CHEMISTRY

BOOKS - UNIVERSAL BOOK DEPOT 1960 CHEMISTRY (HINGLISH)

SOLID STATE

Ordinary Thinking Type Of Solid And Their Properties

1. With Which one of the following elements silicon should be doped so as to give p-type of semiconductor?

A. Selenium

B. Boron

C. Germanium

D. Arsenic

Answer: B

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

A. 1

B. 4

C. 8

D. 6

Answer: C

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3. Solid NaCl is a bad conductor of electricity because

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. A pure crystallic substance , on being heated gradually first a hurbit looking liquid and then the furbidly completely disppears .This behaviour is the characteristic of substances forming

A. Isomeric crystals

B. Liquid crystals

C. Isomorphous crystals

D. Allotropic crystals

Answer: B

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5. Which of the following is a ferroelectric compound?

A. $BaTiO_3$

B. $K_4\left[Fe(CN)_6\right]$

C. Pb_2O_3

D. $PbZrO_3$

Answer: A

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6. Which of the following is true for diamond

A. Diamond is a good conductor of electricity.

B. Diamond is soft

C. Diamond is a bad conductor of heaet.

D. Diamond is made up of C,H and O

Answer: C

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7. The metallic lustre of metals is due to :

A. Its high density

B. Its high polishing

C. Its chemical inertness

D. presence of free electrons

Answer: D

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8. Which of the following is a good conductor of electricity?

A. Diamond is a good conductor of electricity.

B. Graphite

C. Silicon

D. Amorphous carbon.

Answer: B

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9. The characteristic features of solids are:

A. Definite shape

B. Definite size

C. Definite shape and size

D. Definite shape, size and rigidity.

Answer: D

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10. Quartz is a crystalline variety (purest form) of

A. Silica

B. Sodium silicate

C. Silicon carbide

D. Silicon.

Answer:

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11. Molecuels ions and their magnetic properties are given below

$(\text{Molecular/ion, Magnetic property}), (i)(C_6H_6, 1.\ \text{Antiferromagnetic}), (Cr$

The correctly matched pairs in the above is

A. i-5,ii-3iii-2,iv-1,v-4

B. $i-3, ii-5, iii-1, iv-4, v-2$

C. i-5,ii-3,iii-1,iv-2,v-4

D. i-5,ii-3,iii-1,iv-4,v-2

Answer: C

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12. The ability of a substance to exist in two or more crstaline forms knows as:

A. Amorphism

B. Isomorphism

C. Polymorphism

D. Isomerism.

Answer: C

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

A. Solid with hydrogen bonding

B. Electrovalent solid

C. Covalent solid.

D. Glass.

Answer: C

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

A. Ionic

B. Covalent

C. Metallic

D. Molecular

Answer: C

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15. The substance which does not show sharp melting point is

A. KCl

B. Glass

C. Plastic

D. Diamond.

Answer: B

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16. Crystalline solids have :

A. Glass

B. Rubber

C. Plastic

D. Sugar.

Answer: D

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17. Which one of the following metal oxide is antiferromagenetic in nature?

A. MnO_2

B. TiO_2

C. VO_2

D. CrO_2

Answer: A

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18. Silicon is a

A. Semiconductor

B. Insulator

C. Conductor

D. None of these

Answer: A

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19. A crystalline solid

A. Long range order

B. Short range order

C. Disordered arrangement

D. None of these

Answer: A

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20. 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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21. 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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22. Davy and Faraday proved that

A. Diamond is a form of carbon.

B. The bond lengths of carbon containing compounds are always equal

C. The strength of graphite is minimum compared to platinum

D. Graphite is very hard.

Answer: A

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23. A crystalline solid

A. Changes abruptly from solid to liquid when heated

B. Has no definite melting point

C. Undergoes deformation of tis geometry easily

D. Has an irregular 3-dimensional arrangements

Answer: A

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

A. Metallic

B. Molecular

C. Network

D. Ionic.

Answer: D

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25. Dulong and Petit's law is valid only for

A. Metals

B. Non-metals

C. Gaseous elements

D. Solid elements .

Answer: D

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26. Which are not true about the amorphous solids ?

A. They melt over a range of temperature

B. They are anisotropic

C. There is no orderly arrangement of particles.

D. They are rigid and incompressible

Answer: B

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

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

B. The interaction of electrons with with metalions in the other

C. The presence of electrostatic force

D. The crystalline structure in metal.

Answer: A

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28. Which of the following is not correct for ionic crystals

A. They posses high melting point and boiling point

B. All are electrolyte.

C. Exhibit the property of isomorphism.

D. Exhibit directional properties of the bond.

Answer: D

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29. A crystalline solid

A. Anisotropic

B. Isotropic

C. Hard

D. Dense.

Answer: B

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30. Diamond is hard because

A. All the four valence electrons are bonded to each carbon atom by covalent bonds

B. It is a giant molecule

C. It is made up of carbon atoms.

D. It cannot be burnt.

Answer: A

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31. Which solid will have the weakest intermolecular forces?

A. Ice

B. Phosphorus

C. Naphthalene

D. Sodium fluoride

Answer: A

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32. In the metallic crystal

A. C

B. Si

C. W

D. AgCl

Answer: C

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

A. Ionic crystal

B. Metallic crystal

C. Molecular crystal

D. Covalent crystal

Answer: C

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34. Assertion : Diamond is a precious stone

Reason : carbon atomic are tetrahedrally arranged in dimond

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

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

C. If the assertion and reason both are false.

D. If assertion is false but reason is true.

Answer: B

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35. Assertion: Crystalline solids have short range order.

Reason: Amorphous solids have long range order.

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

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

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

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

Answer: A

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

Reason :The electrons change their spin on heating

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

Answer: A

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38. Assertion :Lead zirconate is a piezoelectric crystal

Reason : Lead zirconate crystal have no dipole moment

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

Answer: C

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Ordinary Thinking Crystallography And Lattice

1. If $'a'$ stands for the edge length of the cubic systems: simple cubic,body centred cubic and face centred cubic then the ratio of radii of the spheres inthese systems will be respectively,

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

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

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

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

Answer: C

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2. If a is the length of the side of a cube, the distance between the body centred atom and one corner atom in the cube will be:

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

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

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

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

Answer: B

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

A. Cubic

B. Hexagonal

C. Orthorhombic

D. Rhombohedral.

Answer: B

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4. The unit cell with crystallographic dimensions, $a \neq b \neq c, \alpha = \gamma = 90^\circ$ and $\beta \neq 90^\circ$ is :

A. Calcite

B. Graphite

C. Rhombic sulphur

D. Monoclinic sulphur.

Answer: D

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5. What is the number of atoms in a unit cell of face-centred cubic crystal ?

A. 4

B. 6

C. 8

D. 10

Answer: C

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6. Which of the following is correct.

A.

Crystal system	Axial distance	Axial angles	Examples
Cubic	$a \neq b = c$	$\alpha = \beta \neg amma =$	Cu, KCl

B.

Crystal system	Axial distance	Axial angles	Examples
Monclinic	$a \neq b = c$	$\alpha = \beta = \gamma = 90^\circ$	$PbCrO_2$

C.

Crystal system	Axial distance	Axial angles	Examples
Rhombohed	$a = b = c$	$\alpha = \beta = \gamma \neq 90^\circ$	$CaCO_3 HgS$

D.

Answer: C

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

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

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

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

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

Answer: B

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8. Crystals can be classified into ....basic crystal habits

A. 3

B. 7

C. 14

D. 4

Answer: B

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

A. 7

B. 14

C. 32

D. 230

Answer: B

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10. When potassium chloride is dissolved in water

A. Face centred cubic

B. Body centred cubic

C. Simple cubic

D. Simple tetragonal.

Answer: A

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11. How many molecules are there in the unit cell of sodium chioride?

A. 2

B. 4

C. 6

D. 8

Answer: B

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12. Nickle crystallise in a fcc unit cell with a cell edge length of 0.3524 nm.

Calculate the radius of the nicke atom

A. 0.1624nm

B. 0.1246nm

C. 0.2164nm

D. 0.1426nm

Answer: B

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13. which of the following dimension of unit cell represent a cubic unit

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

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

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

D. $a \neq b \neq c, \alpha \neq \beta \neq \gamma$

Answer: A

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14. Limiting radius ratio $((r_+)/(r_-))$ for co-ordination number six (octahedral arrangement) is

A. 0.155-0.225

B. 0.225-0.414

C. 0.414-0.732

D. 0.732-1.000

Answer: C

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15. The correct statement in the following is

A. The ionic crstal 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 ionic compounds 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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16. $a \neq bc$ and $\alpha \neq \beta \neq \gamma$ follow

A. Triclinic

B. Monoclinic

C. Rhombohedral

D. Tetrahedral

Answer: A

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17. Monoclinic crystal has dimension

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

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

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

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

Answer: A

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18. For a crystal system, $a = b = c, \alpha = \beta = \gamma \neq 90$, the system is

A. Tetragonal

B. Hexagonal

C. Rhombohedral

D. Monoclinic

Answer: C

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19. Which is not the correct statement for ionic solids in which positive and negative ions are held by strong electrostatic attractive forces.

A. The radius r^+/r^- increases as coordination number increases.

B. As the difference in size of ions increases, coordination number increases.

C. When coordination number is eight, the r^+/r^- ratio lies between 0.732 to 1.000

D. In ionic solid of the type Ax(ZnS, Wurtzite) the coordination number of Zn^{2+} and S^{2-} respectively are 4 and 4.

Answer: C

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20. For tetrahedral coordination number, the radius ratio $\frac{r_{c^+}}{r_{a^-}}$ is :

A. 0.732-1.000

B. 0.414-0.732

C. 0.225-0.414

D. 0.155-0.225

Answer: C

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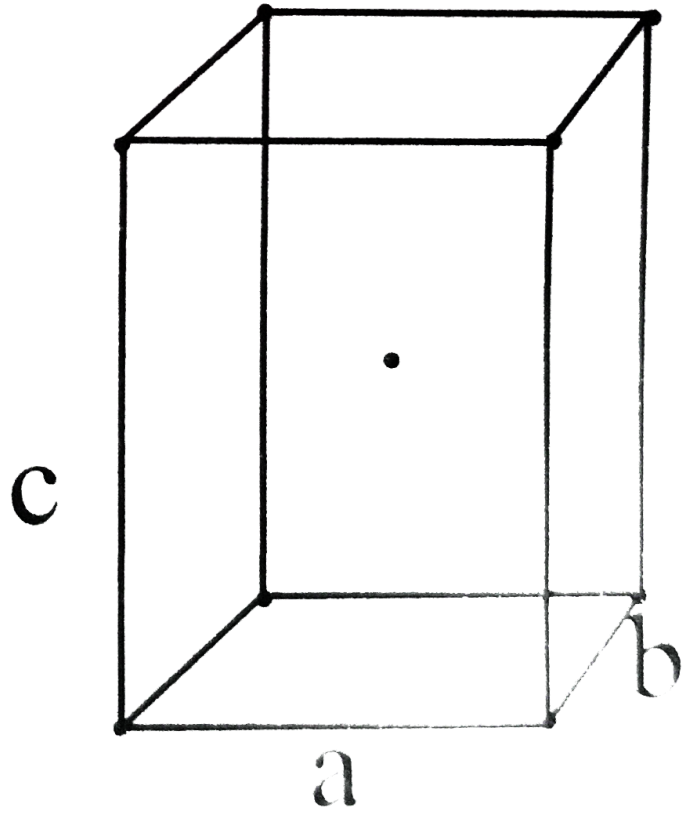
21. Assign the Bravais lattice type of the following unit cell structure.



A. Cubic I

B. Orthorhombic I

C. Tetragonal I

D. Monoclinic I

Answer: C

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22. Rhombic sulphur has the following structure.

A. Open chain

B. Tetradhedral

C. Puckered 6-membered ring

D. Puckered 8-membered ring.

Answer: D

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23. The maximum ra dius of sphere that can be fitted in the octahedral hole of cubical closed packing of sphere of raius r is

A. 0.732I

B. 0.414 I

C. 0.225I

D. 0.155I

Answer: B

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24. The structure of $TICI$ is silmilar to $CsCI$ .What would be the radius ratio in $TICI$?

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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25. Assertion (A) : Graphite is an example of tetragonal crystal system.

Reason (R) : For a tetragonal system, $a = b \neq c$ and $\alpha = \beta = 90^\circ, \gamma = 120^\circ$.

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

Answer: D

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Ordinary Thinking Crystal Packing

1. The intermetallic compounds $LiAg$ crystallises in cubic lattice in which both lithium and silver have coordination number of eight ,the crystal class is

A. Simple cube

B. Body-centred cube

C. Face-centred cube

D. None of these

Answer: B

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

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

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

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

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

Answer: A

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

A. 48% and 26%

B. 30% and 26%

C. 26% and 32%

D. 32% and 48%

Answer: C

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4. Which of the following statements is not correct.

A. The number of carbon atoms in an unit cell of Diamond is 4

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

C. The fraction of the total volume occupied by the atoms in a primitive cell is 0.52

D. Molecular solids are generally volatile.

Answer: A

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5. The total number of octahedral void (s) per atom present in a cubic close packed structure is

A. 1

B. 3

C. 2

D. 4

Answer: A

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6. 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 monovelent metal B .The formula of the oxide is

A. ABO_2

B. A_2BO_2

C. $A_2B_3O_4$

D. AB_2O_2

Answer: D

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7. Fraction of the vacant space in bcc lattice unit cell is

A. 0.26

B. 0.48

C. 0.23

D. 0.32

Answer: D

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8. 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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9. If $'Z'$ is the number of atoms in the unit cell that represents the closet packing sequence.....$ABCABC$..... The number of tetrahedral voids in the unit cell is equal

A. Z

B. 2Z

C. Z/2

D. Z/4

Answer: B

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10. The Ca^{2+} and F^{-} ions arc located in CaF_2 crystal respectively at face centred cubic lattice points and in

A. Tetrahedral voids

B. Half of tetrahedral voids

C. Octahedral voids

D. Half of octahedral voids.

Answer: A

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11. If the crystallises in zinc blende structure with I^{-} ions at lattice points. What fraction of tetrahedral voids is occupied by Ag^{+} ions ?

A. 0.25

B. 0.5

C. 1

D. 0.75

Answer: B

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12. 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 and2

B. 9 and 14

C. 14 and 9

D. 2 and 4

Answer: D

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13. 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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14. In a compound ,atoms of element Y from ccp lattice and those of element X occupy 2/3rd tetrahedral voids.The formula of the compound will be:

A. X_2Y_2

B. X_2Y

C. X_3Y_4

D. X_4Y_3

Answer: D

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15. In a face centred cubic lattice, atom A occupies the corner positions and atom B occupies the face centred positions. If one atom of B is missin from one of the face centred points„ the formula of the compound is :

A. A_2B

B. AB_2

C. A_2B_3

D. A_2B_5

Answer: D

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16. Three element A, B, C crystallize into a cubic solid lattice.Atoms A occupy the corners B atoms the cube centres and atom C the edge .The formula of the compound is

A. ABC

B. ABC_2

C. A_2BC_3

D. ABC_4

Answer: C

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17. A metallic crystal cystallizes into a lattice containing a sequence of layers $ABABAB\ldots$. Any packing of spheres leaves out voids in the lattice. What percentage by volume of this lattice is empty spece?

A. 74

B. 26

C. 20

D. 16

Answer: B

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

A. ABC ABA

B. ABC ABC

C. ABABA

D. ABBAB

Answer: C

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19. The arranegement $ABC, ABC, ABC \ldots\ldots$ is referred as

A. octahedral close packing

B. Hexagonal close packing

C. Tetragonal close packing

D. Cubic close packing.

Answer: D

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20. The number of close neighbours in a body-centred cubic unti cell of monoatomic substance is,

A. 8

B. 6

C. 4

D. 2

Answer: A

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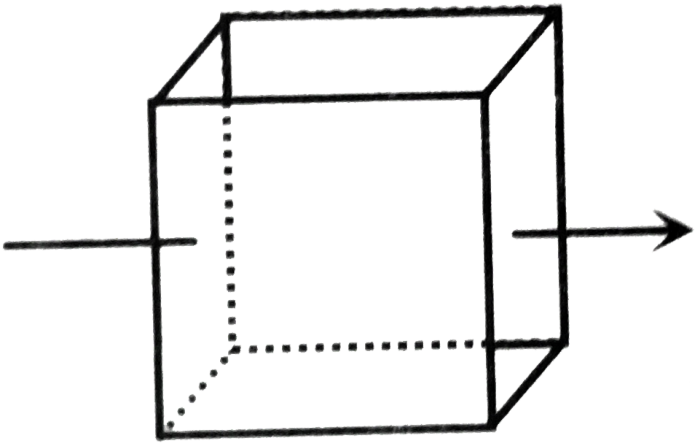
21. In NaCl unit cell, all the ions lying along the axis as shown in the figure are removed. Then the number of Na^+ and Cl^- ions remaining in the unit cell are:



A. 4 and 4

B. 3 and 3

C. 1 and 1

D. 4 and 3

Answer: B

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22. The ratio of closed packed atoms to tetrahedral holes in cubic close packing is :

A. $1:1$

B. $1:2$

C. $1:3$

D. $2:1$

Answer: B

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23. Close packing is maximum in the crystal lattice of :

A. NaCl

B. Mg

C. Al

D. None of these

Answer: B

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24. Antifluorite structure is for :

A. Octahedral voids

B. Centre of cube

C. Tetrahedral voids

D. Corners of cube.

Answer: C

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

A. XZ

B. XZ_2

C. X_2Z

D. X_2Z_3

Answer: C

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26. In the closest packed struture of a metallic lattice , the number of mearest neighhours of a metallic atom is

A. Twelve

B. Four

C. Eight

D. Six.

Answer: A

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27. What is the number of atoms per unit cell in a body centred cubic structure ?

A. Octahedral

B. Body centred cubic bcc

C. Face centred cubic fcc

D. Simple cubic.

Answer: B

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28. Antifluorite structure is derived from fluorite structure by:

A. NaF

B. SrF_2

C. $AlCl_3$

D. SiF_4

Answer: B

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

A. 1

B. 2

C. 4

D. 8

Answer: C

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30. Iron exhibits b structure at roomj temperature. Above $9000^\circ C$, it transformers to f structure. The ratio of density of iron at room temperature to that at $900^\circ C$ (assuming molar mass and atomic radius of iron remains 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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Ordinary Thinking Mathematical Analysis

1. The number of atoms contained in one face -centred cubic unit cell of monoatomic substance is :

A. 1

B. 2

C. 4

D. 6

Answer: C

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

A. 4×10^{25}

B. 3×10^{25}

C. 2×10^{25}

D. 1×10^{25}

Answer: A

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3. The second order Bragg diffraction of X-rays with $\lambda = 1.0\text{Å}$ from a set of parallel planes in a metal occurs at an angle 60°. The distance between

the scattering planes in the crystals is

A. $0.575\overset{\circ}{A}$

B. $1.00\overset{\circ}{A}$

C. $2.00\overset{\circ}{A}$

D. $1.15\overset{\circ}{A}$

Answer: C

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4. In the crystals of which of the following ionic compounds would you expect maximum distance between the centres of the cations and anion?

A. LiF

B. CsF

C. CsI

D. LiI

Answer: C

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5. $CsBr$ 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. $4.25g/cm^3$

C. $42.5g/cm^3$

D. $0.425g/cm^5$

Answer: B

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

A. 108pm

B. 127pm

C. 157pm

D. 181pm

Answer: B

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7. Lithium metal crystallizes in a body centred cubic crystals. If the length of the side of the unit cell of lithium is $351pm$ the atomic radius of the lithium will be

A. 240.8pm

B. 151.9pm

C. 75.5pm

D. 300.5pm

Answer: B

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

A. 300pm

B. 335pm

C. 250pm

D. 200pm

Answer: B

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9. a metal crystallizes with a face-centered cubic lattice.The edge of the unit cell is 408 pm. The diameter of the metal atom is :

A. 288pm

B. 408pm

C. 144pm

D. 204pm

Answer: A

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

A. $20 g \text{mol}^{-1}$

B. $40 g \mathrm{mol}^{-1}$

C. $30 g \mathrm{mol}^{-1}$

D. $28 g \mathrm{mol}^{-1}$

Answer: D

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11. A given metal crystalline out with a cubic structure having edge length of 361 pm .if there are four metal atoms in one unit cell, what is the radius of metal atom?

A. 127 pm

B. 80 pm

C. 108pm

D. 40pm

Answer: A

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

A. 6

B. 4

C. 8

D. 2

Answer: A

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

A. 154pm

B. 352pm

C. 527pm

D. 264pm

Answer: B

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14. Potassium has a bcc structure with nearest neighour distance 4.52Å 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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15. Sodium metal crystallizes in body centred cubic lattice with the cell edge a=4.28Å. What is the radius of the sodium atom ?

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

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

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

D. $9.312 \times 10^{-7} cm$

Answer: A

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

A. 1/4 part

B. 1/8 part

C. 1 part

D. 1/2 part.

Answer: D

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17. KCl crystallises in the same type of lattice as does NaCl Given that $r_{Na^+}/r_{Cl^-} = 0.55$ and $r_{K^+}/r_{Cl^-} = 0.74$, the ratio of the side of unit cell for KCl to that of NaCl is

A. 1.123

B. 0.891

C. 1.414

D. 0.414

Answer: A

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18. 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

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

A. Primitive

B. Face centered

C. Body centered

D. End centered.

Answer: B

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

A. Greater than 0.73

B. In between 0.73 and 0.41

C. In between 0.41 and 0.22

D. Less than 0.22

Answer: B

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21. 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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22. In Bragg's equation for diffraction of X-rays 'n' represents

A. Quantum number

B. An integer

C. Avogadro's numbers

D. Moles.

Answer: B

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

A. 1

B. 2

C. 4

D. 6

Answer: B

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24. An elementoccurring 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^{25}

B. 36.18×10^{23}

C. 6.04×10^{23}

D. 12.08×10^{23}

Answer: A

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25. The interionic distance for cesium chloride crystal will be

A. a

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

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

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

Answer: C

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

A. 219.25pm

B. 235.16pm

C. 189.37pm

D. 209.87pm

Answer: A

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

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

A. Number of moles

B. The principal quantum number

C. Avogadro's number

D. Order of reflection.

Answer: D

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

A. 2.57×10^{21} unit cells

B. 5.14×10^{21} unit cells

C. 1.28×10^{21} unit cells

D. 1.71×10^{21} unit cells

Answer: A

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

A. 75pm

B. 300pm

C. 240pm

D. 152pm

Answer: D

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30. In the distance between Na^+ and CI^- ions in sodium chliride crystal is X pm , the length of the edge of the unit cell is

A. 4X pm

B. X4 pm

C. X2pm

D. 2Xpm

Answer: D

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31. The radius of Na^+ is 95pm and that of Cl^- is 181 pm. The edge length of unit cell in NaCl would be (pm).

A. 276pm

B. 138pm

C. 552pm

D. 415pm

Answer: C

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

A. 2

B. 3

C. 4

D. 6

Answer: C

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33. A metal has bcc structure and the edge length of its unit cell is 4.08 Å . The volume of the unit cell in cm^3 will be _____.

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

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

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

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

Answer: B

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34. Number of unit cells in 4g of X(atomic mass=40). Which crystallises in bcc pattern in $(N_0 = \text{Avogadro number})$

A. 0.1 N_A

B. $2 \times 0.1 N_A$

C. $\frac{0.1 N_A}{2}$

D. $2 \times N_A$

Answer: C

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

A. $\frac{1}{4}$

B. 1

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

D. $\frac{1}{8}$

Answer: B

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36. Calculate the number (n) of atoms contained within (a) cubic cell, (b) a body $-$ centred cubic cell, (c) a face $-$ centred cubic cell.

A. In (i) 2 and in (ii)4

B. In (i) 3 and in (ii) 2

C. In (i) 4 and in (ii)2

D. In (i) 2 and in (ii) 3

Answer: A

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37. Assertion: Space or crystal lattice differ in symmetry of the arrangement of points.

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

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

Answer: B

View Text Solution

Ordinary Thinking Crystal Structure

1. Most crystals show good cleavage because their atoms ions or molecules are

A. Weakly bonded together

B. Strongly bonded together

C. Spherically symmetrical

D. Arranged in planes.

Answer: D

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2. A compound is formed by elements A and B. This crystallises in the cubic structure when atoms A are at the corners of the cube and atoms B are at the centre of the body.The simplest formula of the compound is

A. AB

B. AB_2

C. A_2B

D. AB_4

Answer: A

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3. A solid compound XY has $NaCl$ structure. If the radius of the cation is 100 pm, the radius of the anion $\left(Y^-\right)$ will be

A. 241.5pm

B. 165.7pm

C. 275.1pm

D. 322.5pm

Answer: A

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4. Body -centred cubic lattice has a corrdination number of

A. 4

B. 8

C. 12

D. 6

Answer: B

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

A. 6

B. 4

C. 8

D. 2

Answer: B

Watch Video Solution

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

A. 3

B. 8

C. 4

D. 6

Answer: D

Watch Video Solution

7. Crystal structure of NaCl is

A. Face centred cubic

B. Monoclinic

C. Orthorhombic

D. Tetragonal

Answer: A

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8. A solid compound contains X,Y and Z atoms in a cubic lattice with X atoms occupying the corners,Y atoms in the body centred positions and Z

atoms at the centres of faces of the unit cell. What is the empirical formula of the compound

A. XY_2Z_1

B. XYZ_3

C. $X_2Y_2Z_3$

D. X_8YZ_6

Answer: B

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9. Point out the correct statement for the set of characteristics of ZnS crystal.

A. coordination number $(4:4)$, p, Zn^{++} ion in the alternate tetrahedral voids.

B. Coordination number $(6:6):hcp$, Zn^{++} ion in all tetraderal voids

C. Coordination number $(6:4)$, hcp, Zn^{++} ion in all octahedral voids.

D. Coordination number $(4:4):\mathrm{p}$, Zn^{++} ion in all tetraderal voids.

Answer: A

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

A. $NaWO_2$

B. $NaWO_3$

C. Na_2WO_3

D. $NaWO_4$

Answer: B

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11. In CsCl structure, the coordination number of Cs^+ is

A. Equal to that of Cl^-, that is 6

B. Equal to that of Cl^- that is 8

C. Not equal to that of Cl^-, that is 6

D. Not equal to that of Cl^-, that is 8

Answer: B

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12. The coordination number of each atom in simple cubic structure is

A. 3

B. 4

C. 6

D. 8

Answer: C

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13. Ferrous oxide (FeO) crystal has a cubic structure and each edge of the unit cell is $5.0A^{\circ}$ Taking density of the oxide as $4.0gcm^{-3}$. The number of Fe^{2+} and O^{2-} ions present in each unit cell is:

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

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

C. Four Fe^{3+} and two O^{2-}

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

Answer: A

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14. Co-ordination number for copper (Ca) is

A. 1

B. 6

C. 8

D. 12

Answer: D

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15. The number of atoms present in unit cell of a monoatomic substance of simple cubic lattic is

A. 6

B. 3

C. 2

D. 1

Answer: D

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16. In the calcum fluaride structure, the coordination bumber of the cations and anions are respectively ,

A. 6,6

B. 8,4

C. 4,4

D. 4,8

Answer: B

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17. If the ratio is in the range of $0.414 - 0.732$, then the coordination number will be

A. 2

B. 4

C. 6

D. 8

Answer: C

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18. Which of the following statements is not correct.

A. The units of surface tension are dynes cm^{-1}

B. The units of viscosity coefficient of a liquid are "Poise"

C. CsCl crystallizes in body central cubic type of lattice.

D. The coordination number of S^{2-} in ZnS is 6

Answer: D

View Text Solution

19. The unit cell of a binary compound of A and B metals has a ccp structure with A atoms occupying the corners and B atoms occupying the centres of each faces of the cubic unit cell. If during the crystallisation of this alloy, in the unit cell two A atoms are missed, the overall composition per unit cell is :

A. AB_6

B. AB_4

C. AB_8

D. A_6B_{24}

Answer: D

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20. The crystal structure of solid $Mn(II)$ oxide is

A. NaCl structure

B. Fe_2O_3 structure

C. CaF_2 structure

D. Na_2O structure.

Answer: A

View Text Solution

21. Which of the following statements is not true about NaCl structure?

A. Cl^- ions are in fcc arrangement

B. Na^+ ions has coordination number 4

C. Cl^- ions has coordination number 6

D. Each unit cell contains 4NaCl molecules

Answer: B

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22. Potassium crystallizes is a bcc lattice the coordination number of potassiium in potassium metal is

A. 0

B. 4

C. 6

D. 8

Answer: D

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23. The unit cell edge length of NaF crystal is 4.634Å. If the ionic radius of Na^+ ion is 95 pm, what is the ionic radius of F^- ion, assuming that anion-anion contact and face centred cubic lattice?

A. 190pm

B. 368pm

C. 181pm

D. 276pm

Answer: C

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

A. 190pm

B. 368pm

C. 181 pm

D. 276pm

Answer: B

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

A. NaCl type

B. CsCl type

C. ZnS type

D. None of these

Answer: B

Watch Video Solution

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

A. CsCl type

B. ZnS type

C. NaCl type

D. CaF_2 type.

Answer: B

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27. How many O-atoms are shared per SiO_4 tetrahedral in silicate anion of beryl mineral

A. 4

B. 3

C. 2

D. 1

Answer: A

View Text Solution

28. 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. CsCl type

C. ZnS type

D. Similar to diamond.

Answer: B

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29. An example of a non- stoichiometric compound is

A. Al_2O_3

B. Fe_3O_4

C. NiO_2

D. PbO

Answer: B

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30. Assertion: In a crystal, the size of the cation is larger in a tetrahedral hole than in an octahedral hole.

Reason: Cations occupy more space than atoms in crystal packing

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

Answer: D

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31. Assertion: Quasi-crystals form when certain molten alloys cool very slowly.

Reason: quasi-crystals have shorts-range as well as long-range order in their arrangement.

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

Answer: B

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32. Assertion: In a close packing of spheres, a tetrahedral void is surrounded by four spheres whereas an octahedral void is surrounded by six spheres.

Reason: A tetrahedral void has a tetrahedral shape while an octahedral void has an octahedral shape

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

Answer: C

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33. Assertion: Cyclic silicates and chain silicates have the same general molecular formula.

Reason: In cyclic silicates, three corners of each SiC_4 tetradedron are shared while in chain silicates only two are shared with other tetrahedra.

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

Answer: C

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Ordinary Thinking Defects In Crystal

1. Schottky defect in a crystal is observed when

A. Density of crystal is increased

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

C. An ion leaves its normal site and occupies and interstitial site

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

Answer: D

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2. The appearance of colour in solid alkali metal halides is generally due to

A. Frenkel defect

B. Interstitial positions

C. F-centres

D. Schottky defects.

Answer: C

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3. If $NaCl$ is doped with $10^{-4} mol\,\%$ of $SrCl_2$ the concentration of cation vacancies will be $\left(N_A = 6.02 \times 10^{23} mol^{-1}\right)$

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

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

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

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

Answer: C

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4. The incorrect statement regarding defeat in crystalline solid is :-

A. Schottky defects have n effect on the density of crystalline solids.

B. Frenkel defects decrease the density of crystalline solids

C. Frenkel defect is a dislocation defect

D. Frenkel defect is found in halides of alkaline metals.

Answer: C

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

A. Interstitial defect

B. Valency defect

C. Frenkel defect

D. Schottky defects.

Answer: C

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6. Schottky defect defines imperfection in the lattice structure of a

A. Solid

B. Liquid

C. Gas

D. Plasma

Answer: A

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7. Write the difference between Frenkel and Schottky defects.

A. Nucleus defects

B. Non-crystal defects

C. Crystal defects

D. None of these

Answer: C

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

A. Pyroelectricity

B. Ferroelectricity

C. Peizoelectricity

D. Ferrielectricity.

Answer: C

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9. When electrons are trapped into the crystalline anion vacancy the defect is known as

A. Schottky defect

B. Frenkel defects decrease the density of crystalline solids

C. Stoichiometric defect

D. F-centres.

Answer: D

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10. ZnO shows yellow colour on heating due to

A. Frenkel defect

B. Metal excess defect

C. Metal deficiency defect

D. Schottky defect.

Answer: B

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

A. Defect less (perfect) crystal

B. Schottky defect only

C. Frenkel defect only.

D. Both Schottky and Frenkel defects

Answer: D

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12. Te defect that is more likely to occur in almost all types of ionic crystals is

A. Non-stoichiometric defects

B. Schottky defect only

C. Frenkel defect

D. All the above.

Answer: B

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13. Due to Frenkel defect, the density of the ionic solids

A. Increases

B. Decreases

C. Does not change

D. Changes.

Answer: C

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

A. Frenkel

B. Schottky

C. Interstitial

D. F-centre.

Answer: B

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

A. Establishing thermal equilibrium

B. Having tendency to diffuse

C. Contritbuting to scattering

D. Introducing new electronic energy levels.

Answer: A

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

A. AgBr

B. AgCl

C. CsCl

D. ZnS.

Answer: C

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17. Schottky defect occurs mainly in electrovalent compounds where

A. Positive ions and negative ions are of different size

B. Positive ions and negative ions are of same size

C. Positive ions are small and negative ions are big

D. positive ions are big and negative ions are small

Answer: B

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18. p-type semiconductor is

A. Increasing the band gap.

B. Decreasing the temperature

C. Adding appropriate electron deficit impurities

D. Adding appropriate rich impurities.

Answer: C

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

A. Softer

B. Less tensile

C. Less malleable

D. More ductile.

Answer: B

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20. Schottky defect.

A. NaCl

B. KCl

C. CsCl crystallizes in body central cubic type of lattice.

D. All of these

Answer: D

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21. The flame colours of metal ions are due to

A. Frenkel defect

B. Schottky defect only

C. Metal deficiency defect

D. Metal excess defect

Answer: D

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22. Doping silicon with boron produces a -

A. n-type semiconductor

B. p-type semiconductor

C. Meta

D. Insulator.

Answer: B

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23. In an insulator, the forbidden energy gap between the valence band and conduction band is of the order of

A. Both the bands are overlapped with each other

B. Very small

C. Infinite

D. Very large.

Answer: D

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24. The corrent statement regarding F-centre is

A. Electron are held in the voids of crystals

B. F-centre produces colour to the crystals.

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

D. All

Answer: D

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

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

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

C. Brass and steel are both substitutional alloys

D. Brass and stell are both interstitial alloys.

Answer: C

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26. 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 explanantion 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: D

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27. Assertion: The presence of a large number of Schottky defects in NaCl lowers its density.

Reason: In NaCl, there are approximately 10^6 Schottky pairs per cm^3 at room temperature.

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

Answer: B

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28. Assertion: Anion vacancies in alkali halides are produced by heating the alkali halide crystals with alkali metal vapour.

Reason: Electrons trapped in anion vacancies are referred to as F -centres.

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

Answer: B

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29. Which is the incorrect statement.

A. Density decreases in case of crystals with Schottky's defect

B. NaCl[s] is insulator, silicon is semiconductor , sivler 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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Critical Thinking Objective Question

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

A. $10.376g/cm^3$

B. $5.188g/cm^3$

C. $7.289g/cm^3$

D. $2.144 g / cm^3$

Answer: B

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2. The edge length of face centred cubic unit cell is 5.8 pm. if the radius of the caiton is 110 pm. The radius of the anion is

A. 285pm

B. 395pm

C. 144pm

D. 618pm

Answer: C

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3. The pyknometric density of sodium chloride 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. 5.96×10^{-3}

B. 5.96

C. 5.96×10^{-2}

D. 5.96×10^{-1}

Answer: A

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4. If the pressure on a $NaCI$ structure in 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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5. The wrong statement about the interstitial compound is

A. They retain metallic conductivity

B. They are chemically inert

C. They are very hard.

D. Their melting points are lower than those of pure metals.

Answer: C

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6. Antifluorite structure is for :

A. Oxide ions have a cubic close packed arrangement and Na^+ occupy all the eight tetrahedral voids

B. Oxide ions have a cubic close packed arrangement and Na^+ occupy all the octahedral voids

C. Na^+ ions have a cubic close packed arrangement and O^{2-} occupy all the octahedral voids

D. Na^+ ions have a cubic close arrangement and O^{2-} occupy all the tetrahedral voids.

Answer: A

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7. Total no. of voids in 0.5 mole of a compound forming hexagonal closed packed structure are :

A. 6.022×10^{23}

B. 3.011×10^{23}

C. 9.033×10^{23}

D. 4.516×10^{23}

Answer: C

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

A. Tetrahedral site

B. Octahedral site

C. Cubic site

D. Trigonal site.

Answer: B

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9. A match box exhibits

A. Cubic geometry

B. Monoclinic geometry

C. Orthorhombic

D. Tetragonal geometry.

Answer: C

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

$$\begin{array}{cccccc} Na^+ & Cl^- & Na^+ & Cl^- & Na^+ & Cl^- \\ Cl^- & \square & Cl^- & Na^+ & \square & Cl^- \\ Na^+ & Cl^- & \square & Cl^- & Na^+ & Cl^- \\ Cl^- & Na^+ & Cl^- & Na^+ & \square & N^+ \end{array}$$

A. Interstitial defect

B. Schottky defect

C. Frenkel defect

D. Frenkel & Schottky defects.

Answer: B

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11. Silicon is found in nature in the form of

A. Body centered cubic structure

B. Hexagonal close-packed structure

C. Network solid

D. Face centered cubic structure.

Answer: C

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12. Which of the following is a three dimensional silicate

A. Mica

B. Spodumene

C. Zeolite

D. None of these

Answer: C

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13. Give an example of a geometrical figure which has neither a line of symmetry nor a rotational symmetry.

A. Hexagonal

B. Orthorhombic I

C. Cubic

D. Triclinic.

Answer: D

Watch Video Solution

14. Which is the basic building unit of all sillicates?

A. SiO_4 square planat

B. $[SiO_4]^{4-}$ tetraderon

C. SiO_4 octahedron

D. SiO_4 linear.

Answer: B

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

A. NH_3

B. C_2H_4

C. CO_2

D. SO_2

Answer: A

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16. Amorphous solids are

A. Solid substance in real sense

B. Liquid in real sense

C. Supercooled liquid

D. Substance with definie melting point.

Answer: C

Watch Video Solution

17. Calculate the distance between 111 planes in a crystal of Calculate the distance between 111 planes in a crystal of Ca. the answer is

A. 1.61nm

B. 0.610nm

C. 0.321 nm

D. None of these

Answer: C

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18. When an electron in an excited state of Mo atom falls L to K -shell, an X -ray is emitted. These X -rays are diffranted at angle of 7.75° by planes with a sepration of 2.64Å . What is the difference in energy between K-shelll and L -shell in Mo, assuming a first order diffraction ? `(sin 7.75^(@) = 0.1349)

A. $36.88 \times 10^{-19} J$

B. $27.88 \times 10^{-16} J$

C. $63.88 \times 10^{-17} J$

D. $64.88 \times 10^{-16} J.$

Answer: B

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19. The resistance of mercury becomes almost zero at:

A. 20k

B. 10k

C. 25k

D. 4k

Answer: D

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Jee Section Only One Choice Correct Answer

1. Sodium metal crystallises in body centred cubic lattic with cell edge 4.29Å .What is the radius of sodium atom ?

A. $18.6\overset{\circ}{A}$

B. $1.86\overset{\circ}{A}$

C. 1.86pm

D. 1860pm

Answer: B

Watch Video Solution

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

A. $1.86\overset{\circ}{A}$

B. $3.72\overset{\circ}{A}$

C. $4.3\overset{\circ}{A}$

D. $7.44\overset{\circ}{A}$

Answer: B

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3. A metallic crystal crystallizes into lattice containing a sequence of layers AB,AB,AB. . .. . The percentage of free space in this lattice is

A. 0.74

B. 0.26

C. 0.32

D. 0.48

Answer: B

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4. Which of the following statement is correct for $CsBr_3$

A. It is a covalent compound

B. It contains Cs^{3+} and Br^- ions

C. It contains Cs^+ and Br_3^- ions

D. It contain Cs^+, Br^- and lattice, Br_2 molecule.

Answer: C

Watch Video Solution

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

A. 4

B. 12

C. 8

D. 6

Answer: B

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6. 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

C. A_4B_3

D. A_3B_4

Answer: D

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7. Statement 1: In any ionic solid [MX] withschotty defects, the number of positive and negative ions are same

Statement 2: Equals number of cation and anion vacancies are present .

A. If both assertion and reason are true and the reason is the correct explanantion 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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8. A substance A_xB_y crystallises in a face centred cubic (fcc) lattice in which atoms 'A' occupy each corner of the cube and atoms 'B' occupy the

centres of each face of the cube identify the correct formula of the compound.

A. AB_3

B. A_4B_3

C. A_3B

D. Composition cannot be specified.

Answer: A

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

A. NaCl

B. ZnS

C. CaF_2

D. Na_2O

Answer: B

Watch Video Solution

10. The edge length of unit cell of a metal having molecular weight $75gmol^{-1}$ is 5Å which crystallizes in cubic lattice. If the density is $2g\ \hat{}\ (-1)$, then find the radius of metal atom $\left(N_A = 6 \times 10^{23}\right)$. Give the answer in pm.

A. 217pm

B. 210pm

C. 220pm

D. 205pm

Answer: A

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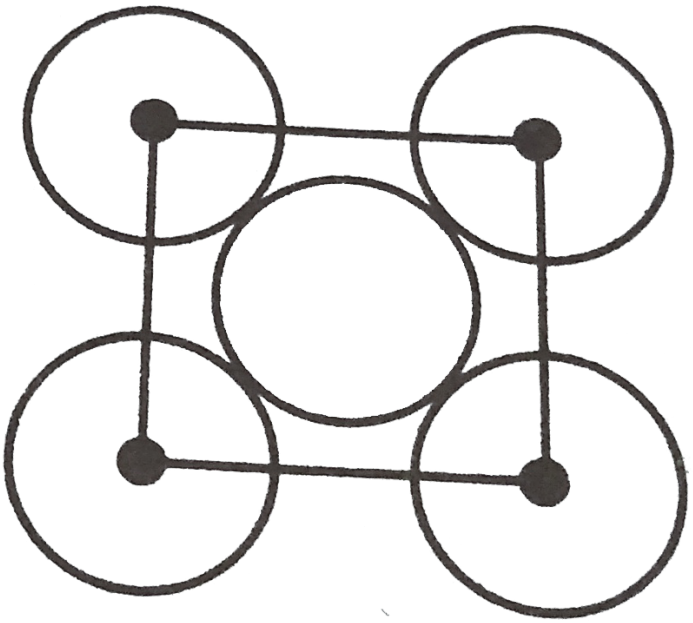
11. The packing efficiency of the two dimensional square unit cell shown below is:



A. 0.3927

B. 0.6802

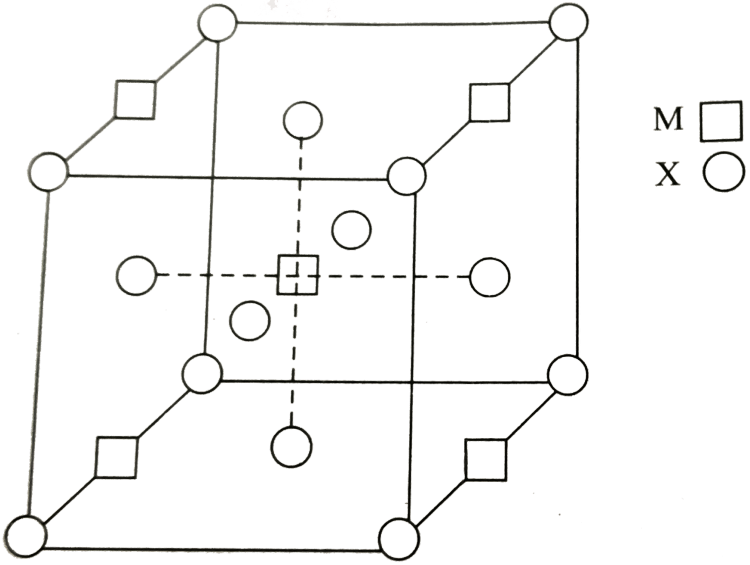
C. 0.7405

D. 0.7854

Answer: D

Watch Video Solution

12. A compound M_pX_q has cubic close packing (p) arrangement of X. Its unit cell structure is shown below. The empirical formula of the compound is



a. MX **b.** MX_2 **c.** M_2X

A. MX

B. MX_2

C. M_2X

D. M_5X_{14}

Answer: B

Watch Video Solution

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

A. Si

B. NaF

C. Al

D. At

Answer: A

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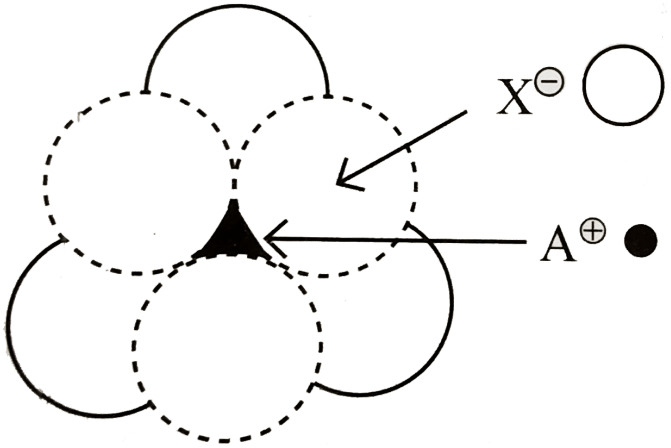
14. The arrangement of $X^{\ominus}$ ions around $A^{\oplus}$ ion in solid AX is given in the figure (not drawn to scale). If the radius of $X^{\ominus}$ is $250 \pm$, the radius of $A^{\oplus}$ is



A. 104pm

B. 125pm

C. 183pm

D. 57pm

Answer: A

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

A. 0.0701

B. 0.0408

C. 0.0605

D. 0.0508

Answer: B

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

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

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

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

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

Answer: C

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17. The correct statement for the molecule CsI_3 is

A. It is a covalent molecule

B. It contains Cs^+ and I_3^-.

C. It contains Cs^{3+} and I^- ions

D. It contains Cs^+, I^- and lattice I_2 molecule.

Answer: B

Watch Video Solution

18. Sodium metal crystallizes in a body centred cubic lattice with a unit cell edge of 4.29 Ã.... The radius of sodium atom is approximately :

A. $1.86\overset{\circ}{A}$

B. $3.22\overset{\circ}{A}$

C. $5.72\overset{\circ}{A}$

D. $0.93\overset{\circ}{A}$

Answer: A

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19. If the unit cell of a mineral has cubic close packed (ccp) array of oxygen atoms with m fraction of octahedral holes occupied by aluminium ions and n fraction of tetrahedral holes occupied by magnesiums ions, m and n respectively, are

A. $\frac{1}{2}, \frac{1}{8}$

B. $1, \frac{1}{4}$

C. $\frac{1}{2}, \frac{1}{2}$

D. $\frac{1}{4}, \frac{1}{8}$

Answer: A

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20. A metal crystallises in a face centred cubic structure. If the edge length of its unit cell is 'a' the closest approach between two atoms in metallic crystal will be

A. $2\sqrt{2}a$

B. $\sqrt{2}a$

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

D. $2a$

Answer: C

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21. Which type of 'defect' has the pressence of cations in the interstitial sites?

A. Vacancy defect

B. Frenkel defect.

C. Metal deficiency defect.

D. Schottky defect.

Answer: B

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Jee Section More Than One Choice Correct Answer

1. Which of the following are not correct statement for $CsBr_3$.

A. It is a covalent compound

B. It contain Cs^{3+} and Br^{-} ions

C. It contains Cs^{+} and Br_3^{-} ions

D. It contains Cs^{+}, I^{-} and lattice I_2 molecule.

Answer: A::B::D

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

A. The percentage of $Fe(III)$ by mass is 11.5%

B. The ratio of Fe(III) to Fe(II) ion is 0.17

C. The percentage of Fe(II) ion is 11.5%

D. The amount of Fe^{3+} is 7.84g.

Answer: A::B::D

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3. Identify the correct statement(s)

A. CsCl changes to NaCl structure on heating

B. NaCl changes to CsCl structure on applying pressure

C. Coordination number increases on applying pressure

D. Coordination number increase on heating.

Answer: A::B::D

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

A. The coordination number of each type of ion in CsCl crystal is 8.

B. A metal that crystallizes in bcc strcutre has a coordination number of 12

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

D. The length of the unit cell in NaCl is 352 pm $(r_{Na^+} = 95\text{pm}, r_{Cl^-} = 181\text{pm})$

Answer: A::C::D

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5. The corrent statement regarding defects is solids in solids is

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

B. Frenkel defect is a dislocation defect

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

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

Answer: B::C

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6. The correct statement (s) for cubic close packed (ccp) three dimensional structure is (are)

A. The number of the nearest neighbours of an atom present in the topmost layer is 12.

B. The efficiency of atom packing is 74%

C. The number of octahedral and tetrahedral voids per atom are 1 and 2, respectively.

D. The unit cell edge length is $2\sqrt{2}$ times the radius of the atom

Answer: B::C::D

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7. Which of the following statements are correct

A. A NaCl type AB crystal lattice can be interpreted to be made up of two individual FCC type unit lattice of A^+ and B^- fused together in such a manner that the corner of one unit lattice becomes the edge centre of the other.

B. In a face centered unit lattice, the body centre is an octahedral void.

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

D. In an SCC lattice, the body centre is the octahedral void

Answer: A::B::D

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8. In a body centered unit lattice of A_2 type

A. The edge length is equal to $\frac{4R}{\sqrt{3}}$

B. The edge length is equal to $2R^2 + 2R^2$

C. The edge length is equal to $\frac{2d}{\sqrt{3}}$ where, d=nearest neighbouring distances

D. The square of the edge length is equal to $16R^2$ where 'R' is radius of atom.

Answer: A::C::D

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

A. The nearest neighbout of A^+ is $6B^-$ ion

B. The nearest neighbour of B^- is $6A^+$ ion

C. The nearest neighbour of B^- is $6A^+$ ion

D. The packing fraction of AB crystal is $\frac{\sqrt{3}\pi}{8}$

Answer: A::B::C

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10. Which of the following crystals do not crystallise in HCP structure.

A. Na

B. Be

C. Ca

D. Ba

Answer: A::C::D

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11. In the crystal lattice of $CsCl$, CS^+ ions are present at the

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

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

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

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

Answer: A::B::C

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12. The $CoCl_2$ lattice is

A. Body centred cubic closed pack

B. Body centred tetragonal

C. There are 16 formula units per unit cell.

D. The number of molecules which the basis consist is 2

Answer: A::B::C

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13. Which of the following exhibit Frenkel defect?

A. AgBr

B. AgCl

C. KBr

D. ZnS.

Answer: A::B::D

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Jee Section Reasoning Type Questions

1. Statement 1: In any ionic solid [MX] withschotty defects, the number of positive and negative ions are same

Statement 2: Equals number of cation and anion vacancies are present .

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

B. Statement 1 is true, statement 2 is true, statement 2 is nota correct explanation for statement 1

C. Statement 1 is true, statement 2 is false

D. Statement 1 is false, statement 2 is true.

Answer: A

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2. Statement 1: Diamond and graphite do not have the same crystal structure.

Statement 2: Diamond is crystalline while graphite is amorphous.

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

B. Statement 1 is true, statement 2 is true, statement 2 is nota correct explanation for statement 1

C. Statement 1 is true, statement 2 is false

D. Statement 1 is false, statement 2 is true.

Answer: C

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Jee Section Comprehension

1. In a hexaonal system system of cycstals, a frequently encountered arrangement of atoms is described as a hexagonal prism. Here, the top and bottom of the cell are refular hexagons, and three atoms are sandwiched in between them. A space-cilling model of this structure, called hexagonal close-paked is constituted of a sphere on a flat surface surrounded in the same plane by six identical spheres as closely as possible. Three spherres are then placed overt the first layer so that they

toych each other and represent the second layer so that they toych each other and present the second layer. Each one of the three spheres touches three spheres of the bottom layer. Finally, the second layer is convered with a third layer identical to the bottom layer in relative position. Assume the radius of every sphere to be r.

The empty space in this hcp unit cell is

A. 4

B. 6

C. 12

D. 17

Answer: B

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2. In a hexaonal system system of cycstals, a frequently encountered arrangement of atoms is described as a hexagonal prism. Here, the top and bottom of the cell are refular hexagons, and three atoms are

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

The empty space in this hcp unit cell is

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

B. $16\sqrt{2}r^3$

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

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

Answer: A

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

The empty space in this hcp unit cell is

A. 0.74

B. 0.476

C. 0.32

D. 0.26

Answer: D

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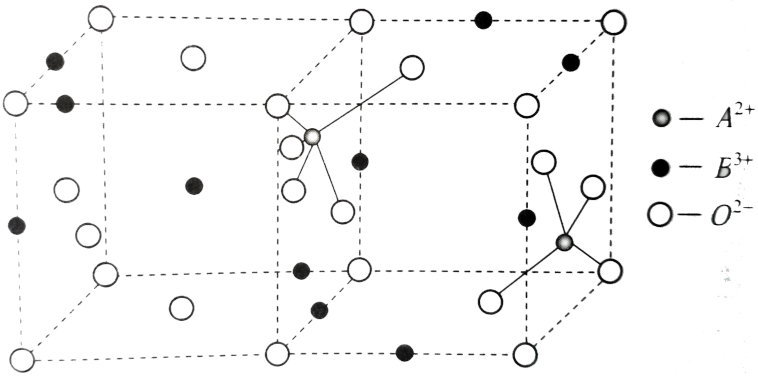
4. A class of oxide is a spinal , it consists of two types of metal ions with the oxide ions. Many of the ferrite have spinel type structures. They are magnetic materials used in telephones or memory loops in computers. Spinel type structures normal and inverse. it has the following structure.



O^{2-} ions are present in

A. Simple cubic arrangement

B. fcc arrangement

C. bcc arrangement

D. hcp arrangement

Answer: B

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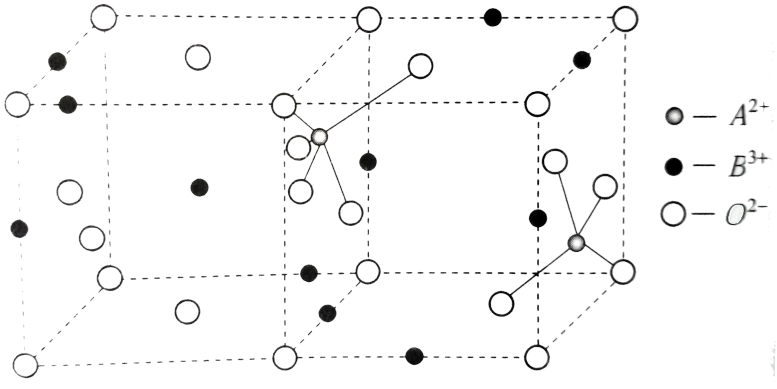
5. A class of oxide is a spinal , it consists of two types of metal ions with the oxide ions. Many of the ferrite have spinel type structures. They are magnetic materials used in telephones or memory loops in computers. Spinel type structures normal and inverse. it has the following structure.



The space lattice given in the figure refers to

A. Inverse spinel structure

B. Rock salt structure

C. Spinel structure

D. Fluorite structure

Answer: C

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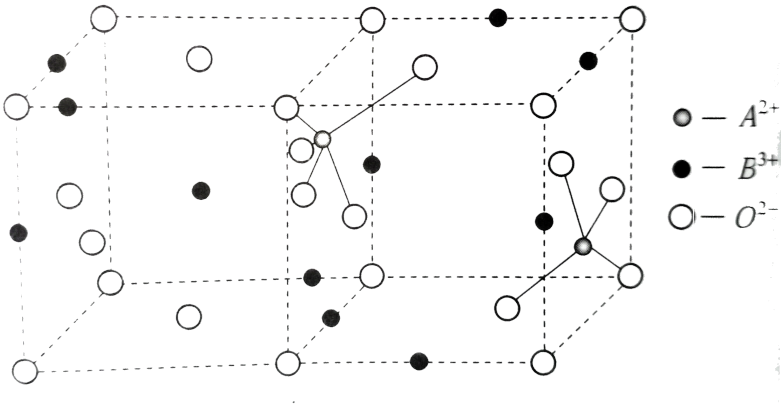
6. A class of oxide is a spinal , it consists of two types of metal ions with the oxide ions. Many of the ferrite have spinel type structures. They are magnetic materials used in telephones or memory loops in computers. Spinel type structures normal and inverse. it has the following structure.



B^{3+} and A^{2+} ions are present in

A. Octahedral, cubic voids

B. Tectrahedral voids

C. Tetrahedral,octahedral voids

D. Octahedral,tetrahedral voids.

Answer: C

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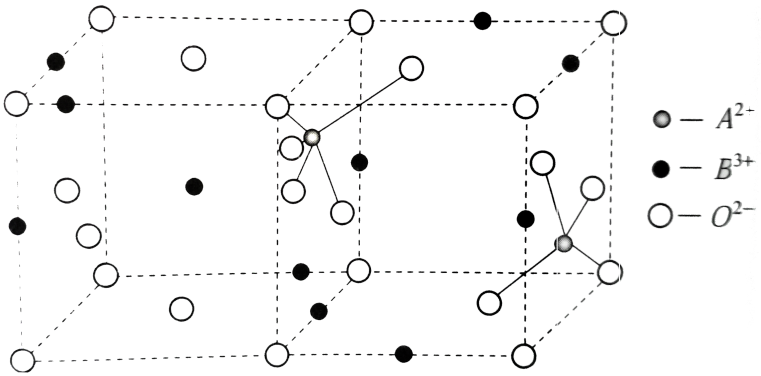
7. A class of oxide is a spinal , it consists of two types of metal ions with the oxide ions. Many of the ferrite have spinel type structures. They are magnetic materials used in telephones or memory loops in computers. Spinel type structures normal and inverse. it has the following structure.



Fraction of the total octahedral voids occupied will be

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

B. $\frac{1}{8}$

C. $\frac{1}{4}$

D. $\frac{1}{6}$

Answer: A

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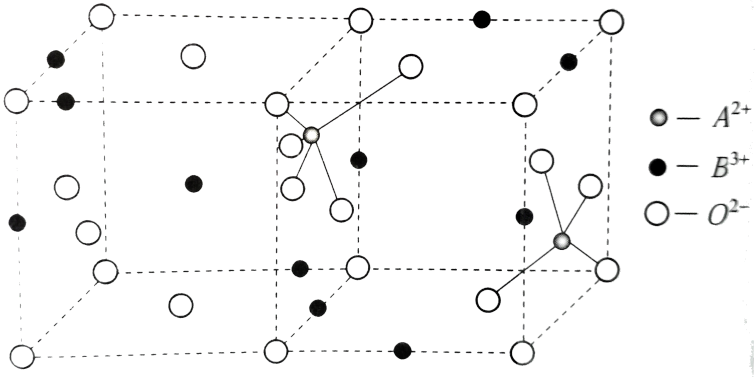
8. A class of oxide is a spinal , it consists of two types of metal ions with the oxide ions. Many of the ferrite have spinel type structures. They are magnetic materials used in telephones or memory loops in computers.

Spinel type structures normal and inverse. it has the following structure.



The formula of the compound is

A. A_2BO_4

B. A_2BO_3

C. AB_2O_4

D. ABO_2

Answer: C

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Jee Section Integer

1. The number of hexagonal faces that are present in a truncated octahedron is

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2. A crystalline solid of a pure substance has a face-centred cubic structure with a cell edge of 400 pm. If the density of the substance in the crystal is $8gcm^{-3}$, then the number of atoms present in 256g of the crystal is $N \times 10^{24}$. The value of N is

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3. Cesium atoms are the largest neturally occurring atoms. The radius of Cs atom is 2.6Å. The number of moles of Cs atoms to be laid side by side to give a row of Cs atoms $2.5cm$ long is $x \times 10^{-17}$. Find the value of x.

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4. A solid has a structure in which X atoms are located at cubic corners of unit cell, O atom are at the edge centres and Y atoms at cube centre. Then the formula of compound is $X_aY_bO_c$

If two atoms of O missing from any of two edge centres per unit cell, then the molecular formula is $X_aY_bO_z$. Then, find the value of $(x+y+z)-(a+b+c)$.

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

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Jee Section Matrix Match

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

	Column-I		Column-II
a)	simple cubic and face-centered cubic	(p)	have these cell parameters $a = b = c$ and $\alpha = \beta = \gamma$
b)	cubic and rhombohedral	(q)	are two crystal systems
c)	cubic and tetragonal	(r)	have only two crystallographic angles of 90°
d)	hexagonal and monoclinic	(s)	belong to same crystal system

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2. Match the entries listed in Column I with appropriate entries listed in Column II

	Column I (Cubic crystal)		Column II (Formula)
(A)	Atoms (A) at corners and (B) at face centres	(p)	A_4B_3
(B)	Atoms (A) at corners and face centres and atoms (B) at edge centres	(q)	A_2B
(C)	Anions (B) are arranged in ccp and cations (A) are equally distributed between tetrahedral and octahedral voids and all octahedral voids are occupied	(r)	AB_3
(D)	Cations (A) are arranged in *fcc* and anions (B) occupy all the tetrahedral voids	(s)	AB_2

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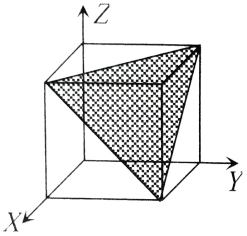
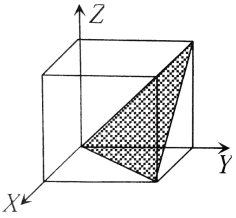
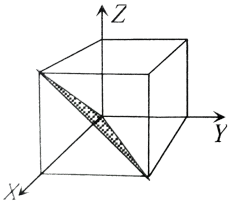
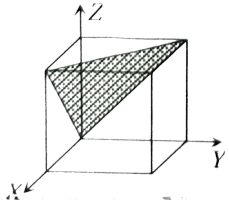
3. Match the entries listed in Column I with appropriate entries listed in Column II

Column I (Cubic unit cells)		Column II (Miller indices of the shaded plane)	
(A)		(p)	$(1\,\bar{1}\,1)$ or $(\bar{1}\,1\,\bar{1})$
(B)		(q)	$(1\bar{1}1)$
(C)		(r)	$(11\bar{1})$ or $(\bar{1}\,\bar{1}\,1)$
(D)		(s)	$(1\bar{1}\bar{1})$ or $(\bar{1}11)$

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Jee Section Numeric

1. Consider an ionic solid MX with NaCl structure. Construct a new structure (Z) whose unit cell is constructed from the unit cell of MX following the sequential instructions given below. Neglect the charge balance. 1.Remove all the anions (X) except the central one 2.Replace all the face centered cations (M) by anions (X) 3.Remove all the corner cations (M) 4.Replace the central anion (X) with cation (M)

The value of $\left(\frac{\text{number of anion s}}{\text{number of cation s}}\right)$ in z is _____.

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