D. 8		

Answer: B

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20. The edge length of face centred unit cubic cells is 508 pm. If the radius of the cation is 110 pm, the radius of anion is

A. 110 pm

B. 144 pm

C. 618 pm

D. 398 pm

Answer: B

21. How many Cl^- ions are there around Na^+ ion in NaCl crystal ?

A. 3 B. 4 C. 6 D. 8

Answer: C

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22. The existence of a substance in more than one solid modification is

known as

A. Isomorphism

B. Polymorphism

C. Amorphism

D. None of these

Answer: B

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23. 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

 $\mathsf{B}.\, A < B$

 $\mathsf{C}.A > B$

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

Answer: A

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24. Which of the following does not represent a type of crystal system

A. Triclinic

B. Monoclinic

C. Rhombohedral

D. Isotropical

Answer: D

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25. The total number of lattice arrangements in different crystal systems

is

A. 7.0

 $B.\,3.0$

C. 8.0

D. 14

Answer: A



26. When Zn converts at its melting stste to its solid state, it has HCP structure, then find out the nearest number of atoms.

A. 6

B. 8

C. 12

D. 4

Answer: C

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27. Which of the following is Bragg's equation ?

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

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

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

D. n. $heta / 2 = d / 2 \sin heta$

Answer: B

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28. Due to Frankel defect, the density of ionic solids

A. decreases

B. increases

C. does not change

D. changes

Answer: C View Text Solution 29. Body centred cubic lattic has a coordination number A. 8 B. 12 C. 6 D. 4 Answer: A

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30. Which of the following metal oxides is antiferromagnetic in nature ?

A. MnO_2

 $\mathsf{B}.\,TiO_2$

 $\mathsf{C}.\,NO_2$

D. CrO_2

Answer: A

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31. Which of the following crystals does not exhibit Frenkel defect ?

A. AgBr

B. AgCl

C. KBr

D. ZnS

Answer: C

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32. The interionic distance for cesium chloride crystals will be

B. a/2

A. a

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

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

Answer: C

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33. A semiconductor of Ge can be made p-type by adding

A. rtivalent impurity

B. tetravalent impurity

C. pentavalent impurity

D. divalent impurity

Answer: A



35. Super conductors are derived from compounds of

A. p-block elements

B. lanthanides

C. actinides

D. transition elements

Answer: A

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36. The major binding force of diamond, silicon and quartz is

A. Electrostatic force

B. Electrical attraction

C. Covalent bond force

D. Non-covalent bond force

Answer: C

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37. Among solids, the highest melting point is exhibited by

A. Covalent solids

B. Ionic solids

C. Pseudo solids

D. Molecular solids

Answer: B

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38. An AB_2 type of sturcture is present in

A. NaCl

B. N_2O

 $\mathsf{C.}\,Al_2O_3$

D. CaF_2

Answer: D



39. Na and Mg crystallise in BCC and FCC type crystals, than the number of Na and Mg atoms present in the unit cell of their respetive crystal is

A. 4 and 2

B. 9 and 14

C. 14 and 9

D. 2 and 4

Answer: D

40. An element (atomic mass = 100g/mol)having BCC structure has uniti cell edge 400 pm. The density of the element is

A. 2.144g cm^{-3}

- B. 5.188g cm^{-3}
- C. 7.289g cm^{-3}
- D. 10.376g cm^{-3}

Answer: B

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41. The pyknometric density of sodium chloride crystal is $2.165 \times 10^3 kg$ m^{-3} while its X-ray density is $2.178 \times 10^3 kg$ m^{-3} . The fraction of unoccupied sites in sodium chloride crystal is

A. $5.96 imes10^{-3}$

 $ext{C.} 5.96 imes 10^{-2}$

D. $5.96 imes10^{-1}$

Answer: A

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42. How many unit cells are present in a cube-shaped ideal crystal of NaCl

of mass 1.00 g ?

[Atomic mass:Na=23,Cl=35.5]

A. $2.57 imes 10^{21}$ unit cells

B. $5.14 imes 10^{21}$ unit cells

C. $1.28 imes 10^{21}$ unit cells

D.

Answer: A

43. Glass is a

A. micro-crystalline solid

B. super-cooled liquid

C. gel

D. polymeric mixture

Answer: B

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44. The tatio of the cationic radius to anionic radius in an ionic crystal is greater than 0.732. Its co-ordination number is

A. 1

B. 4

C. 6

Answer: D



45. What is the coordination number of sodium in Na_2O ?

A. 6

B.4

C. 8

D. 2

Answer: B

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46. What is the co-ordination number of Cl^- in NaCl crystal ?

A. 8		
B. 6		
C. 4		
D. 3		

Answer: B

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47. Density of a crystal remains unchanged as a result of

A. Ionic defect

B. Sohttky defect

C. Frenkel defect

D. Crystal defect

Answer: B

48. The number of tetrahedral voids in the unit cell of a face centred cubic lattice of similar atoms is

A. 4	
B. 6	
C. 8	
D. 10	

Answer: C



Na⁺

A. Frenkel defect

B. Frenkel and Schottky defect

C. Interstitial defect

D. Schottky defect

Answer: D

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50. The crystal system of a compound with unit cell dimensions a = 0.387, b = 0.387 and c = 0.504 nm and $\alpha = \beta = 90^{\circ}$ and $\gamma = 120^{\circ}$ is

A. cubic

B. hexagonal

C. orthorhombic

D. rhombohedral

Answer: B



51. Which of the following statements about amorphous solids is incorrect ?

A. They melt over a range of temperature

B. They are anisotropic

C. There is no orderly arrangement of particles

D. They are rigid and incompressible

Answer: B

View Text Solution

52. If the distance between Na^+ and Cl^- ions in sodium chloride crystal

is X pm, the length of the edge of the unit cell is

A. 4X pm

 $\mathsf{B.}\,X/\operatorname{4pm}$

 $\mathsf{C.}\,X/\operatorname{2pm}$

D. 2Xpm

Answer: D

View Text Solution

53. Coordination number of Zn in ZnS (Zine blende) is

A. 4

B. 6

C. 2

D. None of these

Answer: A

54. A compound formed by elements X and Y crystallises in a cubic structure in which the X atoms are at the corners of a cube and the Y atoms are at the face-centres. The formula of the compound is

A. XY_2

 $\mathsf{B.}\, XY_3$

 $\mathsf{C}.\, X_3Y$

D. XY

Answer: B

View Text Solution

55. If Z is the number of atoms in the unit cell that represents the closest packing sequence -ABC ABC-, the number of tetrahedral voids in the unit cell is equal to

A. Z

B. 2Z

 $\mathsf{C}.Z/2$

D. Z/4

Answer: B

View Text Solution

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

A. AB_3

B. A_3B

C. AB

D. A_2B

Answer: A

D View Text Solution

57. In a face centred cubic lattice, a cell is shared equally by how many unit cells ?

A. 4 B. 2 C. 6 D. 8

Answer: C

D View Text Solution

58. The material possessing superconducting properties is

A. $YbBa_2Cu_2O_8$

- $\mathsf{B.}\,HgBe_2Ca_2Cu_2O_8$
- C. $YBa_2Cu_3O_7$
- D. $YBa_2Cu_3O_7$

Answer: C

View Text Solution

59. A metal crystallises in a bcc lattice. Its unit cell edge length is about 300 pm and its molar mass is about 50g mol^{-1} . What would be the density of the metal (ing cm^{-3}).

A. 3.1

B. 6.2

C. 9.3

D. 12.4

Answer: B

View Text Solution

60. A crystalline solid has a cubic structure in which tungsten (W) atoms are located at the cube corners of the unit cell, oxygen atoms at the cube edges and sodium atom at the cube center. The molecular formula of the compound is

A. Na_2WO_3

B. $NaWO_4$

 $C. NaWO_3$

 $\mathsf{D.}\, Na_2WO_4$

Answer: C

61. The compound which possesses the antifluorite structure is

A. Rb_2S

 $\mathsf{B.}\, PbF_2$

C. Amorphous sphalerite

D. $BaCl_2$

Answer: A

View Text Solution

62. Which has no rotation of symmetry?

A. hexagonal

B. Orthochromic

C. Cubic

D. Triclinic

Answer: D
View Text Solution
63. The hardest substance among the following is
A. BeC
B. graphite
C. titanium
D. SiC
Answer: D
View Text Solution

64. In an antifluorite structure, cations occupy

A. octahedral voids

B. centre of the cube

C. tetrahedral voids

D. corners of the cube

Answer: C

View Text Solution

65. Metallic lustre is explained by

A. Diffusion of metal ions

B. Oscillation of loose electrons

C. Excitation of free protons

D. Existence of bcc lattice

Answer: B

66. In the face centred cubic unit cell, edge length is



Answer: B

View Text Solution

67. The radii of Na^+ and Cl^- ions are 95 pm and 181 pm respectively.

The edge length of NaCl unit cell is

A. 276 pm

B. 138 pm

C. 552 pm

D. 45 pm

Answer: C



View Text Solution

69. In AgBr, there can occur

A. only Schottky defect

B. only Frenkel defect

C. Both (A) and (B)

D. None of these

Answer: C

View Text Solution

70. Empty apace in ccp lattice is

A. 26~%

 $\mathbf{B.}\,45~\%$

 $\mathsf{C}.\,90~\%$

D. $30\ \%$

Answer: A

71. A particular solid is very hard and has a very high melting point. In the solid state, it a non conductor and its melt is a conductor of electricity. Classify the solid.

A. metallic

B. molecular

C. net work

D. ionic

Answer: D

View Text Solution

72. An element (atomic mass=250 u) crystallizes in a simple cubic. If the density of the unit cell is $7.2gcm^{-3}$, what is the radius of the element ?

A. $1.93 imes 10^{-3} cm$

 $\mathrm{B.}\,1.93\times10^{-8}cm$

 $\text{C.}\,1.93\times10^{-8}\text{\AA}$

D. $1.93 imes 10^{-8} m$

Answer: B

View Text Solution

73. Number of atoms in fcc unit cell is

A. 1

B. 2

C. 3

D. 4

Answer: D

74. Which of the following is not ferromagnetic ?

A. Cobalt

B. Iron

C. Manganese

D. Nickel

Answer: C

View Text Solution

75. An example of a face centred cubic lattice is

A. Zinc

B. Sodium

C. Copper

D. Calcium chloride

Answer: C

View Text Solution

76. The cubic unit cell of Al (molar mass 27 g mol^{-1} has an edge length of 405 pm. Its density is 2.7 g cm^{-3}). The cubic unit cell is

A. face centred

B. body centred

C. primitive

D. edge centred

Answer: C

View Text Solution

77. A metallic crystal has the bcc type stacking pattern. What percentage

of volume of this lattice is empty space ?

A. 68~%

 $\mathsf{B.}\,32~\%$

 $\mathsf{C}.\,26~\%$

D. 74~%

Answer: B

View Text Solution

78. A solid compound contains X,Y and Z atoms in a cubic lattice with X atoms occupying the corners, Y atoms in the body centred positions and Z atoms at the centres of faces of the unit cell. What is the empirical formula of the compound ?

A. XY_2Z_3

 $\mathsf{B.}\,XYZ_3$

 $\mathsf{C.}\, X_2T_2Z_3$

D. X_8YZ_6

Answer: B



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

A. 1.123

B. 0.891

C. 1.414

D. 0.414

Answer: A

80. A compound is formed by elements A and B. This crystallizes in the cubic structure where the A atoms are at the corners of the cube can B atoms are at the body centers. The simplest formula of the compound is

A. $A_8 B_4$

B. AB_6

C. AB

D. A_6B

Answer: C

View Text Solution

81. Malleability and ductility of metals can be accounted due to

A. the capacity of layers of metal ions to slide over the other

B. the interaction of electrons with metal ions in the other

C. the presence of electrostatic force

D. the crystalline structure in metal

Answer: A



82. An ionic compound is expected ot have tetrahedral structure if $r_{\,+}\,/\,r^{\,-}$ lies in the range of

A. 0.155to0.225

B. 0.731 to 1

C. 0.414 to 0.732

D. 0.225 to 0.414

Answer: D

83. How many unit cells are present in a cube shaped ideal crystal of NaCl

of mass 1.00 g ? Atomic masses : Na=23, Cl=3.55)

A. $1.28 imes10^{21}$

 $\text{B.}\,1.71\times10^{21}$

 $\text{C.}\,5.14\times10^{21}$

D. $2.57 imes10^{21}$

Answer: D

View Text Solution

84. Total volume of atoms present in a face centred cubic unit cell of a metal is (r=atomic radius)

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

B. $\frac{24}{3}\pi r^{3}$
C. $\frac{12}{3}\pi r^{3}$

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

Answer: D



85. Arrangement of sulphide ions in zinc blends is

A. HCP

B. FCC

C. Simple cubic

D. BCC

Answer: B

86. A compound contains two types of atoms X and Y. It crystallizes in a cubic lattice with atom X at the corners of the unit cell and atom Y at the body centres. The simplest possible formula of this compound is

A. X3)Y

 $\mathsf{B.}\, X_2Y$

C. XY

D. XY_6

Answer: C

View Text Solution

87. The cubic unit cell of a metal (molar mass=63.55 g mol^{-1})has an edge length of 362pm. Its density is 8.92 g cm^3 . The type of cell is

A. FCC

B. BCC

C. Simple cubic

D. None of these

Answer: A

O View Text Solution

88. The substance that does not have sharp ,melting point is

A. KCl

B. Glass

C. Ice

D. Diamond

Answer: B

89. Substance which is weakly rapelled by a magnetic field is

A. O_2

 $\mathsf{B.}\,H_2O$

 $C. CrO_2$

D. Fe_3O_4

Answer: B

View Text Solution

90. Percentage of free space in which cubic close packed structure and in

body centred packed structure are respectively

A. 40% and 26%

B. 30% and 26%

C. 26% and 32%

D. 32% and 48%

Answer: C

View Text Solution

91. Anong the following which one has the highest cation to anion size

ratio?

A. Csl

B. CsF

C. LiF

D. NaF

Answer: B

View Text Solution

92. Sodium chloride, NaCl, usually crystallizes in a face-centred cubic lattice. How many ions are in contact with any single Na^+ion ?
A. 4		
B. 6		
C. 8		
D. 1		

Answer: B

View Text Solution

93. The crystal with metal deficiency is

A. NaCl

B. FeO

C. KCl

D. ZnO

Answer: B

94. Which one of the following is a molecular crystal ?

A. Quartz

B. Rock salt

C. Diamond

D. Dry ice

Answer: D

95. The packing effciency of the two dimensional cell square unit as



shown is

A. 0.3927

B. 0.6802

C. 0.7405

D. 0.7854

Answer: D

96. In a face centred cubic lattice, atom A occupies the corner positions and atom B occupies the face centre positions. If one atom of B is missing from one of the face centred points.

A. A_2B

 $\mathsf{B.}\,AB_2$

 $\mathsf{C}.\,A_2B_3$

D. A_2B_5

Answer: D

View Text Solution

97. CsCl has coordination number ratio

A. 6:6

B.8:8

C.4:4

D. None of these

Answer: A

View Text Solution

98. For coordination number-4, the limiting radius ratio is

A. 0.414

B. 0.732

C. 0.225

D. 0.155

Answer: B

99. A solid compound XY has NaCl structure. If the radius of the cation is 100 pm, the radius of the anion (y^-) will be

A. 275.1 pm

B. 322.5 pm

C. 241.5 pm

D. 165.7 pm

Answer: C

View Text Solution

100. Radius ratio of an ionic compound is 0.93. The structure of the above

ionic compound is of

A. NaCl type

B. CsCl type

C. ZnS type

D. None of these

Answer: B



101. A compound M_pX_q has cubic close packing (ccp) arrangement of X. Its unit cell structure is shown on the side. The empirical formula of the



 $\mathsf{B}.\,MX_2$

 $\mathsf{C}.\,M_2X$

D. $M_5 X_{14}$

Answer: B

View Text Solution

102. A metal has a fcc lattice. The edge length of the unit cell is 404 pm. The density of the metal is $2.72gcm^{-3}$? The molar mass of the metal is

 $ig(N_A \;\; {
m Avogadro's \; constant} = 6.02 imes 10^{23} mol^{-1}ig)$

```
A. 40 g mol^{-1}
```

B. 30 g mol^{-1}

C. 27 g mol^{-1}

D. 20 g mol^{-1}

Answer: C

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



A. 104 pm

B. 125 pm

C. 183 pm

D. 57 pm

Answer: A

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

A. 5.08~%

B. 7.01 %

 $\mathsf{C.}\,4.08\,\%$

D. 6.05~%

Answer: C

View Text Solution

Selected Straight Objective Type Mcqs

1. Pick out the correct statement about CsCl structure

- A. Cl^- adopts a simple cubic lattice
- B. CsCl has a BCC structure
- C. Cl^{-} ions are present at cubic sites
- D. C.N of both Cs and Cl is 6.

Answer: A::C

View Text Solution

2. Stacking of square close packed layers give rise to

A. BCC structure

B. FCC structure

C. Simple cubic structure

D. HCP structure

Answer: A::C

3. Stacking of hexagonal close packed layers give rise to

A. HCP structure

B. CCP structure

C. Simple cubic structure

D. FCC structure

Answer: A::D

View Text Solution

4. In face centred cubic close packed structure octahedral sites are present at

A. edge centres

B. face centres

C. body centre

D. A & C Both

Answer: D



5. Packing fraction in an identical solid spheres is 74% in

A. Simple cubic structure

B. FCC structure

C. HCP structure

D. B&C Both

Answer: D

View Text Solution

6. Pick out the correct statement (s)

A. C.N. of an atom at a lattice point in simple cubic arrangement is 6

B. C.N. of an atom at an octahedral site is 8

C. C.N. of an atom at a lattice point in HCP arrangement is 6

D. C.N. of an atom at octahedral site is 6

Answer: A::D

View Text Solution

7. Which of the following statement(s) is (are) correct ?

A. The co-ordination number of each type of ion in CsCl crystal is 8

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

number of 12

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

cells



 $(r_{Na^+}=95 {
m pm}, r_{Cl^-}=181 {
m pm})$

Answer: A::C

D View Text Solution

8. The co-ordination number of a metal crystallising in a hexagonal close

packing structure is

A. 12

B. 4

C. 8

D. 6

Answer: A

9. In a solid 'AB' having NaCl structure atoms occupy the corners of the cube unit cell. If all the face centred atoms along one of the axis are removed then the resultant stoichiometry of the solid is

A. AB_2

 $\mathsf{B.}\,A_2B$

 $\mathsf{C.}\,A_4B_3$

D. A_3B_4

Answer: C

View Text Solution

10. A substance $A_x B_y$ crystallises in a face centred cubic (FCC) lattice in which atoms 'A' occupy each corner of the cube and atoms 'B' occupy the centres of each face of the cube. Identify the correct composition of the substance $A_x B_y$.

A. AB_3

 $\mathsf{B.}\,A_4B_4$

 $\mathsf{C}.\,A_3B$

D. Composition cannot be specified.

Answer: A

View Text Solution

11. The compound in which cation occupy alternate tetrahedral voids in

cubic closed packing (ccp)

A. NaCl

B. ZnS

 $\mathsf{C}.\, Na_2O$

D. CaF_(2)`

Answer: B

12. Total volume of atoms present in a face-centred cubic unit cell of a metal is (r is atomic radius)

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

B. $\frac{16}{3}\pi r^{3}$
C. $\frac{20}{3}\pi r^{3}$
D. $\frac{24}{3}\pi r^{3}$

Answer: B

View Text Solution

13. CsBr crystallizes in a body centred cubic lattice. The unit cell length is 436.6 pm. Given that the atomic mass of Cs = 133 and that of Br = 80 amu and Avogadro's number being $6.02 \times 10^{23} mol^{-1}$, the density of CsBr is

A.
$$8.25g/\mathit{cm}^3$$

B. $4.25g/cm^3$

 $\mathsf{C.}\,0.425g/\mathit{cm}^3$

D. $42.5g/cm^3$

Answer: B

View Text Solution

14. The $Ca^{2\,+}\,$ and $\,F^{\,-}$ ions are located in CaF_2 crystal, respectively at

face centred cubic lattice points and in

A. Tetrahedral void

B. half of tetrahedral points

C. octahedral points

D. half of octahedral voids.

Answer: A

15. The fraction of the total volume occupied by the atoms present in a

simple cube is

A. $\pi/4$

B. $\pi/6$

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

D. pi/4sqrt2`

Answer: B

D View Text Solution

16. If NaCl is doped with $10^{-4} mol \% \, {
m of} SrCl_2$ the concentration of cation

vacancies will be

$$ig(N_A = 6.02 imes 10^{23} mol^{-1}ig)$$

A.
$$6.02 imes 10^{23} mol^{-1}$$

B. $6.02 imes 10^{15} mol^{-1}$

 ${\rm C.\,6.02\times10^{16}}mol^{-1}$

D. $6.02 imes 10^{17}mol^{-1}$

Answer: D

View Text Solution

17. A metallic cystal has the bcc type staking pattern. What percentage of

volume of this lattice is empty space ?

A. 0.68

B. 0.32

C. 0.26

D. 0.74

Answer: B

18. Which of the following statements is not correct?

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

B. Molecular solids are generally volatile.

C. The number of carbon atoms in a unit cell of diamond is 4.

D. The number of Bravais lattices in which a crystal cell of diamond is

14.

Answer: A

View Text Solution

19. If a stands for the edge length of the cubic systems : Simple cubic, body centred cubic and face centred cubic, then the ratio of the redius of the spheres in these systems will be respectively



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

Answer: A



20. With which one of the following elements silicon should be doped so

as to give p-type of semiconductor ?

A. Germanium

B. Arsenic

C. Selenium

D. Boron

Answer: D

21. In a compound, atoms of element Y form ccp lattice and those of element X occupy the corners, Y atoms in the body centred positions and Z atoms at the centres of faces of the unit cell. What is the empirical formula of the compound ?

A. XY_2Z_3

- B. XYZ_3
- C. $X_2 Y_2 Z_3$
- D. X_8YZ_6

Answer: B

D View Text Solution

22. The edge length of a face centred cubic cell of an ionic substance is 508 pm. If the radius of the cation is 110 pm, the radius of the anion is

A. 144 pm

B. 288 pm

C. 398 pm

D. 618 pm

Answer: A

View Text Solution

23. AB crystallizes in a body centred cubic lattice with edge length 'a' equal to 387 pm. The distance between two oppositely charged ions in the lattices is

A. 250 pm

B. 200 pm

C. 300 pm

D. 335 pm

View Text Solution

Linked Comprehension Type Mcqs

1. In hexagonal system of crystals, a frequently encountered arrangement of atoms is described as a hexagonal prism. Here, the top and bottom of the cell are regular hexagon and three atoms are sandwiched in between them. A space filling model of this structure, called hexagonal close packed (HCP), is constituted of a sphere on a flat surface surrounded in the same plane by six identical sphere as closely as possible. Three spheres are then placed over the first layer so that they touch other and represent the second layer. Each one of the three spheres touches three spheres of the bottom layer. Finally, the second layer is covered with a third layer that is identical to the bottom layer in relative position. Assume radius of every sphere to be same

The number of atoms in this HCP unit cell is

A. 4	
B. 6	
C. 12	
D. 17	

Answer: B

View Text Solution

2. In hexagonal system of crystals, a frequently encountered arrangement of atoms is described as a hexagonal prism. Here, the top and bottom of the cell are regular hexagon and three atoms are sandwiched in between them. A space filling model of this structure, called hexagonal close packed (HCP), is constituted of a sphere on a flat surface surrounded in the same plane by six identical sphere as closely as possible. Three spheres are then placed over the first layer so that they touch other and represent the second layer. Each one of the three spheres touches three spheres of the bottom layer. Finally, the second layer is covered with a third layer that is identical to the bottom layer in relative position. Assume radius of every sphere to be same

The volume of this HCP unit cell is

A. $24\sqrt{2}r^{3}$ B. $16\sqrt{2}r^{3}$ C. $12\sqrt{2}r^{3}$ D. $\frac{64}{3\sqrt{3}}r^{3}$

Answer: A

View Text Solution

3. In hexagonal system of crystals, a frequently encountered arrangement of atoms is described as a hexagonal prism. Here, the top and bottom of the cell are regular hexagon and three atoms are sandwiched in between them. A space filling model of this structure, called hexagonal close packed (HCP), is constituted of a sphere on a flat surface surrounded in the same plane by six identical sphere as closely as possible. Three spheres are then placed over the first layer so that they touch other and represent the second layer. Each one of the three spheres touches three spheres of the bottom layer. Finally, the second layer is covered with a third layer that is identical to the bottom layer in relative position. Assume radius of every sphere to be same

The empty space in this HCP unit cell is

A. 0.74

B. 0.476

C. 0.32

D. 0.26

Answer: D

View Text Solution

4. Only those atoms which form four covalent bonds produce a repetitive three dimensional structure using only covalent bonds, e.g., diamond structure. The latter is based on an fcc lattice where four out of the eight

tetrahedral holes are occupied by carbon atoms. Every atom in this structure is surrounded tetrahedrally by four others. Germanium, silicon and grey tin also crystallize in the same way as diamond

(Given $\sin 54^{\circ} 44' = 0.8164$)

Fraction of volume unoccupied is

A. 0.34

B. 0.66

C. 0.26

D. 0.48

Answer: A

View Text Solution

5. Only those atoms which form four covalent bonds produce a repetitive three dimensional structure using only covalent bonds, e.g., diamond structure. The latter is based on an fcc lattice where four out of the eight tetrahedral holes are occupied by carbon atoms. Every atom in this structure is surrounded tetrahedrally by four others. Germanium, silicon and grey tin also crystallize in the same way as diamond

```
(Given \sin 54^{\circ} 44' = 0.8164)
```

Total number of effective atoms in a cube is



Answer: D

View Text Solution

6. Only those atoms which form four covalent bonds produce a repetitive three dimensional structure using only covalent bonds, e.g., diamond structure. The latter is based on an fcc lattice where four out of the eight tetrahedral holes are occupied by carbon atoms. Every atom in this structure is surrounded tetrahedrally by four others. Germanium, silicon and grey tin also crystallize in the same way as diamond

(Given $\sin 54^{\circ} 44' = 0.8164$)

If edge length of the cube is 3.60Å, then radius of carbon atom is

A. 0.78 Å

B. 0.92 Å

C. 0.64 Å

D. 0.35 Å

Answer: A

View Text Solution

7. Only those atoms which form four covalent bonds produce a repetitive three dimensional structure using only covalent bonds, e.g., diamond structure. The latter is based on an fcc lattice where four out of the eight tetrahedral holes are occupied by carbon atoms. Every atom in this structure is surrounded tetrahedrally by four others. Germanium, silicon and grey tin also crystallize in the same way as diamond (Given $\sin 54^{\circ} 44' = 0.8164$)

If the edge length is same, density of carbon atom is

A. 3.42g/cc

B. 2.40g/cc

C. 1.63g/cc

D. 2.58g/cc

Answer: A

View Text Solution

8. Only those atoms which form four covalent bonds produce a repetitive three dimensional structure using only covalent bonds, e.g., diamond structure. The latter is based on an fcc lattice where four out of the eight tetrahedral holes are occupied by carbon atoms. Every atom in this structure is surrounded tetrahedrally by four others. Germanium, silicon and grey tin also crystallize in the same way as diamond

(Given $\sin 54^{\circ} 44' = 0.8164$)

Total number of unit cells in one gram of such sample is

A. 4.95×10^{21} B. 2.01×10^{22} C. 6.27×10^{21} D. 4.95×10^{22}

Answer: C

View Text Solution

9. No crystal is found to be perfect at room temperature. The defects present in the crystals can be stoichiometric or non-stoichiometric. Due to non-stoichiometric defects, the formula of the ionic compound is different from the ideal formula. For example, the ideal formula of ferrous oxide should be FeO but actually in one sample, it was found to be $Fe_{0.93}O$. This is because the crystal may have some ferric ions in place of ferrous ions. These defects change the properties of the crystals. In some

cases, defects are introduced ot have crystals of desired properties as required in the field of electronics. Doping of elements of group 14 with those of group 13 or 15 is most common. In ionic compounds, usually the impurities are introduced in which the cation has higher valency than the cation of the parent crystal e.g., $SrCl_2$ into NaCl.

Which of the following dopings will produce p type semiconductor ?

A. Silicon doped with arsenic

B. Germanium doped phosphorus

C. Germanium doped with aluminium

D. Silicon doped with phosphorus.

Answer: C

View Text Solution

10. No crystal is found to be perfect at room temperature. The defects present in the crystals can be stoichiometric or non-stoichiometric. Due to non-stoichiometric defects, the formula of the ionic compound is

different from the ideal formula. For example, the ideal formula of ferrous oxide should be FeO but actually in one sample, it was found to be $Fe_{0.93}O$. This is because the crystal may have some ferric ions in place of ferrous ions. These defects change the properties of the crystals. In some cases, defects are introduced ot have crystals of desired properties as required in the field of electronics. Doping of elements of group 14 with those of group 13 or 15 is most common. In ionic compounds, usually the impurities are introduced in which the cation has higher valency than the cation of the parent crystal e.g., $SrCl_2$ into NaCl.

Which one of the following defects does not affect the density of the crystal ?

A. Schottky defect

B. Interstitial defects

C. Frenkel defect

D. Both (A) and (B)

Answer: C
11. No crystal is found to be perfect at room temperature. The defects present in the crystals can be stoichiometric or non-stoichiometric. Due to non-stoichiometric defects, the formula of the ionic compound is different from the ideal formula. For example, the ideal formula of ferrous oxide should be FeO but actually in one sample, it was found to be $Fe_{0.93}O$. This is because the crystal may have some ferric ions in place of ferrous ions. These defects change the properties of the crystals. In some cases, defects are introduced ot have crystals of desired properties as required in the field of electronics. Doping of elements of group 14 with those of group 13 or 15 is most common. In ionic compounds, usually the impurities are introduced in which the cation has higher valency than the cation of the parent crystal e.g., $SrCl_2$ into NaCl.

NaCl was doped with $10^{-3}mol \% SrCl_2$. The concentration of the cation vacancies is

A.
$$6.02 imes10^{18} ext{mol}^{-1}$$

 $\mathsf{B.6.02} imes 10^{15} \mathrm{mol}^{-1}$

 $ext{C.}~6.02 imes10^{15} ext{mol}^{-1}$

D. $6.02 imes10^{12} ext{mol}^{-1}$

Answer: A

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12. No crystal is found to be perfect at room temperature. The defects present in the crystals can be stoichiometric or non-stoichiometric. Due to non-stoichiometric defects, the formula of the ionic compound is different from the ideal formula. For example, the ideal formula of ferrous oxide should be FeO but actually in one sample, it was found to be $Fe_{0.93}O$. This is because the crystal may have some ferric ions in place of ferrous ions. These defects change the properties of the crystals. In some cases, defects are introduced ot have crystals of desired properties as required in the field of electronics. Doping of elements of group 14 with those of group 13 or 15 is most common. In ionic compounds, usually the impurities are introduced in which the cation has higher valency than the

cation of the parent crystal e.g., $SrCl_2$ into NaCl.

The percentage of iron as $Fe_{III} \in Fe_{0.93}O_{1.0}$ is

A. 0.177

B. 0.0784

C. 0.115

D. 9.6~%

Answer: C

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Matrix Match Type Mcqs

1. Statements in Column I are labelled as A, B, C and D whereas the statements in Column II are labelled as p, q, r and s. The answers to these questions are to be appropriately bubbled as illustrated below in the following example. If the correct matches are A-p, A-s, B-q, B-r, C-p, C-q and D-p, their correctly labelled 4times 4 matrix should look like :

		p	q	r	S			
A	1		\bigcirc	$\overline{\bigcirc}$]		
E	3	\bigcirc			Ō			
C	2			\bigcirc	\bigcirc			
۵			0	\bigcirc	\bigcirc			
Column-I				Colum	nn-II			
$(A) \text{NaCl} \qquad p.$. Cryst	alline			
(B) p-type semiconductor q .				. Dopin	ıg			
(C)	${ m n-type \ semiconductor} r.$				holes are responsible for movement of cu			
(D)	Graphite s .			. electr	electrons are responsible for movement o			
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2. Statements in Column I are labelled as A, B, C and D whereas the statements in Column II are labelled as p, q, r and s. The answers to these questions are to be appropriately bubbled as illustrated below in the following example. If the correct matches are A-p, A-s, B-q, B-r, C-p, C-q and

D-p, their corretly labelled 4times 4 matrix should look like :



Column-I

- (A) Simple cubic and face centred cubic
- (B) Cubic and rhombohedral
- (C) Cubic and tetragonal
- (D) hexagonal and monoclinic

Column-II

p.

- have these cell parameters a
- q. are two crystal systems
- r. has only two crystallograph
- s. belong to the same crystal s

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3. Statements in Column I are labelled as A, B, C and D whereas the statements in Column II are labelled as p, q, r and s. The answers to these questions are to be appropriately bubbled as illustrated below in the following example. If the correct matches are A-p, A-s, B-q, B-r, C-p, C-q and

D-p, their corretly labelled 4times 4 matrix should look like :



4. Statements in Column I are labelled as A, B, C and D whereas the statements in Column II are labelled as p, q, r and s. The answers to these questions are to be appropriately bubbled as illustrated below in the

following example. If the correct matches are A-p, A-s, B-q, B-r, C-p, C-q and D-p, their corretly labelled 4times 4 matrix should look like :



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Integer Type Questions

1. A cubic unit cell has one atom on each corner and one atom on each body diagonal. The number of atoms in the unit cell is

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Reason Assertion Type Mcqs

1. Assertion (A) In any ionic solid (MX) with Schttky defects, the number of positive and negative ions is the same.

Reason(R)Equall number of cation and anion vacancies are present.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true but R is not a correct explanation of A

C. A is true but R is false

D. A is false but R is true

Answer: A

2. Assertion (A) Crystalline solids are anisotropic.

Reason(R)The constituent particles are very closely packed.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true but R is not a correct explanation of A

C. A is true but R is false

D. A is false but R is true

Answer: B

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3. Assertion The number of tetrahedral voids is double the number of octahedral voids.

 $\operatorname{Reason}(R)$ The size of the tetrahedral void is half of that of the octahedral void.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true but R is not a correct explanation of A

C. A is true but R is false

D. A is false but R is true

Answer: C

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4. Assertion (A) Due to Frenkel defect there is no effect on density of a solid.

Reason(R)Ions shift from lattice sites to interstitial sites in Frenkel defect.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true but R is not a correct explanation of A

C. A is true but R is false

D. A is false but R is true

Answer: A

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5. Assertion Antiferromagnetic substances can be made paramagnetic by heating.

Reason(R)On heating some of the ions change their direction of spin.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true but R is not a correct explanation of A

C. A is true but R is false

D. A is false but R is true

Answer: A

6. Assertion In crystal lattice, size of the cation is larger in a tetrahedral hole than in a octahedral hole than in a octahedral hole.

 $\operatorname{Reason}(R)$ The cations occupy more space than atoms in crystal packing.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true but R is not a correct explanation of A

C. A is true but R is false

D. A is false but R is true

Answer: D

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7. Assertion Tungsten has a very high melting point.

Reason(R)Tungsten is a covalent compound.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true but R is not a correct explanation of A

C. A is true but R is false

D. A is false but R is true

Answer: C

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8. Assertion Amorphous solids are isotropic.

Reason(R)Amorphous solids do not possess rigidity.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true but R is not a correct explanation of A

C. A is true but R is false

D. A is false but R is true

Answer: C

1. Which of the following is not a Bravais lattice ?

A. End centred cubic

B. Body centred orthorhombic

C. Body centred tetragonal

D. End centred monoclinic

Answer: A

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2. Which of the following is not a Bravais lattice ?

A. Face centred orthorhombic

B. Face centred cubic

C. Face centred tetragonal

D. End centred monoclinic

Answer: C



3. The unit cell that best describe the CsCl crystal lattice is

A. BCC unit cell

B. Simple cubic unit cell

C. FCC unit cell

D. HCP unit cell

Answer: B

4. The thermal conductivity of graphite along an axis in the plane of hexagonal rings is

A. exactly the same as along an sxis perpendicular to this plane

B. is less than along an axis perpendicular to this plane

C. is more than along an axis perpendicular to this plane

D. approximately same as along an axis perpendicular to this plane.

Answer: C

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5. At a temperature of absolute zero an intrinsic semiconductor is

A. an insulator

B. a p-type semiconductor

C. a n-type semiconductor

D. a conductor

Answer: A



7. The edge length of LiCl (NaCl structure) unit cell is 514 pm. Assuming anion-contact, the ionic radius of Cl^- ion is

A. 128.5 pm

B. 257 pm

C. 181.7 pm

D. None of these

Answer: C

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8. A plane with intercepts 0.5a, 0.25b and 1.5c has the Miller indices

A.136

B.361

C. 6 3 1

D.163

Answer: B

9. Graphite at room temperature is

A. a p-type semiconductor

B. an n-type semiconductor

C. an ionic conductor

D. an electronic conductor

Answer: D

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10. Which of the following is a p-type semiconductor ?

A. Ge doped with In

B. Si doped with Bi

C. Si doped with Sb

D. Ge doped with As.

Answer: A



11. Which of the following is an n-type semiconductor ?

A. Si doped with Ga

B. Si doped with In

C. Ge doped with As

D. Ge doped with Ga

Answer: C

12. In a gas lighter, mechanical energy is converted into electrical energy by using crystals of barium titanate. Barium titanate is

A. piezoelectric but not ferroelectric

B. ferroelectric but not piezoelectric

C. both piezoelectric as well as ferroelectric

D. neither piezoelectric nor ferroelectric

Answer: C

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13. In Quartz watches, quartz is used

A. in place of glass

B. as a hard substance to make jewels for the watch

C. as a ferroelectric substance

D. as a piezoelectric substance.

Answer: D



14. Quartz is

A. piezoelectric but not ferroelectric

B. ferroelectric but not piezoelectric

C. both piezoelectric and ferroelectric

D. neither piezoelectric nor ferroelectric

Answer: A

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15. Which of the following is like copper in electrical conductivity and appearance ?

A. Silver

 $\mathsf{B}.\,TiO_2$

C. CdS

D. ReO_3

Answer: D

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16. Pick the odd one out

A. Graphite

B. Silicon

 $\mathsf{C}. CrO_2$

D. Copper

Answer: B

17. The intermetallic compound LiAg crystallizes in a cubic lattice in which Li and Ag atoms have C.N. of 8. To which crystal class the unit cell belongs

A. NaCl

B. CsCl

C. ZnS

D. none of these

Answer: B

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18. In sphalerite structure C.N. of cation and anion are respectively

A. 6, 6

B. 8, 4

C. 4, 4

D. 8, 8

Answer: C



19. Pick out the wrong statement

A. sphalerite is zinc sulphide

B. CrO_2 is ferromagnetic

C. All ferroelectric solids are piezoelectric

D. All piezoelectric solids are ferroelectric

Answer: D

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20. Pick out the wrong statement

A. Quartz is piezoelectric but not ferroelectric

B. Frenkel defect is a combination of Schottky defect and interstitials

C. F centres impart colour to the crystal

D. When a solution of NaCl containing some $SrCl_2$ allowed to

crystallise cation vacancies are produced

Answer: D

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21. Non-stoichiometric Cu_2O in which coper to oxygen ratio is slightly

less than 2:1 is

A. an insulator

B. a superconductor at 273 K

C. is a p-type semiconductor

D. is an n-type semiconductor



each unit cell is
$$\left(ext{Molar mass of } FeO = 72g ext{ mol}^{-1}, N_A = 6.02 imes 10^{23} mol^{-1}
ight)$$

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

and octahedral voids per unit cell is

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4. Assertion Diamond and graphite do not have same crystal structure.

Reason(R) Diamond is crystalline while graphite is amorphous.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true but R is not a correct explanation of A

C. A is true but R is false

D. A is false but R is true

Answer: C

5. Assertion $CaCo_3$ shows polymorphism.

Reason $(R)CaCO_3$ exists in two forms called calcite and aragonite.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true but R is not a correct explanation of A

C. A is true but R is false

D. A is false but R is true

Answer: A