



CHEMISTRY

BOOKS - A2Z CHEMISTRY (HINGLISH)

SOLID STATE

Classification Of Solids Crystalline Solids Crystal Lattice Unit Cell And Crystal System

1. Choose the correct statements

A. equivalent points in unit cells of a periodic lattice lie on a bravais lattice

B. equivalent points in unit cells of a periodic lattice do not lie on a bravais lattice

C. There are four bravais lattices in two dimension

D. There are five bravais lattices in two dimension

Answer: A



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2. Amorphous substances show

(A) short and long range order

(B) short range order

(C) long range order (D) have no sharp $M. P$

A. B and D are correct

B. B and C are correct

C. C and D are correct

D. A and C are correct

Answer: A



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3. CHARACTERISTICS OF CRYSTALLINE SOLID

- A. long range solids
- B. short range solids
- C. Disordered arrangement
- D. None of these

Answer: A



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4. Among solid the highest melting point is established by

- A. Covalent solids
- B. Ionic solids
- C. pseudo solids
- D. Molecular solids

Answer: B



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5. Crystalline solid are

A. Sugar

B. Rubber

C. Plastic

D. Glass

Answer: A



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6. A crystalline solid

A. Changes abruptly from solid to liquid

when heated

B. Has no definite melting point

C. Undergoes deformation of its geometry

easily

D. Has an irregular 3-dimensional

arrangement

Answer: A





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7. Consider the following incomplete sentence

(i) When most liquids are cooled, they eventually freeze and form ...

(ii) Ice is a....

These are completed by

A. column = I supercooled liquid ,column =

II crystalline solid

B. column = I crystalline solid ,column = II

crystalline solid

C. column = I supercooled liquid ,column =

II supercooled liquid

D. column = I crystalline solid ,column = II

supercooled liquid

Answer: B



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8. Amorphous solid are

A. Supercooled liquid

B. Liquid in real sense

C. Solid substance in real sense

D. Substance with definite melting point

Answer: A



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9. The solid $NaCl$ is a bad conductoe of electricity since

A. in solid $NaCl$ there are no ions

B. solid $NaCl$ is covalent

C. in solid $NaCl$ there is no velocity of ions

D. in solid $NaCl$ there are no electrons

Answer: C



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10. Graphite is a soft lubricant extremely difficult to melt. The reason for this anomalous behaviour is that graphites

A. is a non-crystalline substance

B. is a non-allotropic form of diamond

C. has molecules of variable molecular masses like polymers

D. has carbon atoms arranged in large plate of ring of strongly bound carbon atoms with weak interplate bonds

Answer: D



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11. A match box exhibits

A. Cubic geometry

B. Orthorhombic geometry

C. Monoclinetry geometry

D. Tetragonal geometry

Answer: b



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12. Silica (SiO_2) can be crystalline as well as amorphous with following properties

(I) it has high and sharp melting point

(II) Crystalline

(III) The SiO_4 tetrahedra are randomly joined to give polymeric chains or three-dimensional sheets

Which of the properties is/are matched with amorphous solids?

A. II and III

B. only III

C. I and III

D. I and II

Answer: B



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13. The existence of a substance in more than one solid modification is known as allotropy or polymorphism. Any compound having more than two crystal structures is called polymorphic.

A. Polymorphism

B. Isomorphism

C. Allotropy

D. Enantionmorphism

Answer: A



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14. Which of the following characteristics is/are possessed by non- polar molecular solids?

- A. They have low melting point and are usually in liquid or gaseous state at room temperature and pressure
- B. Atoms or molecules are held by weak dispersion forces or London forces
- C. They are soft and non-conductors of electricity
- D. All of the above

Answer: D



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15. Which is not a property of solids?

A. Solids are always crystalline in nature

B. solid have hight density and low compressinility

C. The diffusion of solid is very slow

D. Solids have defniete volume

Answer: A



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16. Which one of the following is the most correct statement?

A. Brass is an interstitial alloy, while steel is a substitutionally alloy

B. Brass and steel are both substitutional alloys

C. Brass is a substitutional alloy, while steel is an interstitial alloy

D. Brass and steel are both interstitial alloys

Answer: b



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17. Na and Mg crystallize in bcc- and fcc-type crystals, respectively, then the number of atoms of Na and Mg present in the unit cell of their respective crystal is

A. 4 and 2

B. 9 and 14

C. 14 and 9

D. 2 and 4

Answer: D



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18. Which solid will have the weakest intermolecular forces?

A. ice

B. Phosphorus

C. Naphthalene

D. Sodium fluoride

Answer: a



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19. Which of the following exists as covalent crystals in the solid state?

A. Sulphur

B. Phosphorus

C. Iodine

D. Silicon

Answer: d



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20. Which of the following statements is not true about amorphous solids?

A. The constituent particles are arranged in a regular fashion containing short range as well as long range order

B. When kept for a long time time , they
may become crystalline

C. They are be moulded by heating

D. They are isotropic in nature

Answer: A



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21. The sharp melting point of crystalline solids compared to amorphous solids is due to
to

A. different arrangement of constituent particles in different directions

B. same arrangement of constituent particles in different directions

C. a regular arrangement of constituent particles observed over a short distance in the crystal lattice

D. a regular arrangement of constituent particles observed over a long distance in the crystal lattice

Answer: D



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22. In graphite, carbon atoms are joined together due to

A. Covalent bonding

B. van der waals forces

C. Metallic bonding

D. Ionic bonding

Answer: A



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23. Which of the following is a molecular crystal?

A. ice

B. NaCl

C. Graphite

D. SiC

Answer: A



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

A. Ionic

B. Metallic

C. Covalent

D. Molecular

Answer: B



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25. The number of atom per unit in a simple cubic, face - centered cubic and body - centered cubic arerespectively

A. 1, 4, 2

B. 4, 1, 2

C. 2, 4, 1

D. 4, 8, 2

Answer: A



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26. The total number of lattice arrangements in different crystal system is ----- ?

A. 3

B. 8

C. 7

D. 14

Answer: D



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**Ssc Fcc Bcc Nearest Neighbouring Distance Next
Nearest Neighbouring Distance Packing Fraction**

1. In a face contact cubic cell, contribution of
are atom at a face of the unit cell is

A. $1/2$

B. 1

C. 2

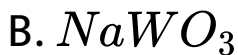
D. 3

Answer: A



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2. A solid has a structure in which W atoms are located at the corner of a lattice O atoms at the center of edges and Na atoms at the center of the cube. The formula for the compound is



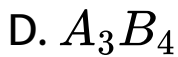
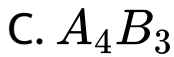
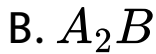
Answer: B



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3. In a solid AB having the $NaCl$ structure, A atom occupies the corners of the cubic unit cell. If all the face-centred atoms along one of

the axes are removed, then the resultant stoichiometry of the solid is

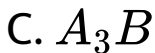
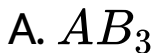


Answer: D



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4. A substance A_xB_y crystallises in a face cubic centred cubic (fcc) lattice in which A occupy each corner of the cube and atoms B occupy the centers of each face of the cube. If the number of atoms of A and B are identical, the correct composition of the substance A_xB_y



D. composition cannot be specified

Answer: A



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5. An element crystallises in fcc lattice having edge length 350 pm. Maximum radius of the atoms which can be placed in the internal site without distorting the structure is

A. 58.55 pm

B. 117 pm

C. 51.23 pm

D. 83 pm

Answer: c



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6. The number of atoms present in unit cell of a monoatomic substance of simple cubic lattice is

A. 1

B. 3

C. 2

D. 6

Answer: A



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7. Sodium metal crystallises in body centred cubic lattice with cell edge 427 pm .Thus radius of sodium atom is

A. 429 pm

B. 214.5 pm

C. 186 pm

D. 185 pm

Answer: D



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

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



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9. The edge of unit of $FCCXe$ crystal is 620 pm .The radius of Xe atom is

A. 219.25 pm

B. 235.16 pm

C. 189.37 pm

D. 209.87 pm

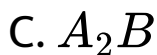
Answer: A



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10. A compound is formed by element A and B .This crystallizes in the cubic structure when atoms A are the corners of a cube and B ions

on the centres of the faces of the cube .The
empirical formula for the compound be

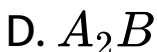
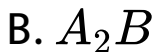


Answer: D



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



Answer: C



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12. Copper crystallises in fcc with a cell length of 361 pm .What is the radius of copper atoms?

A. 127.6 pm

B. 157 pm

C. 181 pm

D. 109 pm

Answer: A



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13. Percentage of free space in cubic close packed structure and in body centered structure are respectively.

A. 48 % and 26 %

B. 30 % and 26 %

C. 26 % and 32 %

D. 32 % and 48 %

Answer: A



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14. Percentage of free space in cubic close packed structure and in body centred structure are respectively.

A. $1.6 \times 10^{21} \text{ cm}^3$

B. $2.81 \times 10^{-23} \text{ cm}^3$

C. $6.02 \times 10^{-23} \text{ cm}^3$

D. $6.6 \times 10^{-24} \text{ cm}^3$

Answer: b



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15. In face centred cubic unit cell edge length is

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

B. $\frac{4}{\sqrt{2}}r$

C. $2r$

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

Answer: B



16. 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 ----- pm

A. 114 pm

B. 288 pm

C. 398 pm

D. 618 pm

Answer: A



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17. An element occurring in the bcc structure has 12.08×10^{23} unit cells. The total number of atoms of the element in these cells will be

A. 24.16×10^{23}

B. 36.18×10^{23}

C. 6.04×10^{23}

D. 12.08×10^{23}

Answer: A



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18. The interionic distance for cesium chloride crystal will be

A. a

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

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

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

Answer: c



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19. Sodium metal crystallises in body centred cubic lattice with cell edge 4.29\AA .What is the radius of sodium atom ?

A. $1.857 \times 10^{-8} \text{ cm}$

B. $2.371 \times 10^{-7} \text{ cm}$

C. $3.817 \times 10^{-8} \text{ cm}$

D. $9.312 \times 10^{-8} \text{ cm}$

Answer: a



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20. Lithium forms body centred cube structure
.The length of the side of its unit cell is 351
pm Atomic radius of the lithium will be

A. 300 pm

B. 240 pm

C. 152 pm

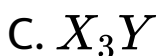
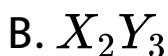
D. 75 pm

Answer: C



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



D. XY

Answer: A



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22. The fraction of total volume occupied by atoms in a simple cube is

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

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

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

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

Answer: D



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23. Silver metal crystallises in a cubic closed packed arrangement with edge length 404 pm .Thus radius of the silver atom is

A. 203.5 pm

B. 138.8 pm

C. 142.8 pm

D. 407.0 pm

Answer: C



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24. Xenon crystallises in face - centered cubic , and the edge of the unit cell is 620 pm .The radius of a xenon atom is

A. 438.5 pm

B. 219.20 pm

C. 536.94 pm

D. 265.5 pm

Answer: B



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25. The length of the unit cell edge of a lattice metal is 350 pm .Thus volume of atoms in one mole of the metal is

A. 9.21cm^3

B. 7.25cm^3

C. 1.21cm^3

D. 4.00cm^3

Answer: A



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26. If a stand for the edge length of the cube system simple cubic , body centred cubes and face centred cubic ,then the ratio of radii of

the spheres in these system will be respectively

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

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

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

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

Answer: c



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

A. $1/2$ part

B. $1/8$ part

C. 1part

D. $1/24$ part

Answer: A



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28. The number of atom/molecules contained in one body centered cubic cell is

A. 1

B. 6

C. 4

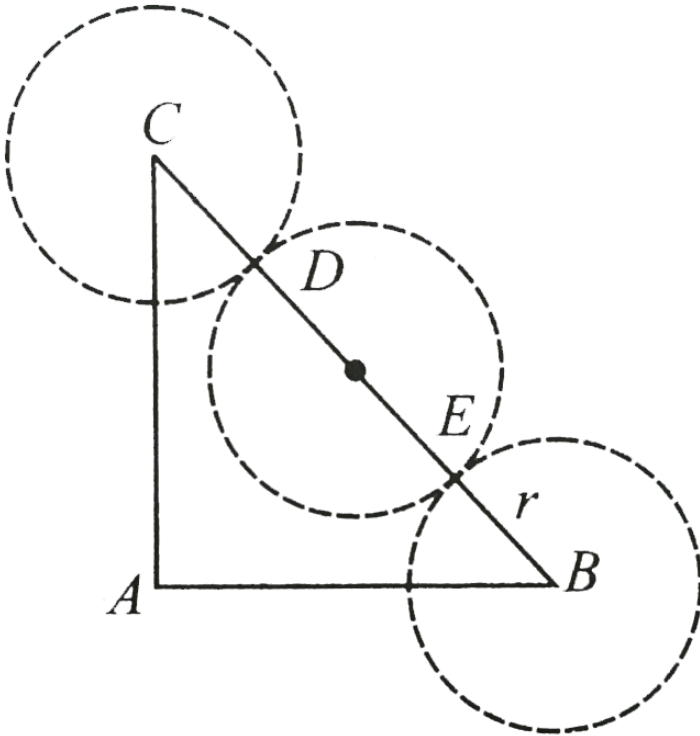
D. 2

Answer: D



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29. Structure of unit cell is described in the given figure packing fraction of the unit cell is?



A. 0.521

B. 0.907

C. 0.093

D. 0.745

Answer: b



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30. Potassium crystallizes with a

A. Face - centred cubic lattice

B. Body - centered cubic lattice

C. Simple cubic lattice

D. Orthorhombic lattice

Answer: b



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31. The packing fraction of the element that crystallizes in simple cubic arrangement is

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

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

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

D. $\frac{\pi}{2}$

Answer: B



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Ccp Hcp Octahedral And Tetral Voids

1. Potassium crystallizes is a bcc lattice the coordination number of potassiiium in potassium metal is

A. 0

B. 4

C. 6

D. 8

Answer: D



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2. Which one of the following schemes of ordering closed packed sheets of equal sized

spheres does not generate close packed lattice

A. ABCABC

B. ABACABAC

C. ABBAABBA

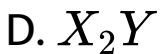
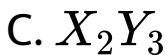
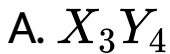
D. ABCBCABCBC

Answer: C



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3. In a compound atoms of element Y form ccp lattice and those of element X occupy $2/3^{\text{rd}}$ of tetrahedral voids. The formula of the compound will be

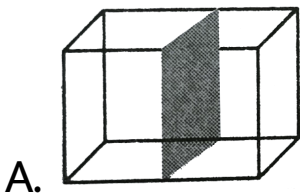
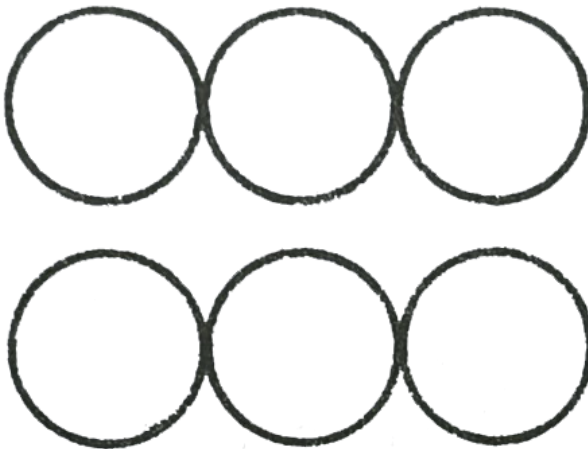


Answer: B

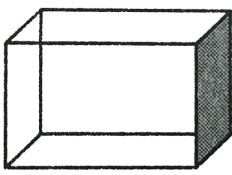


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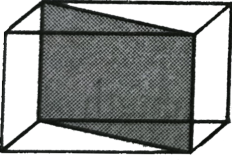
4. Which of the following shaded plane in fcc lattice contains arrangement of atoms



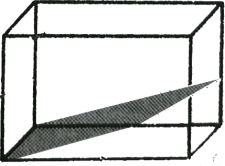
B.



C.



D.



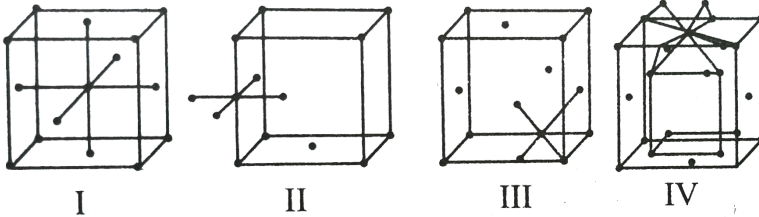
Answer: c



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5. Which one of the following option is correct

:



A. I and II represent tetrahedral holes

B. II, III and IV represent tetrahedral holes

C. I and II represent octahedral holes

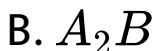
D. I II and IV represent octahedral holes

Answer: c





6. A binary solid ($A^+ B^-$) has a zinc blende structure with B ions constituting the lattice and A^+ ions occupying 25% of the tetrahedral holes. The formula of the solid is



Answer: c



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7. In the crystal lattice of diamond carbon atoms adopt

A. fcc arrangement along with occupancy

of 50 % tetrabedral holes

B. fcc arrangement along with occupancy

of 25 % tetrabedral holes

C. fcc arrangement along with occupancy

of 25 % octahedral holes

D. bcc arrangement

Answer: a



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8. If Z is the number of atoms in the unit cell that represent the closed packing sequence — — — $ABCAB$ — — — the number of tetrahedral in the unit cell is equal to

A. Z

B. ZZ

C. $Z/2$

D. $Z/4$

Answer: b



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9. In a multilayered close - packed structure

A. there are twice as many tetrahedral holes as there are closed packed atoms

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

C. there are twice as many octahedral holes as there are closed packed atoms

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

Answer: A



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10. The number of octahedral and tetrahedral sites in a cubical closed packed array of N spheres respectively is

A. N and $2N$

B. $N/2$ and N

C. $2N$ and N

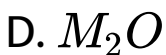
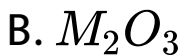
D. $4N$ and $2N$

Answer: a



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11. In a metal oxide , the oxide ions are arranged in hexagonal close packing and metal ions occupy two - third of the octahedral voids .The formula of the oxide is



Answer: b



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12. If Z is the number of atoms in the unit cell that represent the closed packing sequence — — — $ABCAB$ — — — the number of tetrahedral in the unit cell is equal to

A. $2Z$

B. Z

C. $Z/2$

D. $Z/4$

Answer: a



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13. Coordination number in a square close packed structure and hexagonal close packed structure respectively are

A. 6, 4

B. 2, 6

C. 3, 6

D. 4, 6

Answer: d



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14. The arrangement

ABC, ABC, ABC..... is referred as

A. Cubic close packing

B. Hexagonal close packing

C. Teragonal close packing

D. Octahedral close packing

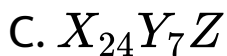
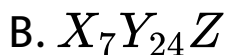
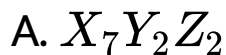
Answer: a



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15. In a *CCP* lattice of *X* and *Y* atoms are present at the corners while *Y* atoms are at face centers .Then the formula of the compound would be if one of the atoms from

a corner is replaced by Z atoms (also monovalent)?



Answer: B



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16. The maximum radius of sphere that can be fitted in the octahedral hole of cubical closed packing of sphere of radius r is

A. $0.732r$

B. $0.414r$

C. $0.225r$

D. $0.155r$

Answer: b



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17. The number of octahedral sites per sphere in fcc structure is

A. 1

B. 4

C. 2

D. 8

Answer: a



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Structure Coordination Number Radius Ratio Rule Density Of Unit Cell

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

A. less than 0.225

B. in between 0.225 and 0.732

C. between 0.414 and 0.732

D. greater than 0.732

Answer: A



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2. The ratio of cationic radius to anionic radius in an ionic crystal is greater than 0.732 its coordination number is

A. 6

B. 1

C. 8

D. 4

Answer: C



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3. In orthorhombic , the value of a, b and c are respectively 4.2\AA , 8.6\AA and 8.3\AA .Given the molecular mass of the solur is 155gmmol^{-1} and that of density is $3.3\text{gm} /$ the number of formula unit per unit cell is

A. 2

B. 3

C. 4

D. 6

Answer: c



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4. The structure of $TiCl$ is similar to $CsCl$

.What would be the radius ratio in $TiCl$?

A. 0.155 – 0.225

B. 0.225 – 0.414

C. $0.414 - 0.732$

D. $0.732 - 1.000$

Answer: D



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5. In which of the following crystals, alternate tetrahedral voids are occupied?

A. $NaCl$

B. ZnS

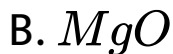


Answer: B



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6. Which of the following contains rock salt structure?



C. Al_2O_2

D. All

Answer: B



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7. Structure similar to zinc blende is found in

A. $AgCl$

B. $NaCl$

C. $CuCl$

D. TICI'

Answer: C



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8. In $CsCl$ lattice the coordination number of Cs ion is

A. 2

B. 8

C. 4

D. 12

Answer: B



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9. Potassium fluoride has $NaCl$ type structure
.What is the distance between K^+ and F^- ions
if cell edge is a cm?

A. $2a$ cm

B. $a/2$ cm

C. $4acm$

D. $a / 4cm$

Answer: B



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10. In $NaCl$ lattice the coordination number of Cl ion is

A. 2

B. 6

C. 4

D. 8

Answer: B



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

A. XZ

B. XZ_2

C. X_2Z

D. X_2Z_3

Answer: C



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12. How many unit cell are present in a cubic-shaped ideal crystal of $NaCl$ of mass $1.0g$?

A. 2.75×10^{21}

B. 5.14×10^{21}

C. 1.28×10^{21}

D. 1.71×10^{21}

Answer: a



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13. Select the correct statement (*s*)

(a) The *C.N.* of cation occupying a tetrahedral hole is 4

(b) The $C.N.$ of cation occupying an octahedral hole is 6

(c) In schottky defects, density of the lattice decreases

A. a,b

B. b,c

C. a,b,c

D. a,c

Answer: C



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14. A mineral having the formula XY_2 crystallises in the cubic closed packed lattice with the A- atoms occupying the lattice points. Fraction of the tetrahedral sites occupied by B-atoms is

A. 1.00

B. 0.52

C. 0.68

D. 0.74

Answer: A



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

A. 3.72\AA

B. 1.86\AA

C. 7.44\AA

D. 4.3\AA

Answer: A



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16. Experimentally it was found that a metal oxide has formula $M_{0.98}O$, Metal M , is present as M_{+2} and M_{+3} in its oxid. Fraction of the metal which exist as $M_{(+3)}$ would be :

A. 6.05 %

B. 5.08 %

C. 7.01 %

D. 4.08 %

Answer: d



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17. $CsCl$ crystallizes in body centred cubic lattice. If ' a ' is its edge length then which of the following expressions is correct ?

A. $r_{Cs^+} + r_{Cl^-} = \frac{a\sqrt{3}}{2}$

B. $r_{Cs^+} + r_{Cl^-} = a\sqrt{3}$

$$C. r_{Cs^+} + r_{Cl^-} = -3a$$

$$D. r_{Cs^+} + r_{Cl^-} = \frac{3a}{2}$$

Answer: a



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18. The number of atoms in 100ganf crystal with density $d = 10\text{g}/\text{cm}^3$ and the edge equal to 100 pm is equal to

A. 4×10^{25}

B. 3×10^{25}

C. 2×10^{25}

D. 1×10^{25}

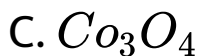
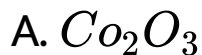
Answer: a



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19. What is the formula of a magnetic oxide of cobalt used in recording tapes that crystallises with cobalt atoms occupying one - eight of the tetrahedral holes and one- half of the

octahedral holes in a closest packed array of oxide ions ?



Answer: b



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20. The coordination number of a metal crystallizing in a hexagonal close-packed structure is

A. 6

B. 8

C. 4

D. 12

Answer: D



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21. In the calcium fluoride structure, the coordination number of the cation and the anion are, respectively,

A. 6, 6

B. 4, 4

C. 8, 4

D. 4, 8

Answer: C



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22. The number of unit cells in 58.5g of $NaCl$ is nearly

A. 6×10^{20}

B. 3×10^{22}

C. 1.5×10^{23}

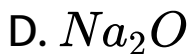
D. 0.5×10^{24}

Answer: c



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23. In which of the following crystals, alternate tetrahedral voids are occupied?



Answer: b



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24. Radii of A and that of X and Y have been given as

$$A = 1.00 \text{ pm}$$

$$X = 1.00 \text{ pm}$$

$$Y = 2.00 \text{ pm}$$

Thus ratio of volume of AX and AY unit cells is

A. 17.54

B. 0.057

C. 1.0

D. 0.217

Answer: b



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25. The radius of the Na^+ is 95 pm and that of Cl ion is 181 pm Predict the coordination number of Na^+ ?

A. 4

B. 6

C. 8

D. unpredictable

Answer: B



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26. Experimentally it is was found that a metal oxide has formula $M_{0.95}O$.Metal M present as M^{3+} in its oxide fraction of the metal which exits as M^{2+} would be

A. 89.47 %

B. 4.08 %

C. 6.05 %

D. 5.08 %

Answer: a



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27. How many unit cell are present in a cubic-shaped ideal crystal of *NaCl* of mass 1.0g?

A. 2.5×10^{21} unit cell

B. 5.14×10^{21} unit cell

C. 1.28×10^{21} unit cell

D. 1.71×10^{21} unit cell

Answer: a



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28. The radius of Ag ion is 126 pm and that of I - ion is 216 pm .The coordination number of Ag ion is

A. 2

B. 4

C. 6

D. 8

Answer: c



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29. The tetrahedral voids formed by cubical arrangement of Cl^- ions in rock salt structure are

A. Occupied by Na^+ ions

B. Occupied by Cl^- ions

C. Occupied by either Na^+ or Cl^- ions

D. Vacant

Answer: d



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

A. $0.4 \times N_A$

B. $0.1 \times N_A$

C. $4 \times N_A$

D. $N_A / 40$

Answer: d



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31. In which of the following 8:8 coordination is found?

A. $CsCl$

B. MgO

C. Al_2O_3

D. All of these

Answer: A



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32. For some crystals , the radius ratio for cation and anion is 0.525 its coordination number will be

A. 2

B. 6

C. 4

D. 8

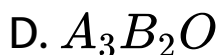
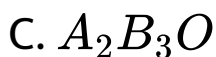
Answer: b



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33. In solid oxide are arranged in cup .One - sixth of tetrahedral voids are occupied by cation A which one third of octahedral voids

are occupied by cation B . What is the formula of compound ?



Answer: B



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

A. $r_c + r_a = a/2$

B. $r_c + r_a = a$

C. $r_c + r_a = 2a$

D. $r_c r_a = 2^{1/2} a$

Answer: b



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

A. 10.376g/cm^3

B. 2.144g/cm^3

C. 7.289g/cm^3

D. 5.188g/cm^3

Answer: d



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

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

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

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

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

Answer: b



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37. An AB_2 type structure is found in

A. NaCl

B. CaF_2

C. Al_2O_3

D. N_2O

Answer: b



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38. Cesium chlorid on heating to $760K$ changes in

A. $CsCl(g)$

B. $NaCl$ structure

C. antifloerite structure

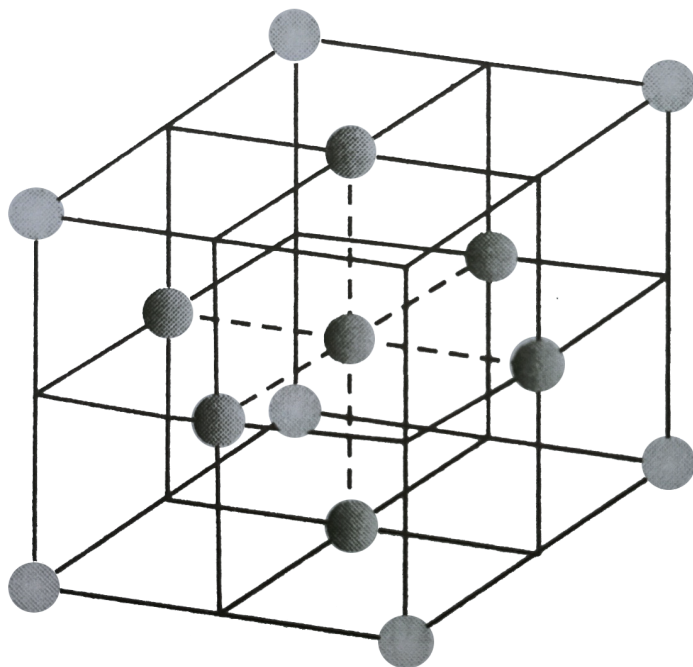
D. ZnS structure

Answer: B



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39. The figure below shown a unit cell of the mineral perovskite (the titanium atom is at the centre of the cube), What of the following is a correct chemical formula for this mineral?



A. Ca_8TiO_6

B. $CaTiO$

C. Ca_2TiO_3

D. $CaTiO_3$

Answer: d



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

A. $CaCl$ type

B. $NaCl$ type

C. ZnS type

D. CaF_2 type

Answer: B



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41. A group IV A element with a density of 11.35g/cm^3 crystallises in a face centered

cubic lattice whose unit cell edge length is 4.95\AA . Calculate its atomic mass

A. 207.2g/mol

B. 180g/mol

C. 109.9g/mol

D. 280.8g/mol

Answer: d



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42. Select the incorrect statement for $CsCl$ crystal

A. Co-ordination no for Cs^+ and Cl^- is

6

B. $\frac{r_{Cs^+}}{r_{Cl^-}} = 0.732$

C. The structure changes to $NaCl$ at $760K$

D. Cl^- ions are present at cubic sides

Answer: a



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43. For cubic - coordination the value of ratio is

A. $0.14 - 0.732$

B. $0.225 - 0.414$

C. $0.000 - 0.225$

D. $0.732 - 1.000$

Answer: D



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44. For unit cell of a $NaCl$ lattice

A. is body centred cube

B. has $3Na^+$ ions

C. is electrically charged

D. has $4NaCl$ unit

Answer: d



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45. How many molecules are there in the unit cell of sodium chloride?



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

A. 3×10^{25}

B. 5×10^{24}

C. 1×10^{25}

D. 5.96×10^{-3}

Answer: b



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47. Structure of ZnS is

A. Body centred cubic

B. Simple cube

C. Face centred cubic

D. Floorite structure

Answer: C



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48. 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. Face centred cubic

C. Body centred cube

D. None of these

Answer: c



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49. For an ionic crystal of the type AB , the value of (limiting) radius ratio is 0.40. The value suggests that the crystal structure should be

A. Octahedral

B. Tetrahedral

C. Square planar

D. Plane triangle triangle

Answer: b



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50. Potassium has a bcc structure with nearest neighbour distance 4.52\AA its atomic weight is 39 its density (in kg m^{-3}) will be

A. 454

B. 804

C. 852

D. 908

Answer: d



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51. In Which of the following substances the carbon atom is arranged in a regular tetrahedral structure?

A. Diamond

B. Benzene

C. Graphite

D. Carbon black

Answer: a



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52. If the value of ionic radius ratio $\left(\frac{r_c}{r_a}\right)$ is 0.52 in an ionic compound, the geometrical of

ions in crystal is

A. Tetrahedral

B. Planar

C. Octahedral

D. Pyramidal

Answer: C



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53. In the closest packed structure of a metallic lattice, the number of nearest neighbours of a metallic atom is

- A. Six
- B. Four
- C. Eight
- D. Twelve

Answer: d



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54. If the ratio is in the range of $0.414 - 0.732$

, then the coordination number will be

A. 2

B. 6

C. 4

D. 8

Answer: b



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55. The formula for determination of density of unit cell is

A. $\frac{a^3 \times N_0}{N \times M} gcm^{-3}$

B. $\frac{a^3 \times M}{N \times N_0} gcm^{-3}$

C. $\frac{N \times M}{a^3 \times N_0} gcm^{-3}$

D. $\frac{M \times N}{a^3 \times N} gcm^{-3}$

Answer: C



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56. In 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
- B. $X/4$ pm
- C. $X/2$ pm
- D. $2X$ pm

Answer: d



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57. An element occurring in the bcc structure has 12.08×10^{23} unit cells. The total number of atoms of the element in these cells will be

A. 12.08×10^{23}

B. 36.18×10^{23}

C. 6.04×10^{23}

D. 24.16×10^{23}

Answer: d



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58. In A^+B^- ionic compound radii of A^+ and B^- ions are $180 \pm$ and $187 \pm$ respectively. The crystal structure of this compound will be

A. $NaCl$ type

B. $CaCl_2$ type

C. ZnS type

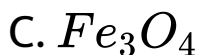
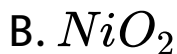
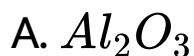
D. Similar to diamond

Answer: b



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59. An example of a non-stoichiometric compound is



Answer: c



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60. For an ionic crystal of the formula AX and coordination number 6, the value of radius ratio will be

- A. greater than 0.73
- B. In between 0.41 and 0.22
- C. in between 0.73 and 0.41
- D. Less than 0.22

Answer: c



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61. In orthorhombic , the value of a, b and c are respectively 4.2\AA , 8.6\AA and 8.3\AA .Given the molecular mass of the solur is 155gmmol^{-1} and that of density is $3.3\text{gm} /$ the number of formula unit per unit cell is

A. 2

B. 3

C. 4

D. 6

Answer: C

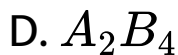


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62. In a solid AB having the $NaCl$ structure, A atom occupies the corners of the cubic unit cell. If all the face-centred atoms along one of the axes are removed, then the resultant stoichiometry of the solid is

A. AB_2

B. A_2B



Answer: a



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63. ferrous oxide has cubic structure and each edge of the unit cell is 5.0\AA . Assuming of the oxide as 4.0g/cm^3 then the number of Fe^{2+} and O^{2-} ions present in each unit cell will be

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

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

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

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

Answer: c



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64. In the zinc blende structure (ZnS), S^{2-} adopts ccp arrangement and Zn^{2+} occupies

A. Octahedral sites

B. Hexagonal sites

C. Teragonal sites

D. Both octahedral sites

Answer: C



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65. A metal crystallizes in two cubic phases, face-centred cubic and body-centred cubic, which have unit cell lengths 3.5\AA and 3.0\AA ,

respectively. Calculate the ratio of densities of fcc and bcc.

A. 2.123

B. 1.259

C. 5.124

D. 3.134

Answer: b



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66. NiO adopts a rock - salt structure , The coordination number of the Ni^{2+} ion is

A. Two

B. Four

C. Twelve

D. Six

Answer: d



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67. The coordination number of a metal crystallizing in a hexagonal close-packed structure is

A. 4

B. 6

C. 8

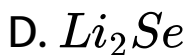
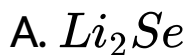
D. 12

Answer: D



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68. Lithium selenide can be described as a closest-packed array of selenide ion with lithium ions in all of the tetrahedral holes.
Formula of lithium selenide is



Answer: d



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69. In the crystal of CaCl_2 , the nearest neighbours of each Ca^{2+} ion are

- A. Six chloride ions
- B. Six Ca^{2+} ions
- C. Eight chloride ions
- D. Eight Ca^{2+} ions

Answer: c



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70. Space lattice of CaF_2 is

- A. Face centred cubic
- B. Body centred cubic
- C. Simple cubic
- D. Hexagonal closed packing

Answer: a



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71. How many chloride ions are there around sodium ion in sodium chloride crystal?

A. 6

B. 8

C. 4

D. 3

Answer: a



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72. A binary solid ($A^+ B^+$) has a rock salt structure. If the edge length is 400 \AA and radius of cation is 75 pm the radius of anion is

A. 100 pm

B. 125 pm

C. 250 pm

D. 325 pm

Answer: b



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Defects In Solids And Semiconductors

1. What fraction of the surface of a crystal of Cd at $T = 298K$ consists of vacancies?

$$\Delta_{\text{sub}}H^{\circ}(Cd) = 113.02 \text{ kJ mol}^{-1} \quad \text{Energy}$$

needed in form a vacancy is approximately 60%

of $\Delta_{\text{sub}}H^{\circ}$

A. 1.50×10^{16}

B. 6.02×10^{-23}

C. 6.02×10^{22}

D. 1.30×10^{-12}

Answer: d



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2. The correct statement regarding defects in solids is

- A. Frenkel defect is favoured by a very small difference in the size of cation and anion
- B. Frenkel defect is not a point defect

C. Trapping of r^- in lattice leads in the formation of F - center

D. Schtiky defect have no effective on the physical properties of solid

Answer: C



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3. In $AgBr$ crystal , the ion size lies in the order $Ag^+ < < Br^-$ The $AgHt$ crystal should have the following characteristics

A. Defectless (perfect) crystal

B. Schottky defect only

C. Frenkel defect only

D. Both Schottky and Frenkel defects

Answer: c



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4. Frenkel defect is caused due to

- A. An missing from the normal lattice site creating a vacancy
- B. An extra positive ion occupying an intersirttile position in the lattice
- C. An extra negative ion occupying an intersirttile position in the lattice
- D. The shift of a positive ion from its normal lattice site to an interstitial site

Answer: D



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5. How many energy levels are present in the 3s conduction band of a single crystal of sodium weighing 25.6 mg?

A. 7.01×10^{20}

B. 7.01×10^{23}

C. 6.02×10^{23}

D. 6.68×10^{20}

Answer: d



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6. Which defect cause decrease in the density of crystal?

A. Frenkle

B. Interstitial

C. schottky

D. F-centre

Answer: C



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7. To get n -type doped semiconductor, impurity to be added to silicon should have the following number of valence electrons

A. 1

B. 2

C. 3

D. 5

Answer: d



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8. The flame colours of metal ions are due to

A. Metal excess defect

B. Schottky defect

C. Metal deficiency defect

D. Frenkel defect

Answer: A



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9. Schottky defect in crystal is when

A. Density of crystal is increase

B. Unequal number of cations and anions
are missing from the lattice

C. An ion leave its normal site and
occupies an interstitial site

D. Equal number of cations and anion are
missing from the lattice

Answer: D





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10. When electron are trapped into the crystal in anion cancy ,the defect is known as

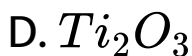
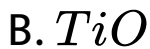
- A. F-centres
- B. Frenkel defect
- C. Stochimetric defect
- D. Schottky defect

Answer: A



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11. In which of the following oxides conducting or insulating property of oxide is dependent on temperature?



Answer: d



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12. The correct statement in the following is

A. The ionic crystal of $AgBr$ has schottky defect

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

C. In ions compound having frenkel defect
the ratio $\frac{\gamma_+}{\gamma_-}$ is high

D. The coordination number of Na^+ ion in

$NaCl$ is 4

Answer: b



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13. The pycnometric density of $NaCl$ crystal is

$2.165 \times 10^3 \text{kgm}^{-3}$ while its X -ray density is

$2.178 \times 10^{-3} \text{kgm}^{-3}$. The fraction of

unoccupied sites in $NaCl$ crystal is

a. 5.96 b. 5.96×10^{-2}

c. 5.96×10^{-1} d. 5.96×10^{-3}

A. 5.96×10^{-1}

B. 5.96

C. 5.96×10^{-2}

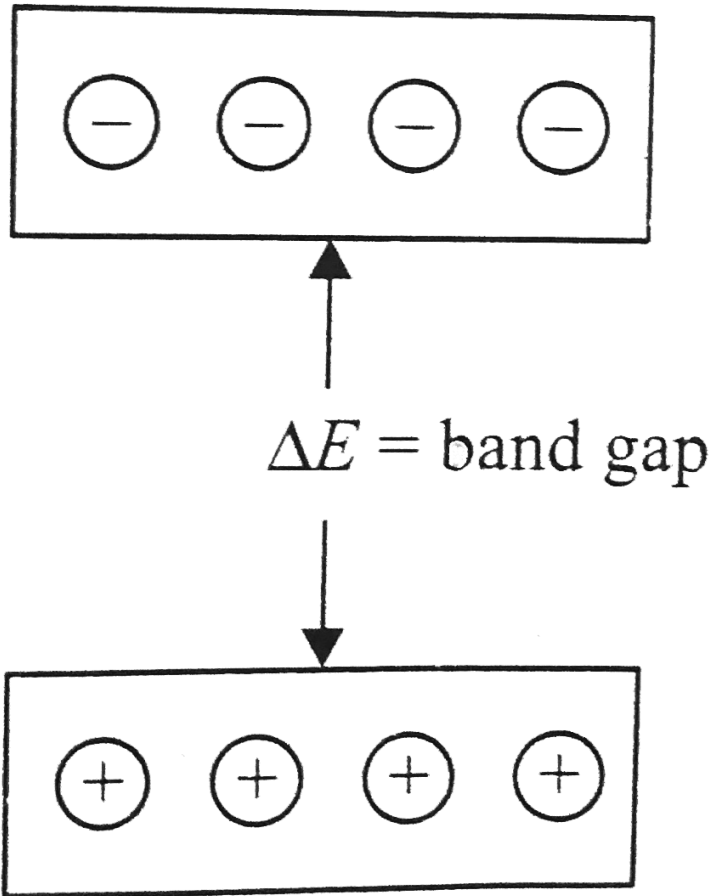
D. 5.96×10^{-3}

Answer: d



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14. For silicon , given



Wavelength of light that excite an electron

from the valence to the conduction band in silicon is

A. 1022nm

B. 1039nm

C. 1022 pm

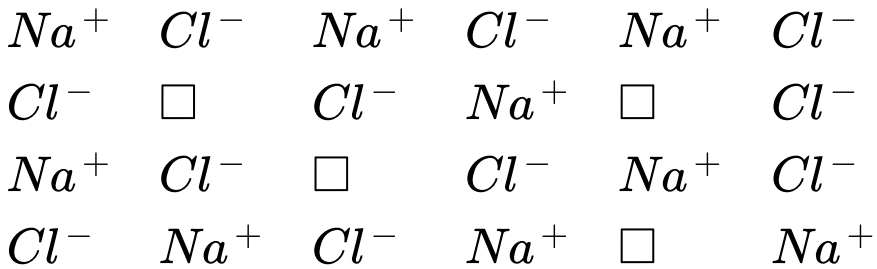
D. 872 pm

Answer: b



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



- A. Frenkle defect
- B. Schottky defect
- C. Interstitial defect
- D. Frenkle defect and Schottky defect

Answer: B





16. In the laboratory, sodium chloride is made by burning the sodium in the atmosphere of chlorine which is yellow in colour. The cause of yellow colour is

A. Presence of Na^+ ions in the crystal lattice

B. Presence of Cl^- ions in the crystal lattice

C. Presence of electron in the crystal lattice

D. Presence of face centered cubic crystal lattice

Answer: c



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17. If $NaCl$ is doped with 10^{-3} mole of $SrCl_2$ then number of cationic vacancies is

A. $6.02 \times 10^{-18} mol^{-1}$

B. $10^{-5} mol^{-1}$

C. $6.02 \times 10^{20} \text{mol}^{-1}$

D. $6.02 \times 10^{18} \text{mol}^{-1}$

Answer: D



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18. The following is not a function an impurity present in a crystal

A. Contributing to scattering

B. Having tendency to diffuse

C. Establishing thermal equilibrium

D. Introducing new electronic energy levels

Answer: c



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19. The correct statement regarding F-centre is

A. Electrons are held in the voids of crystals

B. F-centre produces colour to the crystal

C. Conductivity of the crystal increases due to F- centre

D. All

Answer: D



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20. If a non-metal is added to the interstitial sites of a metal, then the metal becomes

A. More ductile

B. Less tensile

C. Less malleable

D. Softer

Answer: B



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21. $NaCl$ shown Schottky defect and $AgCl$ frenkel defect .Their electrical conductivity is due to

A. motion of ions and not the motion of electrons

B. motion of electrons and not the motion of electrons

C. lower coordination number of $NaCl$

D. higher coordination number of $AgCl$

Answer: A



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Section B Assertion Reasoning

1. Assertion: In Frenkel defect in an ionic crystal, an ion is displaced from its normal site to an interstitial site.

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

A. If both assertion and reason are true and the reason is the correct explanation of the assertion

B. If both assertion and reason are true but reason is not the correct explanation of the assertion

C. If assertion is true bur reason is false

D. If assertion is false bur reason is true

Answer: a



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2. Assertion: If the length of the unit cell of $LiCl$ having $NaCl$ structure is 5.14\AA , the ionic radius of Cl^- ion is $.82\text{\AA}$

Rason : Anion- anion contact is retained in $LiCl$ structure because anion constitute the lattice

A. If both assertion and reason are true and the reason is the correct explanation of the assertion

B. If both assertion and reason are true but reason is not the correct explanation of the assertion

C. If assertion is true bur reason is false

D. If assertion is false bur reason is true

Answer: a



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3. Assertion :The close packing of atoms in cubic structure is in the order $f > b > sc$

Reason: Packing density

$$= \frac{\text{Volume of unit cell}}{a^3}$$

A. If both assertion and reason are true

and the reason is the correct

explanation of the assertion

B. If both assertion and reason are true but

reason is not the correct explanation of

the assertion

C. If assertion is true but reason is false

D. If assertion is false but reason is true

Answer: a



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4. Assertion : In point defect density of solid may decrease and increase

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

A. If both assertion and reason are true and the reason is the correct explanation of the assertion

B. If both assertion and reason are true but reason is not the correct explanation of the assertion

C. If assertion is true bur reason is false

D. If assertion is false bur reason is true

Answer: b



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

Reason : In hexagonal close packing voids are called tetrahedral voids and octahedral voids

A. If both assertion and reason are true and the reason is the correct explanation of the assertion

B. If both assertion and reason are true but reason is not the correct explanation of the assertion

C. If assertion is true bur reason is false

D. If assertion is false bur reason is true

Answer: c



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6. Assertion : Antiferromagnetic on heating to high temperature become paramagnetic

Reason : On heating randomisation of spins occurs

A. If both assertion and reason are true and the reason is the correct explanation of the assertion

B. If both assertion and reason are true but reason is not the correct explanation of the assertion

C. If assertion is true but reason is false

D. If assertion is false but reason is true

Answer: a



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7. Assertion : Stoichiometric compounds obey the law of constant composition

Reason: Schottky and Frenkel defects are observed in stoichiometric compounds

A. If both assertion and reason are true and the reason is the correct explanation of the assertion

B. If both assertion and reason are true but reason is not the correct explanation of the assertion

C. If assertion is true bur reason is false

D. If assertion is false bur reason is true

Answer: b



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8. Assertion : Bragg's equation has no solution,
if $n = 2$ and $\lambda > d$

Reason : Bragg's equation is $n\lambda = 2d \sin \theta$

A. If both assertion and reason are true
and the reason is the correct
explanation of the assertion

B. If both assertion and reason are true but
reason is not the correct explanation of
the assertion

C. If assertion is true but reason is false

D. If assertion is false but reason is true

Answer: a



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

Reason : The structure of Na_2O is also called spinal structure

A. If both assertion and reason are true and the reason is the correct explanation of the assertion

B. If both assertion and reason are true but reason is not the correct explanation of the assertion

C. If assertion is true but reason is false

D. If assertion is false but reason is true

Answer: c



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10. Assertion : Solids having more F-centre possess intense colour

Reason: Excess of Na^+ in $NaCl$ solid having F-centers makes it appear pink

A. If both assertion and reason are true and the reason is the correct explanation of the assertion

B. If both assertion and reason are true but reason is not the correct explanation of

the assertion

C. If assertion is true but reason is false

D. If assertion is false but reason is true

Answer: c



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11. Assertion (A) : Triclinic system is the most unsymmetrical system.

Reason (R) : No axial angle is equal to 90° in triclinic system.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion

B. If both assertion and reason are true but reason is not the correct explanation of the assertion

C. If assertion is true but reason is false

D. If assertion is false but reason is true

Answer: b



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12. Assertion (A) : Frenkel defects are shown by AgX .

Reason (R) : Ag^{\oplus} ions have small size.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion

B. If both assertion and reason are true but reason is not the correct explanation of the assertion

C. If assertion is true bur reason is false

D. If assertion is false bur reason is true

Answer: a



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13. Assertion : In $AgCl$ crystal, frenkel defect can be observed

Reason: Ag^+ is a small sized cation

A. If both assertion and reason are true and the reason is the correct explanation of the assertion

B. If both assertion and reason are true but reason is not the correct explanation of the assertion

C. If assertion is true but reason is false

D. If assertion is false but reason is true

Answer: a



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14. Assertion : A crystal having f structure is more closely packed than a crystal having b structure

Reason: packing fraction for f structure is double than that of b structure

A. If both assertion and reason are true and the reason is the correct explanation of the assertion

B. If both assertion and reason are true but reason is not the correct explanation of the assertion

C. If assertion is true bur reason is false

D. If assertion is false bur reason is true

Answer: c



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15. Assertion : ZnO becomes yellow when it is
beated

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

A. If both assertion and reason are true
and the reason is the correct
explanation of the assertion

B. If both assertion and reason are true but
reason is not the correct explanation of

the assertion

C. If assertion is true but reason is false

D. If assertion is false but reason is true

Answer: b



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16. Assertion (A) : Covalent crystals have higher melting point.

Reason (R) : Covalent bonds are stronger than ionic bonds.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion

B. If both assertion and reason are true but reason is not the correct explanation of the assertion

C. If assertion is true but reason is false

D. If assertion is false but reason is true

Answer: c



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17. Assertion : $CsCl$ has body - centred cubic arrangement

Reason: $CsCl$ has one and $8Cl^-$ ion is its unit cell

A. If both assertion and reason are true and the reason is the correct explanation of the assertion

B. If both assertion and reason are true but reason is not the correct explanation of

the assertion

C. If assertion is true but reason is false

D. If assertion is false but reason is true

Answer: c



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18. Assertion : In $NaCl$ crystal each Na^+ ion is touching $6Cl^-$ ion but these Cl^- ion do not touch each other

Reason: The radius ratio is greater than 0.414
required for exact fitting

A. If both assertion and reason are true
and the reason is the correct
explanation of the assertion

B. If both assertion and reason are true but
reason is not the correct explanation of
the assertion

C. If assertion is true but reason is false

D. If assertion is false but reason is true

Answer: a



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19. Assertion (A) : In the rock salt type structure, all the OV_s are occupied by Na^{\oplus} ions.

Reason (R) : Number of $OV_s =$ Number of Cl^{\ominus} ions in the packing.

A. If both assertion and reason are true
and the reason is the correct

explanation of the assertion

B. If both assertion and reason are true but reason is not the correct explanation of the assertion

C. If assertion is true but reason is false

D. If assertion is false but reason is true

Answer: b



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

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

A. If both assertion and reason are true and the reason is the correct explanation of the assertion

B. If both assertion and reason are true but reason is not the correct explanation of the assertion

C. If assertion is true bur reason is false

D. If assertion is false bur reason is true

Answer: c



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21. Assertion : The octahedral voids have double the size of the tetrahedral voids in a crystal

Reason: The number of tetrahedral voids is double the number of octahedral voids in a crystal

A. If both assertion and reason are true and the reason is the correct explanation of the assertion

B. If both assertion and reason are true but reason is not the correct explanation of the assertion

C. If assertion is true bur reason is false

D. If assertion is false bur reason is true

Answer: d



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Aipmt Neet Questions

1. When molten zinc is cooled to solid state it assumes hcp structure .Then the number of nearest neighbours of zinc atom will be

A. 4

B. 6

C. 8

D. 12

Answer: d



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2. The pyknometric density of $NaCl$ crystal is $2.165 \times 10^3 kgm^{-3}$ while its X -ray density is $2.178 \times 10^{-3} kgm^{-3}$. The fraction of unoccupied sites in $NaCl$ crystal is

a. 5.96 b. 5.96×10^{-2}

c. 5.96×10^{-1} d. 5.96×10^{-3}

A. 5.99

B. 5.96×10^{-2}

C. 5.96×10^{-1}

D. 5.96×10^{-3}

Answer: d



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3. With which one of the following element silicon should be depend so as to give p- type semiconductor?

A. As

B. Se

C. B

D. Ge

Answer: c



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

A. $8.25g/cm^3$

B. $4.25\text{g} / \text{cm}^3$

C. $42.5\text{g} / \text{cm}^3$

D. $0.425\text{g} / \text{cm}^3$

Answer: b



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5. Which of the following statement is not correct?

A. Molecular solids are generally volatile

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

C. The number of Bravais lattices in which a crystal can be categorized is 14

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

Answer: b



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6. If $NaCl$ is doped with 10^{-4} mole % of $SrCl_2$ then number of cationic vacancies will be

A. $6.02 \times 10^{16} mol^{-1}$

B. $6.02 \times 10^{17} mol^{-1}$

C. $6.02 \times 10^{14} mol^{-1}$

D. $6.02 \times 10^{15} mol^{-1}$

Answer: b



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7. The fraction of total volume occupied by atoms in a simple cube is

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

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

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

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

Answer: d



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

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

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

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

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

Answer: d





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9. Percentage of free space in cubic in a body-centred cubic unit cell is .

A. 32 %

B. 34 %

C. 28 %

D. 30 %

Answer: a



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10. Lithium crystallizes in a body - centred cubic crystal .If the length of the unit cell if lithium is 315pm , the atomic radius of the lithium will be

A. 300.5 pm

B. 240.8 pm

C. 151.8 pm

D. 75.5 pm

Answer: c



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11. AB crystallises in a bcc lattice with edge length a equal to 387 pm . The distance between two oppositely charged ions in the lattice is

A. 335 pm

B. 250 pm

C. 200 pm

D. 300 pm

Answer: a



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12. The number of octahedral voids (s) per atoms present in a cubic packed structure is

A. 2

B. 4

C. 1

D. 3

Answer: c



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13. A metal crystallizes with a face-centred cubic lattice. The edge of the unit cells is 408 pm. The diameter of the metal atoms is

A. 144 pm

B. 204 pm

C. 288 pm

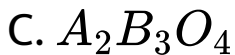
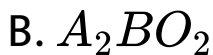
D. 408 pm

Answer: c



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14. Structure of a mixed oxide is cubic closed - packed (ccp) .The cubic unit cell of mixed oxide is composed of oxide ions .One fourth of the tetrahedral voids are occupied by divalent metal A and the octahedral voids are occupied by a monovalent metal B .The formula of the oxide is



Answer: d



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15. A metal has a fcc lattice. The edge length of the unit cell is 404 pm, the density of the metal is 2.72 g cm^{-3} . The molar mass of the

metal is (N_A , Avorgadro's constant

$$= 6.02 \times 10^{23} \text{mol}^{-1})$$

A. 30g mol^{-1}

B. 27g mol^{-1}

C. 20g mol^{-1}

D. 40g mol^{-1}

Answer: b



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

A. 8

B. 6

C. 1

D. 4

Answer: a



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17. If a is the length of the side a cubic unit cell the distance between the body-centred atoms and one corner atoms in the cube will be

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

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

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

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

Answer: b



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18. A given metal crystallises out with a cubic structure having edge length of 361pm .If there are metal atoms in one cell, what is the radius of one atoms?

A. 80 pm

B. 108 pm

C. 40 pm

D. 127 pm

Answer: d



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19. The vacant space in bcc lattice unit cell is

A. 23 %

B. 32 %

C. 26 %

D. 48 %

Answer: b



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20. Lithium metal has a body centred cubic structure. Its density is 0.53gcm^{-3} and its molar mass is 6.94gmol^{-1} . Calculate the edge length of a unit cell of Lithium metal

A. 264 pm

B. 154 pm

C. 352 pm

D. 527 pm

Answer: d



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21. The ionic radii of A^+ and B^- ions are 0.98×10^{-10} and $1.81 \times 10^{-10} m$. The coordination number of each ion in AB is

A. 2

B. 6

C. 4

D. 8

Answer: b



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22. Which is the incorrect statement?

A. Density decreases in case of crystals with

Schottky 's defect

B. $NaCl(s)$ is insulator , silicon is

semiconductor , silver is conductor

quartz is piezo electric crystal

C. Frenkel defect is favoured in those ionic

compounds in which sizes of cation and

anions are almost equal

D. $FeO_{0.98}$ has non stoichiometric metal deficiency defect

Answer: c



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23. Iron exhibits bcc structure at room temperature. Above $900^{\circ}C$ it transitions to fcc structure. The ratio of density of iron at room temperature to that at $900^{\circ}C$ (assuming

molar mass and atomic , radii of ion remain s
constant with temperature) is

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

B. $\frac{4\sqrt{3}}{3(\sqrt{2})}$

C. $\frac{3\sqrt{3}}{4(\sqrt{2})}$

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

Answer: c



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1. The three states of matter are solid, liquid and gas .Which of the following statement is/are about them?

A. Gases and liquid have viscosity as a common property

B. The molecules in all the three states posses random transtational motion

C. Gases cannot be converted into solids without passing through the liquid phase

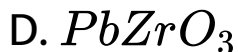
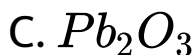
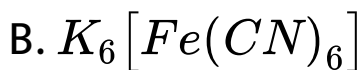
D. Solids and liquid have vapour pressure as a common property

Answer: a



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2. Which of the following is a ferroelectric compound?



Answer: a



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3. The solid $NaCl$ is a bad conductor of electricity since

A. in solid $NaCl$ there are no ions

B. solid $NaCl$ is covalent

C. in solid $NaCl$ there is no velocity of ions

D. in solid $NaCl$ there are no electrons

Answer: c



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4. In graphics carbon atoms are joined together due to

- A. ionic bonding
- B. van der waals forces
- C. metallic bonding
- D. covalent bonding

Answer: a



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5. Example of unit cell with crystallographic dimension $a \neq b \neq c$, $\alpha = \gamma = 90^\circ$ is

A. calcite

B. graphite

C. rhombic sulphur

D. monoclinic sulphur

Answer: d



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6. If Z is the number of atoms in the unit cell that represent the closed packing sequence $— — — ABCAB — — —$ the number of tetrahedral in the unit cell is equal to

A. Z

B. $2Z$

C. $Z/2$

D. $Z/4$

Answer: b



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7. An AB_2 type structure is found in

A. $NaCl$

B. Al_2O_3

C. CaF_2

D. N_2O

Answer: c



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8. An example of a body cube is

A. sodium

B. magnesium

C. zinc

D. copper

Answer: a



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

A. $1/4$ part

B. $1/8$ part

C. 1part

D. $1/2$ part

Answer: d



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10. Sodium metal crystallises in body centred cubic lattice with cell edge 4.29\AA .What is the radius of sodium atom ?

A. $1.857 \times 10^{-8} \text{ cm}$

B. $2371 \times 10^{-7} \text{ cm}$

C. $3.817 \times 10^{-8} \text{ cm}$

D. $9312 \times 10^{-7} \text{ cm}$

Answer: a



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11. Potassium has a bcc structure with nearest neighbour distance 4.52\AA its atomic weight is 39 its density (in kg m^{-3}) will be

A. 454

B. 804

C. 852

D. 908

Answer: d



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12. The coordination number of each atom in body centered cubic unit cell is

A. 4

B. 8

C. 12

D. 6

Answer: b



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13. Find the coordination of Na^{\oplus} in Na_2O .

A. 6

B. 4

C. 8

D. 2

Answer: b



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

A. Interstitial defect

B. vacancy defect

C. Frenkel defect

D. Schottky defect

Answer: c



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

A. 10376g/cm^3

B. 5.188g/cm^3

C. 7.289g/cm^3

D. 2.144g/cm^3

Answer: b



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16. If the pressure on a $NaCl$ structure increases, then its coordination number will

- A. increases
- B. decreases
- C. remain the same
- D. either (b) or (c)

Answer: a



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17. The edge length of a cube is 400 pm .its body diagonal would be

A. 600 pm

B. 566 pm

C. 693 pm

D. 500 pm

Answer: c



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

A. $0.155r_A$

B. $0.125r_A$

C. $0.414r_A$

D. $0.732r_A$

Answer: c



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19. Potassium has a bcc structure with nearest neighbour distance 4.52\AA its atomic weight is 39 its density (in kg m^{-3}) will be

A. 454

B. 804

C. 852

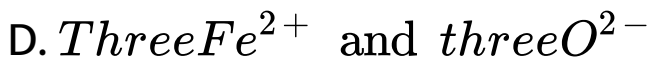
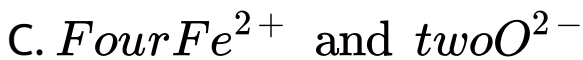
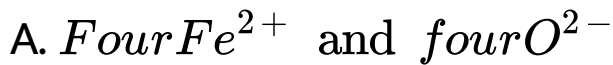
D. 910

Answer: d



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20. Ferrous oxide has cubes structure and each edge of the unit cell is 5.0\AA .Assuming of the oxide as $4.0\text{g}/\text{cm}^3$ then the number of Fe^{2+} and O^{2-} inos present in each unit cell will be



Answer: a



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21. ZnO is white cold and yellow when heated, it is due to the development of

A. Frenkel defect

B. Metal defect

C. Schottky defect

D. Metal deficiency defect

Answer: b



22. f-centre is

- A. anion vacancy occupied by unpaired electron
- B. anion vacancy occupied by electron
- C. cation vacancy occupied by electron
- D. anion present in interstitial site

Answer: a



Assertion Reasoning Questions

1. Assertion :No compound has both schottky and frenkel defect

Reason : schottky defect change the density of the solid

A. If both assertion and reason are true and the reason is the correct explanation of the assertion

B. If both assertion and reason are true but reason is not the correct explanation of the assertion

C. If assertion is true bur reason is false

D. If assertion is false bur reason is true

Answer: d



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2. 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 assertion and reason are true and the reason is the correct explanation of the assertion

B. If both assertion and reason are true but reason is not the correct explanation of

the assertion

C. If assertion is true but reason is false

D. If assertion is false but reason is true

Answer: a



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3. Assertion : Coordination structure of $CaCl_2$ changes from 8:8 \rightarrow 6:6 on heating

Reason: The crystal structure $CaCl_2$ changed in $NaCl$ on heating

A. If both assertion and reason are true and the reason is the correct explanation of the assertion

B. If both assertion and reason are true but reason is not the correct explanation of the assertion

C. If assertion is true bur reason is false

D. If assertion is false bur reason is true

Answer: a



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4. Band gap in germanium is small.

The energy spread of each germanium atomic energy level is infinitesimally small.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion

B. If both assertion and reason are true but reason is not the correct explanation of the assertion

C. If assertion is true but reason is false

D. If assertion is false but reason is true

Answer: c



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5. Assertion : Diamond is a precious stone

Reason : carbon atoms are tetrahedrally arranged in diamond

A. If both assertion and reason are true and the reason is the correct explanation of the assertion

B. If both assertion and reason are true but reason is not the correct explanation of the assertion

C. If assertion is true but reason is false

D. If assertion is false but reason is true

Answer: b



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6. Assertion (A) : In sodium chloride crystal, Na^{\oplus} ions occupy OVs while Cl^{\ominus} ions occupy vertices of octahedron.

Reason (R) : The radius ratio of $Na^{\oplus} : Cl^{\ominus}$ lies between 0.4 and 0.7.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion

B. If both assertion and reason are true but reason is not the correct explanation of the assertion

C. If assertion is true bur reason is false

D. If assertion is false bur reason is true

Answer: d



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

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

A. If both assertion and reason are true and the reason is the correct explanation of the assertion

B. If both assertion and reason are true but reason is not the correct explanation of the assertion

C. If assertion is true bur reason is false

D. If assertion is false bur reason is true

Answer: c



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Section D Chapter End Test

1. The mass of unit cell of CaF_2 (fluorite structure) corresponds to

A. mass of $8Ca^{++}$ ions and $4F^{-}$ ions

B. mass of $4Ca^{++}$ ions and $8F^{-}$ ions

C. mass of $4Ca^{++}$ ions and $4F^{-}$ ions

D. mass of $1Ca^{++}$ ions and $2F^{-}$ ions

Answer: B



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2. Close packing is maximum in the crystal
which in the crystal which is

A. Simple cube

B. bcc

C. fcc

D. none

Answer: c



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3. An ionic compound AB has ZnS type of structure if the radius A^+ is 22.5 pm , then the ideal radius of B is

A. 54.35 pm

B. 100 pm

C. 145.16 pm

D. None

Answer: B



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4. A pure crystalline substance, on being heated gradually first a turbid looking liquid and then the turbidity completely disappears

.This behaviour is the characteristic of substances forming

- A. Isomeric crystals
- B. liquid crystals
- C. isomorphous crystal
- D. Allotropic crystals

Answer: b



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5. Under which category iodine crystals are placed among the following

A. Ionic crystals

B. Metallic crystals

C. Molecular crystals

D. Covalent crystals

Answer: c



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6. How many molecules are there in the unit cell of sodium chloride?

A. 2

B. 4

C. 6

D. 8

Answer: b



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7. The structure of $TlCl$ is similar to $CsCl$

.What would be the radius ratio in $TlCl$?

A. 0.155 – 0.225

B. 0.225 – 0.414

C. 0.414 – 0.732

D. 0.732 – 1.000

Answer: d



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8. Na and Mg crystallize in bcc- and fcc-type crystals, respectively, then the number of atoms of Na and Mg present in the unit cell of their respective crystal is

A. 4 and 2

B. 9 and 14

C. 14 and 9

D. 2 and 4

Answer: d



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9. In the closest packed structure of a metallic lattice, the number of nearest neighbours of a metallic atom is

A. Twelve

B. Four

C. Eight

D. Six

Answer: a



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10. The number of atoms in 100g of crystal with density $d = 10\text{g}/\text{cm}^3$ and the edge equal to 100 pm is equal to

A. 4×10^{25}

B. 3×10^{25}

C. 2×10^{25}

D. 1×10^{25}

Answer: a



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11. Potassium has a bcc structure with nearest neighbour distance 4.52\AA its atomic weight is 39 its density (in kg m^{-3}) will be

A. 454

B. 804

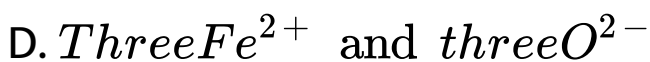
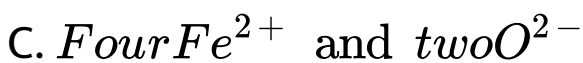
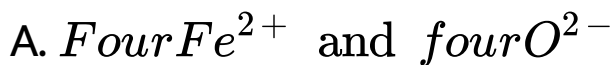
C. 852

D. 910

Answer: d



12. Ferrous oxide has cubes structure and each edge of the unit cell is 5.0\AA .Assuming of the oxide as $4.0\text{g}/\text{cm}^3$ then the number of Fe^{2+} and O^{2-} inos present in each unit cell will be



Answer: a



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13. In A^+B^- ionic compound radii of A^+ and B^- ions are 180pm and 187 pm respectively .The crystal structure of this compound will be

A. *NaCl* type

B. *CaCl* type

C. *ZnS* type

D. Similar to diamond

Answer: B



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14. In the calcium fluoride structure, the coordination number of the cation and the anion are, respectively,

A. 6, 6

B. 8, 4

C. 4, 4

D. 4, 8

Answer: b



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15. Which of the following has Frenkel defect?

A. Sodium chloride

B. Graphite

C. Silver bromide

D. Dimond

Answer: c



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16. Which one of the following is the most correct statement?

A. Brass is an interstitial alloy, while steel is a substitutionally alloy

B. Brass is substitutionally alloy, while steel is an interstitial alloy

C. Brass and steel are both substitutional alloys

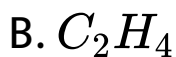
D. Brass and steel are both interstitial alloys

Answer: c



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17. The molecule having three fold axis of symmetry is :

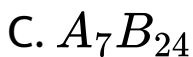
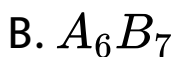
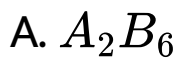


Answer: a



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18. In a *f. c. c.* arrangement of *A* and *B* atoms, where *A* atoms are at the corners of the unit cell and *B* atoms at the face – centres, one of the *A* atom is missing from one corner in each unit cell. The formula of compound is :



Answer: d



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19. In fluorite structure (CaF_2)

A. Ca^{2+} ions are ccp and F^- ions are present in all the tetrahedral voids

B. Ca^{2+} ions are ccp and F^- ions are present in all the octahedral voids

C. Ca^{++} ions are ccp and F^{-} ions are present in all the octahedral voids

D. None

Answer: a



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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 tetrahedral sites. What is the formula of the compound ?

A. PO_2

B. P_2O

C. PO

D. P_2O_2

Answer: a



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21. The fraction of total volume occupied by atoms in a simple cube is

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

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

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

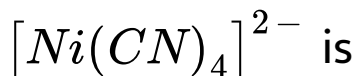
D. $\frac{\pi}{6}$

Answer: d



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22. The limiting radius ratio of the complex



A. $0.225 - 0.414$

B. $0.414 - 0.732$

C. $0.155 - 0.225$

D. None

Answer: b



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23. If the ratio of co-ordination no P to that of Q be $Y : Z$, then the formula of the solid is

A. $P_Y O_Z$

B. $P_Z O_Y$

C. $P_{zY} O_{YZ}$

D. None

Answer: b



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24. Xenon crystallises in face - centered cubic ,
and the edge of the unit cell is 620 pm .The
radius of a xenon atom is

A. 438.5 pm

B. 219.25 pm

C. 536.94 pm

D. 265.5 pm

Answer: b



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25. The arrangement of Cl^- ions in $CsCl$ structure is

A. hcp

B. fcc

C. bcc

D. Simple cubic

Answer: d



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26. The maximum radius of sphere that can be fitted in the octahedral hole of cubical closed packing of sphere of radius r is

A. $0.155r_A$

B. $0.125r_A$

C. $0.414r_A$

D. $0.732r_A$

Answer: c



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27. The edge length of a cube is 400 pm .its
body diagonal would be

A. 693 pm

B. 566 pm

C. 600 pm

D. 500 pm

Answer: a



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28. 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.



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29. Assertion : On heating ferromagnetic or ferromagnetic substance , they become paramagnetic

Reason The electrons change their spin on heating



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30. Assertion :Lead zirconate is a piezoelectric crystal

Reason : Lead zirconate crystal has no dipole moment



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Others

1. Bragg's X- rays diffraction studies are successful when

A. $\lambda > 2d$

B. $\lambda \leq 2d$

C. $\lambda \geq 2d$

D. $\lambda = d$

Answer: c



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2. Which of the following relation is correct for first - order Bragg's diffraction?

$$\text{A. } \sin \theta = \frac{2a}{\lambda} (h^2 + k^2 + l^2)$$

$$\text{B. } \sin \theta = \frac{2a}{\lambda} (h^2 + k^2 + l^2)^{1/2}$$

$$\text{C. } \sin \theta = \frac{\lambda}{2a} (h^2 + k^2 + l^2)^{1/2}$$

$$\text{D. } \sin \theta = \frac{\lambda}{2a} (h^2 + k^2 + l^2)^2$$

Answer: c



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3. The oxide which shows metallic conduction

is

A. ReO_3

B. VO

C. CrO_2

D. all of these

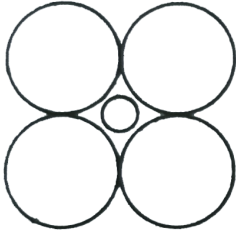
Answer: d



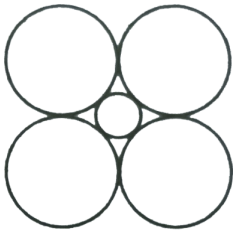
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4. Select the correct match

A. Ferroelectricity



B. Anti-Ferroelectricity



C. Both of the above

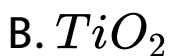
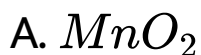
D. None of the above

Answer: c



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5. Which one of the following metal oxide is antiferromagnetic in nature?



Answer: a



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6. Certain crystals produce electric signals on application of pressure. This phenomenon is called :

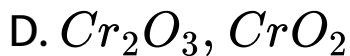
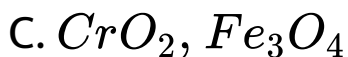
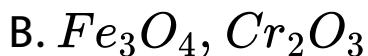
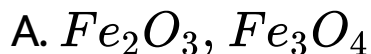
- A. Pyroelectricity
- B. Ferroelectricity
- C. Piezoelectricity
- D. Ferrielectricity

Answer: C



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7. Which of the following pairs contain ferromagnetic and ferrimagnetic , solids respectively ?



Answer: c



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8. Which of the following statements are true

?

A. Piezoelectricity is due to net dipole

moment

B. Piezoelectricity is due to alignment of

dipole in same direction

C. Piezoelectricity is due to heating polar

crystals

D. All of the above

Answer: d



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9. The diffraction of barium with X-radiation of wavelength 227 pm given a first - order diffraction at 30° . Thus, distance between the two planes is

A. 114.5 pm

B. 229 pm

C. 458 pm

D. 227 pm

Answer: d



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10. Which arrangement of electron decides ferrimagnetism?

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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11. In Bragg's X-rays diffraction studies , 100 pm has second - order diffraction at glancing angle of 30° Its interplanar spacing will be

A. 200 pm

B. 150 pm

C. 100 pm

D. 144 pm

Answer: a



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12. At what angle for the first - order diffraction, spacing between two planes respectively is λ and $\frac{\lambda}{2}$?

A. 0° , 90°

B. 90° , 0°

C. 30° , 90°

D. 90° , 30°

Answer: c



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13. Which substance shown
antiferromagnetism?

A. ZnO_2

B. CdO

C. CrO_2

D. MnO_3

Answer: d



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