CHEMISTRY

JEE (MAIN AND ADVANCED) CHEMISTRY

SOLID STATE

EXERCISE P.2.1

1. How is a crystalline solid different from an amorphous solid?

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EXERCISE P.2.2

1. Amorphous solids have unit cells in them. Comment.

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EXERCISE P.2.3

1. What type of crystalline solid is boron nitride? Why?

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EXERCISE P.2.4

1. Compare the metallic bond strengths in Mg, Ca and Al.

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EXERCISE P.2.5

1. Classify the following solids in different categories based on the nature of intermolecular forces operating in them :

Potassium sulphate , tin , benzene , urea , ammonia , water , zinc sulphide , graphite , rubidium , argon , silicon carbide .

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EXERCISE P.2.6

1. How does the inter-particle forces help in characterising the properties of (a) potassium metal and (b) solid argon?

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EXERCISE P.2.7

1. How many symmetry elements are there for a cubic structure or a crystal ?

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EXERCISE P.2.8

1. In a cubic structure, atoms of 'X' occupy the comers, atoms of 'Y' occupy the centre of the body and atoms of 'Z' occupy the centres of all six faces. Write the composition of the unit cell.

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EXERCISE P.2.9

1. How many carbon atoms are present in one unit cell of diamond ?

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EXERCISE P.2.10

1. The packing fraction of a simple cubic structure is $\frac{\pi}{6}$. Prove.

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EXERCISE P.2.11

1. An alloy of copper and zinc solidifies in ccp structure, where copper occupies lattice points and zinc occupies 50% of the tetrahedral voids and all octahedral voids. Calculate the weight percentage of copper in the alloy.

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EXERCISE P.2.12

1. A metal forms hexagonal close-packed structure? How many voids are present in 0.5 mol of it?

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EXERCISE P.2.13

1. An alloy of metals M and N, crystallises in ccp. Atoms of N occupy lattice points and atoms of M occupy one-third of tetrahedral voids. What is the composition of the unit cell?

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EXERCISE P.2.14

1. An X-ray beam $(\lambda = 70.9 \pm \ )$ was scattered by a crystalline solid. The angle (2θ) of the diffraction for a second order reflection is 14.66°. Calculate the distance between parallel planes of atoms of the crystalline solid.

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EXERCISE P.2.15

1. Calculate the density of unit cell of sodium, if the edge length of cubic structure is 4.24 angstroms.

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EXERCISE P.2.16

1. Length of a face edge in lithium chloride crystal is $5.11A^0$. What is the radius of anion of the crystal?

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EXERCISE P.2.17

1. Density of ionic substance is unchanged in Frenkel defect, but the conductivity of ionic crystalline solid increases. Comment.

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EXERCISE P.2.18

1. Differentiate between vacancy defect and interstitial defect.

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EXERCISE P.2.19

1. On cooling hot zinc oxide, the yellow colour become white. Why ?

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EXERCISE P.2.20

1. Crystal stability decreases, upon stoichiometric defects. Why ?

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EXERCISE P.2.21

1. The non - stoichiometric iron oxide has a composition $Fe_{0.94}O$. Find the ratio of ferrous and ferric ions present in it.

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EXERCISE P.2.22

1. In the crystallisation of 71.75 grams of $AgCl$, in molten state 1×10^4 mole of cadmium chloride is added to cause impurity defect. Calculate (a) the number of Ag^+ ions present, (b) the number of Cd2+ ions present and (c) the number of lattice vacancy defects.

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EXERCISE P.2.23

1. What is the significance of resistance ratio, $\rho_{300K} / \rho_{4.2K}$?

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EXERCISE P.2.24

1. Graphite is a good conductor - explain.

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EXERCISE P.2.25

1. Write the conductivity order of aluminium phosphide, silicon and cadmium sulphide.

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EXERCISE P.2.26

1. Sodium vapour is paramagnetic, but cations of sodium are diamagnetic, while magnesium vapour as well as cations of magnesium are diamagnetic. Explain.

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EXERCISE P.2.27

1. NiO is antiferromagnetic. But on heating at $250^{\circ}C$, it becomes paramagnetic. Why?

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EXERCISE 2.1.1

1. Write the main differences between crystalline

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2. Discuss the metallic bonding.

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3. What are (a) ionic solids and (b) covalent solids ? Write examples

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4. Mention the forces that operate in molecular solids. Discuss.

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5. Ionic solids conduct electricity in molten state but not in solid state . Explain .

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6. Show that crystalline silica (quartz) and amorphorphous silica are different.

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7. Explain anisotropy in crystalline solids.

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8. Explain the following and give reasons :

(a) diamond is hard, but graphite is soft ,

(b) diamond is insulator, but graphite is a conductor.

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EXERCISE 2.1.2

1. Define (a) space lattice, (b) crystal lattice, (c) unit cell and (d) coordination number.

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2. Name the parameters that characterise a unit cell .

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3. Draw the three cubic lattices of metallic crystals.

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4. Derive the Bragg's equation useful for X-ray diffraction of crystals.

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5. Discuss the close packing in crystal structures.

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6. Which of the following lattices has the highest packing efficiency ?

i) Simple cubic ii) Body- centred cubic iii) Hexagonal close-packed lattice

Packing efficiency in

i) Simple cubic lattice = 52.4 %

ii) body-centred cubic lattice = 68 %

iii) Hexagonal close-packed lattice = 74 %

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7. A grating has 5.7×10^3 lines per cm. If X-rays of wavelength 546 nm are incident on the grating, find the angle of reflection for the first order diffraction maximum.

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8. A bee lattice is made up of two elements X and Y. Atoms of X occupy two comers and atoms of Y occupy the remaining lattice points. Derive the composition of the compound.

XY_7

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9. Atomic weight of silver is 107 .8. Silver crystallises in fee lattice with edge length of unit cell is $4.086A^0$. Calculate the density of unit cell of silver and radius of silver atom.

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10. An element with molar mass $2.7 \times 10^{-2} kgmol^{-1}$ forms a cubic unit cell with edge length 405 pm . If its density is $2.7 \times 10^3 kgm^{-3}$ what is the nature of the cubic unit cell ?

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11. A compound is formed by two elements X and Y . Atoms of the element Y (as anions) make ccp and those of the element X(as cations) occupy of the octahderal voids . What is the formula of the compound ?

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12. Atoms of element B form hcp lattice and those of the element A occupy $2/3^{\text{rd}}$ of tetrahedral voids . What is the formula of the compound formed by the element A and B ?

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13. The edge length of a face of crystalline barium is 0.42 nm. Calculate the diameter of an atom of the metal.

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14. The edge length of sodium chloride 5.64A^(0)`. Calculate is the density of sodium chloride.

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15. A metal crystallises in body centred cubic lattice with edge length of the cube 287 pm. Calculate the radius of metal atom.

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EXERCISE 2.1.3

1. How do the properties of crystals vary with imperfections?

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2. How are the properties of crystal vary upon point defects?

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3. Explain the following terms with suitable examples:

(i) Schottky defect (ii) Frenkel defect (iii) Interstitials and (iv) F-centres.

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4. Explain the following terms with suitable examples:

(i) Schottky defect (ii) Frenkel defect (iii) Interstitials and (iv) F-centres.

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5. Differentiate between stoichiomelric and non-stoibiometric defects.

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6. Write on metal excess defect.

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7. Illustrate with a suitable example. the impurity defect in ionic crystal.

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EXERCISE 2.1.4

1. Distinguish between conductors, insulators and semiconductors.

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2. What are n-type and p-type semiconductors?

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3. Discuss on diamagnetism and paramagnetism with suitable examples.

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4. What type of substances would make better permanent magnets , ferromagnetic or ferrimagnetic ? Justify your answer

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5. A group 14 elements is to be converted into n- type semiconductor by doping in with a suitable impurity. To which group shouyld theis impurity belong ?

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6. What type of defect can arise when a solid is heated ? Physical property is affected by it and in what why ?

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7. What type of stoichiometric defect is shown by

ZnS

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8. Ionic solids , which have anionic vacancies due to metal excess defect , develop colour .

Explain with the help of a suitable example .

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9. Write applications of $n-$ and $p-$ type semi conductors.

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10. What type of substances would make better permanent magnets , ferromagnetic or ferrimagnetic ? Justify your answer

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EXERCISE 2.2

1. Mention various types of ·crystalline solids. Give examples.

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2. Mention different examples of molecular solids.

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3. What are anisotropy and isotropy?

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4. Discuss the band theory of solids, to account for their conductivity properties.

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5. How the elements of group 12, 13, 15 and 16 are used in order to get substances of electrical importance?

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6. Distinguish between square and hexagonal two dimensional packing of metal atoms

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7. Distinguish between hep and ccp lattices with suitable examples.

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8. A compound having elements X and Y crystallises in a cubic structure, where X is at the corneer position and Y is at the center of the cube. The correct formula of the compound is

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9. An alloy of Au and Cu crystallises with atoms of an occupying all lattice points at the corners of cubic and atoms of Cu occupying the centres of all faces. Write the empirical formula of the alloy.

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10. Unit cell of silver (at wt. 108) has a density $10.5g\ \hat{}\ (-1)$ The crystal is cubic with edge length $4.09A^0$. How many silver atoms are present in unit cell of the metal?

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11. Discuss the symmetry elements of crystal line solids.

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12. The density K.Br cubic crystal is 2.75g cm^{-3} with an edge length of cube $654 \pm$. How many mass points are present in the unit cell?

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13. A crystal was examined with X - rays of wave length $1.53A^{\circ}$ with a maximum reflection at $15^{\circ}36$. What is the interplanar spacing ? If X - rays of wave length $2.29A^{\circ}$ was used, what will be angle of reflection?

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14. Density of silver is 10.5 g $\hat{}(-1)$ Calculate the edge length of the unit cell of silver.

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15. Density of potassium is 2.64×10^6 g m^{-3}. What is the radius of metal atom?

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16. Silicon crystallises in fcc lattice, a single crystal of high purity like diamond. Gram atomic weight of silicon is 28 g mol^{-1}. Edge length of unit cell is 0.543nm. Calculate the number of silicon atoms per unit cell and density of unit cell.

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17. In a close packed structure of mixed oxide, the lattice is composed of O^{2-} ions. One eighth of tetrahedral voids are occupied by divalent cations A^{2+} and one half of octahedral voids by trivalent cations B^{3+}. What is the formula of oxide?

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18. A metal crystallises in two phases, one as fcc and other as bcc with unit cell edge length of 3.5Å and 3.0Å respectively. The ratio of density of fcc and bcc phases approximately is

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19. Metallic chromium crystallises in bee lattice. The edge length of unit cell is $2.87A^0$. Calculate (a) atomic radius and (b) density.

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20. For a cubic lattice edge length of unit cell is $5A^0$ and density is $2g\hat{\ }(-1)$. Calculate the radius of an atom, if gram atomic weight is 75 g mol^{-1}.

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21. What is the ratio of lengths of face edge, face diagonal and body diagonal of cube ?

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22. Which of the crystal structures has no symmetry elements? Why?

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23. The interplanar distance in a crystal used for X - ray diffraction is $2A^0$. The angle of incidence for first order diffraction is 9°, what is the wave length of X - rays?

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24. An alloy is made up of metals X and Y. Atoms of X are in ccp arrangement. Atoms of Y occupy half of the tetrahedral and all octahedral voids. Write the composition of the alloy.

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25. An element crystallises in the fee lattice having edge length 400 pm. Calculate the maximum diameter which can be placed in interstitial sites with out disturbing the structure.

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26. In a compound AB, the ionic radii of A^{+} and B^{-} are 88 pm and 200 pm respectively. Write the coordination number of A^{+}.

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27. Edge length of unit cell of KCl is 629 pm and density is $1.989g\hat{}(-1)$. Calculate Avagadro's number based on this X-ray diffraction data.

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28. Analysis shows that nickel oxide has the formula $Ni^{0.98}0, 1.00$, what fractions of nickel exist as Ni^{2+} and Ni^{3+} ions ?

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29. NH_4 X1 crystallises in bee lattice with edge length 383 pm. If the radius of NH_4^+ ion is $154 \pm$,calculate the radius of halide (X^-).

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30. Discuss the non-stoichiometric imperfections in crystalline solid substances.

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31. During the crystallisation one fourth mole of Cu_2CI_2 in molten state one millimole of zinc chloride is added. How many cuprous ions are removed? Calculate the number of lattice vacancies created in the crystal.

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32. Solids containing F-centres are paramagnetic and coloured. Why?

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33. Differentiate between intrinsic semiconductors and extrensic semiconductors.

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34. Explain different magnetic properties of solids. What happens when these substances are heated?

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35. Ferrites are ferrimagnetic substances. Substantiate.

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36. Magnetically ordered solids transform to paramagnetic state upon heating. Explain.

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PROBLEM

1. How is a crystalline solid different from an amorphous solid?

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2. Compare the metallic bond strengths in Mg, Ca and AI.

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3. Amorphous solids have unit cells in them. Comment.

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4. What type of crystalline solid is boron nitride? Why?

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6. How many symmetry elements are there for a cubic structure or a crystal ?

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8. An alloy of copper and zinc solidifies in ccp structure, where copper occupies lattice points and zinc occupies 50% of the tetrahedral voids and all octahedral voids. Calculate the weight percentage of copper in the alloy.

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9. Calculate the density of unit cell of sodium, if the edge length of cubic structure is $4.24A^{\circ}$.

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10. An X-ray beam $(\lambda = 70.9pm)$ was scattered by a crystalline solid. The angle (2θ) of the diffraction for a second order reflection is 14.66^0. Calculate the distance between parallel planes of atoms of the crystalline solid.

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11. The packing fraction of a simple cubic structure is $\pi/6$. Prove.

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12. What is the significance o f resistance ratio $\rho_{300k/\rho_{4.2}}$ k

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13. Sodium vapour is paramagnetic, but cations of sodium are diamagnetic, while vapour magnesium as well as cations of magnesium are diamagnetic. Explain.

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15. NiO is antiferromagnetic. But on heating at $250^{\circ}C$, it becomes paramagnetic. Why?

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16. Graphite is a non-metal, but its electrical behaviour is like metals. Explain.

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SUBJECTIVE EXERCISE -1(VERY SHORT ANSWER QUESTIONS)

1. Write the main differences between crystalline

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2. Discuss the metallic bonding.

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3. What are ionic solids and covalent solids ? Write examples 4. Mention the forces that operate in molecular solids. Discuss.

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4. Do amorphous solids have unit cells in them.

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5. What do you know about "amorphous" substances ? Discuss ?

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6. What are anisotropy and isotropy ?

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7. Mention different examples of molecular solids.

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8. What will be the magnitude of the vapour presure of ionic crystals ?

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9. What is the minimum radius ratio that can give a specific co-ordination number.

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SUBJECTIVE EXERCISE -2(SHORT ANSWER QUESTIONS)

1. Define (a) space lattice, (b) crystal lattice, (c) unit cell and (d) coordination number.

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2. Derive the Bragg's equation useful for X-ray diffraction of crystals.

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3. Discuss the close packing in crystal structures.

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4. What are the tetrahydral hole and octahydral hole ? How they are formed explain ?

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5. Explain when difracted rays may have constructive and destructive interference,

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6. Derive a relation between the density of a crystalline substance and the unit cell length.

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7. Calculate the number of particles present in a fcc crystal structure.

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8. Place the atoms of an element 'A' in the lattice points of Face centred cubic structrue.

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9. How many lattice points are there in a unit cell of a (a) B.C.C lattice (b) End centred lattice

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10. Draw the points of two dimensional lattice with sequence of unit cells.

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11. A space lattice of a crystal has alternate positive and negative ion in the lattice. Comment.

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12. The diffracted X rays from $CuSO_4$ crystal are allowed to fall on a photographic plate. What happens to the photographic plate.

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13. A grating has 5.7×10^{3} lines per cm. If X-rays of wavelength 546 nm are incident on the grating, find the angle of reflection for the first order diffraction maximum.

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14. Atomic weight of silver is 107 .8. Silver crystallises in fee lattice with edge length of unit cell is $4.086 A^{0}$. Calculate the density of unit cell of silver and radius of silver atom.

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15. A bcc lattice is made up of two elements X and Y. Atoms of X occupy two corners and atoms of Y occupy the remaining lattice points. Derive the composition of the compound

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17. NH_4 X1 crystallises in bee lattice with edge length 383 pm. If the radius of NH_4^+ ion is $154 \pm$,calculate the radius of halide (X^-).

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18. Argon crystallises in a F.C.C lattice with 1 atom at each lattice point. If the unit cell length is $5.3114A^0$ at 0^0K. Calculate nearest neighbour distance in A^0 at zero kelvin

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19. A body centred cubic lattice is made up of two elements A and B. Atoms of 'A' occupy two corners of the cube. If the remaining position in

the cell are occupied by atoms of 'B'. Suggest the formula of the compounds.

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20. Calculate the contribution of lattice points in body centred lattice arrangement.

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21. An X-ray beam $(\lambda = 70.9 pm)$ was scattered by a crystalline solid. The angle (2θ) of the diffraction for a second order reflection is 14.66^0. Calculate the distance between parallel planes of atoms of the crystalline solid.

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22. X-rays of wavelength equal to 0.134 nm give a first order diffraction from the surface of a - crystal when the value of θ is 10.5^0, then the distance between the adjacent planes in the crystal is $(\sin 10.5^\circ = 0.1822)$

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23. The density KBr cubic crystal is $2.75 gcm^{-3}$ with an edge length of cube 654pm. How many mass points are present in the unit cell ?

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28. An alloy is made up of metals X and Y. Atoms of X are in ccp arrangement. Atoms of Y occupy half of the tetrahedral and all octahedral voids. Write the composition of the alloy.

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29. A compound of two elements P and Q crystallises in cubic structure. If P occupies corners and occupies face centres, what is the composition of the compound ? If atoms of Q along with one direction are removed, what is the composition ?

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30. An alloy of Au and Cu crystallises with atoms of an occupying all lattice points at the corners of cubic and atoms of Cu occupying the centres of all faces. Write the empirical formula of the alloy.

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31. Unit cell of silver (at wt. 108) has a density $10.5gcc^{-1}$. The crystal is cubic with edge length $4.09A^0$. How many silver atoms are present in unit cell of the metal ?

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34. Metallic chromium crystallises in bee lattice. The edge length of unit cell is $2.87A^0$. Calculate (a) atomic radius and (b) density.

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35. A metal crystallises in fcc lattice with edge length of unit cell $3.5A^0$ and also in bcc lattice with edge length of unit cell $3A^0$. Calculate the ratio of the densities of fcc and bcc lattices.

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36. For a cubic lattice edge length of unit cell is $5A^0$ and density is $2g\hat{}(-1)$. Calculate the radius of an atom, if gram atomic weight is 75 g mol^{-1}.

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37. In a compound XY, the ionic radii of X^+ and Y^- are 88 pm and 200 pm respectively. Write the coordination number of X^+

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38. An element crystallises in the fee lattice having edge length 400 pm. Calculate the maximum diameter which can be placed in interstitial sites with out disturbing the structure.

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39. Calculate the wavelength of X-rays which produces a first order diffraction angle 2θ equal to 16.8° for a crystal. Inter particle distance of crystal is 200 pm.

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40. X-rays of wavelength equal to 0.134 nm give a first order diffraction from the surface of a - crystal when the value of θ is 10.5^0, then the distance between the adjacent planes in the crystal is $(\sin 10.5^\circ = 0.1822)$

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41. 'Al' crystallises unit F.C.C lattice. If the closest approach of Al atoms in the crystal is 0.4054nm. Find the density of Al'.

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SUBJECTIVE EXERCISE -2(VERY SHORT ANSWER QUESTIONS)

1. Distinguish between square and hexagonal two dimensional packing of metal atoms

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2. How is the angle of reflection determined in Bragg's spectrometer method ?

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3. Name the parameters that characterise a unit cell .

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4. Give reasons for use of X rays in the study of solids.

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5. What sort of crystals are necessary in Bragg's method.

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6. What are the characteristics (a, b, c and α, β, γ) values in a tetragonal systems)

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7. Name an element that forms monoclinic crystals.

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8. What is the crystal structure of an orange coloured oxidising agent used in the lab.

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9. Graphite crystallizes in hexagonal solids. Give its characteristics.

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10. Which crystal structure has 12 as coordination number.

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11. How many unit cells share each of the following lattice points in a cubic lattice ?

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12. What relation holds good between the numbers of octahedral and tetrahedral holes in a lattice formed by spheres ?

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SUBJECTIVE EXERCISE -3(SHORT ANSWER QUESTIONS)

1. Distinguish between conductors, insulators and semiconductors.

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2. What are n-type and p-type semiconductors?

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3. Discuss on diamagnetism and paramagnetism with suitable examples.

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4. What are ferromagnetic, antiferromagnetic and ferrimagnetic substances?

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5. Explain different magnetic properties of solids. What happens when these substances are heated ?

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6. Discuss the band theory of solids, to account for their conductivity properties.

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7. How the elements of group 12, 13, 15 and 16 are used in order to get substances of electrical importance ?

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SUBJECTIVE EXERCISE -3(VERY SHORT ANSWER QUESTIONS)

1. Explain ferromagnetic solid materials ?

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2. Differentiate between intrinsic semiconductors and extrensic semiconductors.

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3. What is ferrimagnetism?

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4. How is magnetic moment calculated ?

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5. What is the value of one Bohr magneton in S.I. units?

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OBJECTIVE EXERCISE -1

1. Which of the following is amorphous in nature?

A. Quartz

B. $CuSO_4.5H_2O$

C. Dry ice

D. Fused silica glass

Answer: D

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2. Which of the following is covalent solid

A. Fe

B. Diamond

C. NaCZ

D. Cu

Answer: B

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3. NaCl is an example of

A. Ionic solid

B. Covalent solid

C. Metallic solid

D. Molecular solid

Answer: A

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4. Which of the following melts below 298 k.

A. $NaCI_s$

B. Si_s

C. Ar_s

D. Na_s

Answer: C

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5. For a covalent solid, the units which occupy lattice points are

A. Atoms

B. Ions

C. Molecules or atoms

D. Electrons

Answer: A

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6. Which of the following does not give any diffraction bands with X-rays ?

A. $BaSO_4$

B. Graphite

C. diamond

D. Plastic

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7. Which of the following is not a crystalline solid?

A. kci

B. csci

C. glass

D. rhombic s

Answer: C

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8. Covalent solid among the following is

A. solid ar

B. mgo

C. fe

D. bn

Answer: D

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

A. amorphous solids

B. ionic solids

C. pseudo solids

D. molecualr solids

Answer: B

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10. Which of the following is not a correct statement ?

A. Any material can be made amorphous by quenching it's melt (or) freezing it's vapour

B. The melt of an am orphous solid when slowly cooled it will become crystallin

C. Glass melt over a range of temperatures

D. Quartz has irregular chains of SiO_4 units.

Answer: D

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11.

Column A	Column B
A) Glass	1) Framework silicate
B) Quartz	2) Malleable & ductile
C) Metallic crystal	3) Pseudo solid

The correct match is

	A	B	C		A	B	C
1)	1	3	2	2)	3	1	2
3)	2	1	3	4)	1	2	3

A. 132

B. 312

C. 213

D. 123

Answer: B

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12. The maximum displacement perpendicular to the motion of the wave is known as

A. wavelength

B. intensity

C. amplitude

D. frequency

Answer: C

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13. Which of the following crystal has unit cell such that a $a \neq b \neq c$ and $\alpha \neq \beta \neq \gamma \neq 90^\circ$

A. $NaNO_3$

B. K_2SO_4

C. KNO_3

D. $K_2Cr_2O_7$

Answer: D

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14. Which of the following is not the true about crystalline solids

A. they are rigid and hard

B. they possess plane surfaces

C. they are obtained by rapid cooling of motten substances

D. they have definete geometric configuration

Answer: C

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15. Dry ice is an example of

A. ionic solid

B. molecular solid

C. covalent solid

D. metallic solid

Answer: B

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16. Graphically the total number of fundamental spatial arrangements possible are

A. 3

B. 7

C. 10

D. 14

Answer: D

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17. In case of a cubic system, the number of types of space lattices

A. 3

B. 7

C. 14

D. 12

Answer: A

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18. The number of points at the centre of the primitive unit cell is

A. 1

B. 2

C. 3

D. 0

Answer: D

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19.

(Unitcell)	(no of atoms per unitcell)
A) Simple cube	1) 4
B) fcc	2) 2
C) bcc	3) 1

The correct match is

	A	B	C		A	B	C
1)	2	3	1	2)	2	1	3
3)	3	1	2	4)	1	2	3

The correct match is

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20. How many kinds of primitive unit cells are possible

A. 23

B. 7

C. 230

D. 14

Answer: B

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21. The structural unit of a crystal is called

A. unit cell

B. crystal lattice

C. space lattice

D. structure motif

Answer: D

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22. Number of space lattices presnt in triclinic System

A. four

B. three

C. two

D. one

Answer: D

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23. Out of seven crystal systems how many have body centred unit cell ?

A. 4

B. 3

C. 2

D. 7

Answer: B

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24. How many unit cells are possible for the crystallographic dimensions as $a \ne b \ne c\alpha = \gamma = 90^{\circ}, \alpha \ne \beta$

A. 2

B. 1

C. 4

D. 3

Answer: A

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25. Axial distances are $a = b \neq c$ and axial angles are $a = 90^0 = \beta, Y = 120^\circ$ in the system

A. hexagonal

B. tetragonal

C. cubic

D. monoclinic

Answer: A

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26. Axial distances are $a = b \neq c$ and axial angles are $a = 90^0 = \beta, Y = 120^\circ$ in the system

A. $NaWO_2$

B. $NaWO_3$

C. Na_2WO_3

D. $NaWO_4$

Answer: B

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27. The intermetallic compound LiAg crystallizes in cubic lattice in which both lithium and silver have co-ordination number of eight. The crystal class is

A. simple cubic

B. body centred cubic

C. face centred cubic

D. none of these

Answer: B

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28. Edge length of a cube is 400 pm. Then its bodydiagonal length would be

A. 50 pm

B. 600pm

C. 566 pm

D. 639 pm

Answer: D

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29. Which of the following systems is not correctly characterised ?

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

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

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

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

Answer: D

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30. The total number of crystal forms possible is around

A. 32

B. 14

C. 230

D. 7

Answer: C

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31. Total number of Bravais lattices is

A. 3

B. 7

C. 10

D. 14

Answer: D

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32. If 'a' stands for the edge length of the cubic systems: simple cubic, body centered cubic and face centred cubic, then the ratio of radii of the spheres in these systems will be respectively. 2.

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

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

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

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

Answer: A

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33. In an ionic compound A+X', the radii of A^{+} and X ions are 1.0 pm and 2.0 pm respectively. The volume of the unit cell of the crystal AX will be

A. 27 pm^3

B. 64 pm^3

C. 125 pm^3

D. 21 pm^3

Answer: D

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34. Total volume of atoms present in a face centered cubic unit cell of a metal is

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

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

C. $\frac{20}{\sqrt{3}}\pi r^3$

D. $\frac{24}{3}\pi r^3$

Answer: B

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35. Among the following highest melting point is associated with

A. $NaCI_s$

B. graphite

C. P_4

D. K

Answer: B

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36. The number of space lattices possible for the crystalographic dimensions $\alpha \neq \beta \neq \gamma$

A. 1

B. 2

C. 3

D. 4

Answer: A

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37. In which of the following crystal systems F.C.C unit cells exists ?

A. cubic hexagonal

B. tetragonal , orthorhomibic

C. orthorhombic , cubic

D. triclinic, monoclinic

Answer: C

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38. Which one of the following relationships is correct for cubic (C) and rhombohedral (R) unit cells ?

A. $Ca \neq b \neq c, \alpha = \beta = \gamma$

$R: a = b = c, \alpha = \beta = \gamma = 90^{\circ}$

B. $Ca = b = c, \alpha \neq \beta \neq \gamma$

$R: a \neq b \neq c, \alpha = \beta = \gamma = 90^{\circ}$

C. $Ca = b = c, \alpha = \beta = \gamma$

$R: a = b \neq c, \alpha = \beta = \gamma = 90^{\circ}$

D. $Ca = b = c, \alpha = \beta = \gamma$

$R: a = b \neq c, \alpha = \beta = \gamma \neq 90^{\circ}$

Answer: D

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39. In F.C.C the unit cell is shared equally by how many unit cells ?

A. 10

B. 8

C. 6

D. 2

Answer: C

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List - I	List - II
a) Metallic	i) CaF_2
b) Covalent solid	ii) SiC
c) Non-polar molecule	iii) H_2O
d) Ionic	iv) I_2
e) Polar molecule	v) Ag
	vi) Ar

The correct answer is

	a	b	c	d	e
1)	v	ii	iv	i	iii
2)	vi	iv	ii	iii	i
3)	v	iii	iv	ii	iii
4)	v	iv	vi	iii	i

40.

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41. In a close packed lattice containing 'n' particles, the number of tetrahedral and octahedral voids respectively

A. n and 2n

B. n and n

C. 2n and n

D. 2n and n/2

Answer: C

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42. The co-ordination number of a metal crystallising in a hexagonal close paced structure is :

A. 12

B. 4

C. 8

D. 6

Answer: A

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43. An octahedral void is surrounded by how many spheres ?

A. 6

B. 4

C. 8

D. 12

Answer: A

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

A. 3

B. 4

C. 6

D. 8

Answer: C

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45. The void between two oppositly directed planar triangles of spheres in adjacent layers is called

A. cubic void

B. tetrahedral void

C. octahedral void

D. 2 or 3

Answer: C

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46. In a cubic close packed structure the number of nearest neighbours for a given lattice point is

A. 6

B. 8

C. 12

D. 14

Answer: C

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47. Which of the following structure is most uncommon for metals ?

A. simple cubic

B. b.c.c

C. c.c.p

D. h.c.p

Answer: A

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48. Which of the following packing is more efficient:

A. square close - packing

B. hexagonal close pakcing

C. tetrahedral arrangeement

D. pentagonal arrangement

Answer: B

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49. The packing efficiency in a simple cubic cell system of crystals is

A. 0.68

B. 0.52

C. 0.74

D. 0.92

Answer: B

Watch Video Solution

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

A. 4

B. 6

C. 8

D. 10

Answer: C

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51. The Ca^{2+} and F ions are located in CaF_2crystal, 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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52. The fraction of the total volume occupied by the atoms present in a simple cube is

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

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

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

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

Answer: B

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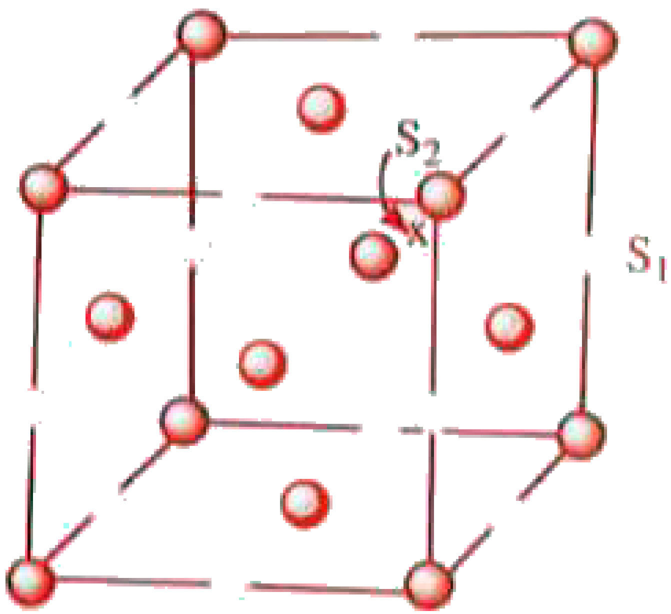
53. In the structure given below, the sites S_1 and S_2 represent



A. both octahedral voids

B. both tetrahedral voids

C. S_1 - octahedral void S_2 - tetrahedral void

D. S_1 tetrahedral void S_2 octahedral void

Answer: C

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54. The packing fraction for a body centred cube

A. 0.74

B. 0.76

C. 0.68

D. 0.86

Answer: C

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55. Density of a crystal is given by :

A. $\frac{a^3 \times M}{z \times N_0}$

B. $\frac{N_0 \times M}{z \times a^3}$

C. $\frac{z \times M}{a^3 \times N_0}$

D. $\frac{a^3 \times N^0}{z \times M}$

Answer: C

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56. The percent of void space in a body - centred cubic lattice is :

A. 0.32

B. 0.48

C. 0.52

D. 0.68

Answer: A

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57. Calculate the efficiency of the packaing in case of face - centered cubic crystal .

A. 0.52

B. 0.68

C. 0.74

D. 0.92

Answer: C

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58. Coordination number for Cu is

A. 1

B. 6

C. 8

D. 12

Answer: D

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59. Which of the following has hcp crystal structure ?

A. naci

B. $caci_2$

C. zn

D. rbci

Answer: C

Watch Video Solution

60. The intermetallic compound LiAg crystallizes in cubic lattice in which both lithium and silver have co-ordination number of eight. The crystal class is

A. simple cubic

B. body centered cubic

C. face centered cubic

D. none of these

Answer: B

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61. In a cubic closed packed structure of mixed oxide, the oxide ions are in CCP arrangement 1/6 of tetrahedral voids are occupied by cations A and 1/2 of octahedral voids are occupied by cations B. The formula of the oxide is

A. abo_2

B. a_2bo_2

C. a_2b_2O

D. $a_2b_3o_6$

Answer: D

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62. Which of the following has both Schottky and Frenkel defects.

A. agbr

B. zno

C. naci

D. kci

Answer: A

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63. 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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64. The ratio of Fe^{3+} and Fe^{2+} ions in $Fe_{0.9}9S_{1.0}$ is

A. 0.28

B. 0.5

C. 2

D. 4

Answer: A

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65. Which of the following has Frenkel defect?

A. sodium chloride

B. graphite

C. silver bromide

D. diamond

Answer: C

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66. In AgBr, there can occur

A. only schottky defect

B. only frenkel defect

C. both a and b

D. none of these

Answer: C

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67. 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. $6.02 \times 10^{14} mol^{-1}$

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

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

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

Answer: D

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68. AB is an ionic solid. If the ratio of ionic radii of A^{+} and B^{+} is 0.52. What is the co-ordination number of B?

A. 2

B. 3

C. 6

D. 8

Answer: C

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69. For an octahedral radius ratio limit is

A. 0.155

B. 0.732

C. 0.414

D. 0.225

Answer: C

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70. Which of the following is an example of body centred cube ?

A. nickel

B. zinic

C. copper

D. potassium

Answer: D

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71. Atoms of an element 'A' occupy 2/3 tetrahedral voids in the hexagonal close packed (hep) unit cell lattice formed by the element 'B'. The B' is formula of the compound formed by 'A' and

A. a_2b

B. ab_2

C. a_4b_3

D. a_2b_3

Answer: C

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72. Match the following columns

List I	List II
A) ccp	1) ABAB
B) hcp	2) BCC
C) $CsCl$	3) ABC ABC. The correct match is

	A	B	C		A	B	C
1)	2	3	1	2)	3	1	2
3)	1	3	2	4)	3	2	1

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73. Schottky defect causes

A. increase in the denisty of solid

B. decrease in the density of solid

C. no change in the density of solid

D. decrease in the conductivity of solid

Answer: B

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74. Match the following columns

List - I	List - II
A) Crystal defect	1) Amorphous
B) SiC	2) Frenkel
C) Quartz glass	3) Covalent crystal

The correct match is

	A	B	C		A	B	C
1)	3	1	2	2)	2	1	3
3)	2	3	1	4)	1	2	3

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75. At zero kelvin, most of the ionic crystals possess

A. frenkel defect

B. schottyky defect

C. metal excess defect

D. no defect

Answer: D

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76. In stoichiometric defects, the ratio of positive and negative ions as indicated by chemical formula of the compound

A. decreases

B. increases

C. remains

D. cannot be predicted

Answer: C

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

A. metal excess defect

B. vacancy defect

C. frenkel defect

D. schottky defect

Answer: C

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78. Non stoichiometric solid among the following

A. mgo

B. cao

C. na_2o

D. tio

Answer: D

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79. The correct statement regarding defect in solids is

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

B. Frenkel defect is a dislocation defect

C. Trapping of proton in the lattice leads to the formation of F-centers.

D. Schottky defect has no effect on the physical properties of solids

Answer: B

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80. Molten sodium chloride conducts electricity due to the presence of

A. free electrons

B. free ions

C. free molecules

D. atoms of sodium and chlorine

Answer: B

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81. Which arrangement of electrons describes ferrimagnetism?

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

B. $\uparrow \downarrow$

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

D. none of these

Answer: C

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82. Which of the following substace is paramagnetic ?

A. na_2o

B. na_2o_2

C. ko_2

D. k_2o_2

Answer: C

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83. On doping Ge metal with a little of gallium one gets

A. p type semi conductor

B. n type semi conductor

C. insulator

D. rectifier

Answer: A

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84. A solid with high electrical and thermal conductivity from the following is

A. si

B. li

C. naci

D. ice

Answer: B

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

A. 2

B. 5

C. 3

D. 1

Answer: B

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

A. trivalent impurity

B. tetravalent impurity

C. pentalvalent impurity

D. divalent impurity

Answer: A

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87. Which substance will conduct the current in the solid state

A. diamond

B. graphite

C. iodine

D. sodium chloride

Answer: B

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88. Metals have conductivity in the order of $\left(\text{ohm}^{-1}\ \text{cm}^{-1}\right)$

A. 10^{12}

B. 10^{8}

C. 10^{2}

D. 10^{-6}

Answer: B

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89. An example of substance for metallic or insutating properties depending on temperature

A. tio

B. cro_2

C. vo_2

D. reo_3

Answer: C

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90. A diode is

A. only n type of semiconductor

B. npn or pnp type of semicondluctor

C. only p type of semiconductor

D. only npn type of semiconductor

Answer: B

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91. Which of the following is ferromagnetic

A. ni

B. co

C. cro_2

D. all

Answer: D

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92. Ferromagnetic substances have

A. zero magnetic moment

B. small magnetic moment

C. large magnetic moment

D. any value of magnetic moment

Answer: C

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93. Extent of Ferromagnetism is maximum in

A. fe

B. ni^{2+}

C. CO_{3+}

D. cCu^{2+}

Answer: A

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94. Germanium can be made n-type semi conductor by doping with

A. silicon

B. arsenic

C. gallium

D. either as or ga

Answer: B

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OBJECTIVE EXERCISE -2

1. A metal crystallises in a simple cubic unit cell of edge length 6.22Å. The radius of the metal atom

A. $1.55A^{\circ}$

B. $3.11A^{\circ}$

C. $6.22A^{\circ}$

D. $2.45A^{\circ}$

Answer: B

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2. The consitutent particles in carborundum

A. atoms

B. molecules

C. $+veions$

D. $+ve$ ions in a sea of electrons

Answer: A

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3. How many atoms are there in a cube based unit cell having one atom on each comer and two atoms on each body diagonal ?

A. 8

B. 6

C. 4

D. 9

Answer: D

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4. point that is located at the corner of a unit cell is shared by how many unit cells ?

A. 2

B. 4

C. 6

D. 8

Answer: D

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5. The number of lattice points per unit cell in B.C.C and end centered lattice respectively

A. 6,6

B. 9,10

C. 6,8

D. 6,10

Answer: B

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6. Sodium metal crystallizes in B.C.C. lattice with edge length of $4.29A^{\circ}$. The radius of sodium atom is

A. $2.857A^{\circ}$

B. $1.601A^{\circ}$

C. $2.145A^{\circ}$

D. $1.857A^{\circ}$

Answer: D

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7. The coordination numbers of oxygen and silicon in SiO_4 respectively

A. 1,2

B. 2,1

C. 2,4

D. 4,2

Answer: C

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8. In metal lattices the co-ordination number of metal atom is usually

A. 2 or 4

B. 4 or 6

C. 6 or 8

D. 8 or 12

Answer: D

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9. All axial distances are unequal as well as all axial angles are unequal in the system

A. monoclinic

B. trigonal

C. triclinic

D. hexagonal

Answer: C

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10. The crystal system without any element of symmetry is

A. monoclinic

B. hexagonal

C. triclinic

D. cubic

Answer: C

Watch Video Solution

11. The number of Bravis lattices possible for the crystal system monoclinic is

A. 2

B. 1

C. 4

D. 3

Answer: A

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12. Crystallographic parameters in $KMnO_4$ are

A. $\alpha = \beta = \gamma \neq 90^\circ$

B. $\alpha = \beta = \gamma = 90^\circ$

C. $\alpha \neq \beta \neq \gamma \neq 90^\circ$

D. $\alpha = \beta = \gamma > 90^\circ$

Answer: A

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13. Na and Mg crystallize in BCC and FCC type of crystals respectively, then the number of atoms of Na and Mg present in the unit cell of their respective crystals is

A. 4,2

B. 9,14

C. 14,9

D. 2,4

Answer: D

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14. Potassium crystallises in a body centred cubic unit cell. The mass of one unit cell is

A. 1.29×10^{-23} gm

B. 1.29×10^{-22} gm

C. 6.29×10^{-23} gm

D. 1.29×10^{-24} gm

Answer: B

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15. A metal 'M' is crystallised in F.C.C lattice. The number of unit cells in it having 2.4×10^{24} atoms

A. N

B. N/2

C. 2n and n

D. 4N

Answer: A

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16. Among the unit cells given below, which two are highly symmetric and unsymmetric respectively

A. hexagonal cubic

B. orthorhombic cubic

C. cubic triclinc

D. monolinic cubic

Answer: C

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17. If two waves with the amplitude of E_0 each undergo constructive interference, the amplitude of the resulting wave is

A. 0

B. $< 2E_0$

C. $2E_0$

D. E_0^2

Answer: C

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18. The contribution of particle at the edge centre to a particular unit cell is

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

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

C. 1

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

Answer: B

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19. A compound having elements X and Y crystallises in a cubic structure, where X is at the corneer position and Y is at the center of the cube. The correct formula of the compound is

A. xy

B. x_3y

C. xy_2

D. xy_3

Answer: A

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20. The number of octahedral voids in a unit cell of cubic close packed structure is

A. 1

B. 2

C. 4

D. 8

Answer: C

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21. In which of the following crystal structure the void efficiency is 32% ?

A. simple cube

B. face centered cube

C. hexagonal close packing

D. body centered cube

Answer: D

Watch Video Solution

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

A. x_3y

B. xy

C. xy_2

D. xy_3

Answer: D

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23. 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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24. Gold crystallizes with a

A. orthorhomibic

B. bcc

C. simple cubic

D. fcc

Answer: D

Watch Video Solution

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

A. $NawO_2$

B. Na_2WO_3

C. NaW_{O_3}

D. $NaWO_4$

Answer: C

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

A. AB

B. A_2B

C. AB_2

D. AB_6

Answer: A

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27. In a compound atoms of element 'Y' form C.C.P. lattice and those of element 'X' occupy 2/3rd of tetrahedral voids. The formula of the compound will be

A. X_2Y_3

B. X_2Y

C. X_3Y_4

D. X_4Y_3

Answer: D

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28. In a compound XY_2O_4, oxide ions are arranged in CCP and cations X are present in octahedral voids. Cations Y are equally distributed between octahedral and tetrahedral voids. The fraction of the octahedral voids occupied is

A. $1/2$

B. $1/4$

C. $1/8$

D. $1/6$

Answer: A

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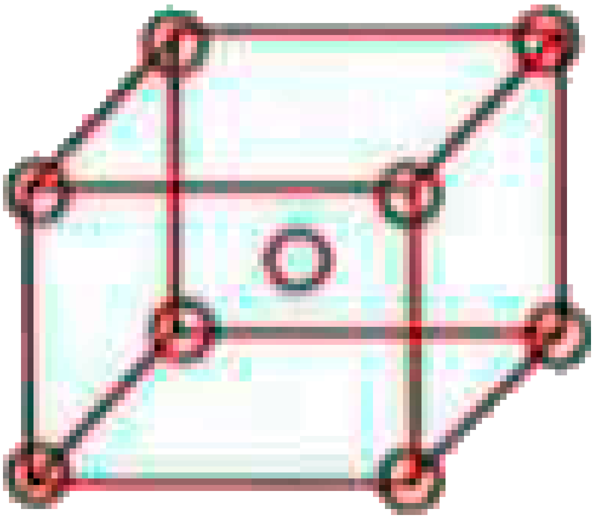
29. A cubic solid A^+B^- has the B^- ions arranged as below. If the A^+ ions occupy all the edge centres, the formula of solid is [O = B^-]



A. AB

B. AB_2

C. A_2B

D. A_3B_2

Answer: D

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30. 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. 8

C. 6

D. 12

Answer: D

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31. Sodium crystallizes in a bcc lattice, hence the coordination number of sodium in sodium metal is

A. 0

B. 4

C. 6

D. 8

Answer: D

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32. 26% void space in its crystal structure is obsered for

A) FCC structure

B) HCP structure C)

CCP structure

A. a only

B. b only

C. c only

D. all a,b,c

Answer: D

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33. In modern periodic table, the position of the element with atomic number '84' is

A. 6th group, 6th period

B. IVA group, 6th period

C. 16th group, 6th period

D. VIA group, 5th period

Answer: C

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34. In a hexagonal closest packing in two layers one above the other, the coordination number of each sphere will be

A. 4

B. 6

C. 8

D. 9

Answer: D

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35. If the radius of K^+ and F^- are 133 pm and 136 pm respectively, the distance between K^+ and F^- in KF is......... pm

A. 269

B. 134.5

C. 136

D. 3

Answer: A

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36. A metal has bcc structure and the edge length of its unit cell is 3.04 A. 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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37. In a metal oxide, oxide ions are arranged in hep array and the metal ion occupies octahedral holes. If one third of octahedral voids and all tetrahedral voids are empty the metal oxide formula is (M- metal)

A. MO_2

B. M_2O_3

C. M_2O_2

D. MO

Answer: B

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38. The density of chromium is 7.2 gm cm^3 and crystallises in a body - centred cubic lattice with edge length 290pm. The number of atoms present in 30.0 gm of the sample is

A. 2.2×10^{23}

B. 6×10^{23}

C. 3.4×10^{23}

D. 9.1×10^{23}

Answer: C

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39. Solid AB has the NaCZ structure. Atom A occupy the corners of the cubic unit cell. If all the face centered 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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40. In a solid AB having the NaCZ structure. 'A' atoms occupy the corners of the cubic unit cell. If all the edge-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: C

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41. A Binary solid has rocksalt structure The edge length is 400 pm and the 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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42. In a crystalline solid, anions B are arranged in ccp lattice and cations A occupy 50% of the octahedral voids and 50% of the tetrahedral voids. What is the formula of the solid

A. AB

B. A_3B_2

C. A_2B_2

D. A_2B_3

Answer: B

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43. The percentage of void space of a metallic element crystallising in a ABCABC .....type lattice pattern is

A. 0.24

B. 0.26

C. 0.34

D. 0.74

Answer: B

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44. A compound contains elements X and Y. Y atoms form CCP lattice and atoms of X occupy l/3rd of tetrahedral voids. What is the molecular formula of the compound ?

A. xy

B. x_2y_3

C. x_3y_3

D. xy_2

Answer: B

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45. In a Face centered Cubic lattice, the packing fraction is

A. 0.52

B. 0.68

C. 0.74

D. 0.65

Answer: C

Watch Video Solution

46. In a face centred cubic arrangement of A and B atoms whose A atoms are at the corner of the unit cell and B atoms at the face centred. One of the A atom is missing from one corner in unit cell. The simplest formula of compound is :

A. a_7b_8

B. a_7b_3

C. ab_3

D. a_7b_{24}

Answer: D

Watch Video Solution

47. The number of atoms in HCP unit cell is ______

A. 4

B. 8

C. 12

D. 6

Answer: D

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48. Edge length of a cube is 300 pm. Its body diagonal would be

A. 600 pm

B. 423 pm

C. 519 -6 pm

D. 450.5 pm

Answer: C

Watch Video Solution

49. The formula of an oxide of iron is $Fe_{0.93}O_{1.00}$. If the compound has hundred O^{-2} ions, then it contains

A. $93Fe^{2+}$ ions

B. $93Fe^{2+}$ ions

C. $79Fe^{2+}, 14Fe^{3+}$

D. $93Fe^{2+}, 14Fe^{3+}$

Answer: C

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50. If one mole of AgCZ is dopped with 10^{-5} mole of $CaCl_2$ then number of Ag^+ ions lost from the lattice

A. 10^{-5}

B. 6×10^{18}

C. 1.2×10^{19}

D. 3×10^{18}

Answer: C

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51. If one mole of AgCl is dopped with 10^{-5} mole of $AICI_3$, the number of cation vacancies created are

A. 10^{-5}

B. 6×10^{18}

C. 12×10^{18}

D. 12×10^{19}

Answer: C

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52. NaCZ is doped with 2×10^{-2} mole% of $SrCl_2$ then the number of cation vacancies per mole

A. 12.046×10^{18}

B. 12.046×10^{19}

C. 13.046×10^{21}

D. 6.023×10^{21}

Answer: B

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53. A solid solution of $CdBr_2$ in AgBr contains

A. schottky defects

B. frenkel defects

C. colour centres

D. frenkel as well schottky defects

Answer: D

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54. Schottky defect in crystals is observed when

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

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

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

D. Density of the crystal is increased

Answer: B

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55. Which among the following is likely to have Schottky defect.

A. agci

B. naci

C. tici

D. $mgci_2$

Answer: B

Watch Video Solution

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

$$\begin{vmatrix} Na^+ & Cl^- & Na^+ & Cl^- & Na^+ & Cl^- \\ Cl^- & \square & Cl^- & Na^+ & \square & Na^+ \\ Na^+ & Cl^- & \square & Cl^- & Na^+ & Cl^- \\ Cl^- & Na^+ & Cl^- & Na^+ & \square & Na^+ \end{vmatrix}$$

A. frenkel defect

B. frenkel and schottky defects

C. insterstitial defect

D. schottky defect

Answer: D

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57. In NaCl number of Schottky pairs and number of ions per 1 cc is about respectively

A. 10^6, 10^{22}

B. 10^6, 10^{16}

C. 10^{16}, 10^{22}

D. 10^{10}, 10^{16}

Answer: A

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58. In which of the following the conductivity would be in the order of $10^{-4} ohm^{-1} cm^{-1}$

A. $NaCI_s$

B. Na_s

C. diamond

D. Ge

Answer: D

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59. The magnetic behavior is different from others in

A. O_2

B. VO_2

C. ZrO_2

D. Ti_2O_3

Answer: C

Watch Video Solution

60. Which of the following is correct statement

A. silicon doped with boron is n-type semiconductor

B. silicon doped with arsenic is a p-type semiconductor

C. metals are good conductors of electricity

D. electrical conductivity of semiconductors decreases with increasing temperature

Answer: C

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61. The general formula of ferrites is MFe_2O_4. Where 'M' would not be

A. Mg

B. Cu

C. Al

D. Zn

Answer: C

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62. Which of the following are diamagnetic in vapour state(A) Sodium metal (B) Sodium cations (C) Magnesium metal (D) Magnesium cations

A. a and b are correct

B. c and d are correct

C. b,c and d are correct

D. a,c and d are correct

Answer: C

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63. At w hich tem perature, Fe_3O_4 is a fe rrimagnetic solid converted to a paramagnetic solid ?

A. 850 k

B. 300 k

C. 400 k

D. 600 k

Answer: A

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List - I	List - II
A) Antiferromagnetic	1) $ZnFe_2O_4$
B) Covalent crystal	2) NiO
C) Ferrimagnetic	3) Diamond

The correct match is

	A	B	C		A	B	C
1)	2	3	1	2)	3	2	1
3)	1	2	3	4)	1	3	2

64.

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65. The alignment of magnetic dipoles shown below $\uparrow \downarrow \downarrow \uparrow \downarrow \downarrow$ represents which of the following ?

A. dimagnetism

B. ferri magnetism

C. ferro magnetism

D. anti ferromagnetism

Answer: B

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66. Correct statements regarding F-centres are (a) they impart magnetic propertes to the crystal (b) they impart colour to crystals (c) they increases the conductivity of crystals The correct answers are

A. only b

B. only c

C. only b and c

D. a, b and c

Answer: D

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67. The material used in solar cells contains

A. Cs

B. Si

C. Sn

D. Ti

Answer: B

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

A. 2

B. 3

C. 1

D. 5

Answer: D

Watch Video Solution

69. The oxide that does not act as an insulator even by a change in temperature

A. VO_2

B. TiO

C. VO

D. TiO_2

Answer: B

Watch Video Solution

70. Observe the following statements (i) Silicon doped with P is a p-type semiconductor (ii) Presence of Schottky defects decreases the density (iii) Among simple cubic (sc), body centered cubic (bcc) and cubic close

packing (ccp) stru ctu res, the p ack in g e fficie n cy is highest for ccp The correct statements are

A. I,ii and iii

B. I and iii

C. I and ii

D. ii and iii

Answer: D

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OBJECTIVE EXERCISE -3

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

A. As

B. Se

C. B

D. Ge

Answer: C

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2. $CsBr$ crystallise in a body centred cubic lattice. The unit cell length is 436.6 pm. Given that the atomic mass of Cs = 133 and that of Br = 80 amu and Avogadro number being $6.02 \times 1023 mol^{-1}$, the density of $CsBr$ is

A. $8.25 g / cm^3$

B. $4.25 g / cm^3$

C. $42.5 g / cm^3$

D. $0.425 g / cm^3$

Answer: A

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

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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4. Which of the following statements is not correct?

A. Molecular solids are generally volatile

B. The number of carbon atoms in an unitcell 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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5. The fraction of the total volume occupied by the atoms present 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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6. If 'a' stands for the edge length of the cubic systems: simple cubic, body centered cubic and face centred cubic, then the ratio of radii of the spheres in these systems will be respectively. 2.

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

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

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

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

Answer: D

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

A. 0.32

B. 0.34

C. 0.28

D. 0.3

Answer: A

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8. Lithium metal crystallizes in a body-centred cubic crystal. If the length of the side of the unit cell of lithium is 351pm, the atomic radius of the lithium will be

A. 300.5 pm

B. 240.8pm

C. 151.8 pm

D. 75.5 pm

Answer: C

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9. 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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10. 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. 5

D. 12

Answer: D

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11. The number of octahedral voids in a unit cell of cubic close packed structure is

A. 2

B. 4

C. 1

D. 3

Answer: C

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12. A metal crystallizes with a face-centred cubic lattice. The edge of the unit cell is 408 pm. The diameter of the metal atom is

A. 144 pm

B. 204 pm

C. 288 pm

D. 408 pm

Answer: C

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13. Structure of a mixed oxide is cubic close-packed (ccp). The 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

A. ABO_2

B. A_2BO_2

C. $A_2B_3O_4$

D. AB_2O_2

Answer: D

Watch Video Solution

14. A metal has 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

A. 30 g mol^{-1}

B. 27 g mol^{-1}

C. 20 g mol^{-1}

D. 40 g mol^{-1}

Answer: B

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15. 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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16. If 'a' is the length of the side of a cubic unit cell the distance between the body-centred atom and the corner atom in the cube will be

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

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

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

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

Answer: B

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17. A given metal crystallises out with a cubic structure having edge length of 360 pm. If there are four metal atoms in one unit cell, what is the radius of one atom ?

A. 80 pm

B. 108 pm

C. 40 pm

D. 127 pm

Answer: D

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18. The vacant space in bcc lattice unit cell is

A. 0.23

B. 0.32

C. 0.26

D. 0.48

Answer: B

Watch Video Solution

19. Lithium has a bcc structure. Its density is 530 kg n r3 and its atomic mass is $6.94 gmol^{-1}$. Calculate the edge length of a unit cell of Lithium metal. (NA = $6.02 \times 10^{23} mol^{-1}$)

A. 154 pm

B. 352 pm

C. 527 pm

D. 264 pm

Answer: A

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20. The ionic radii of A^{+} and B ions are 0.98×10^{-10}m and 1.81×10^{-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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21. Which is the incorrect statement?

A. Frenkel defect is favoured in those ionic compounds in which sizes of cation and anions are almost equal

B. $FeO_{0.98}$ has none stiochemetric metal deficiency defect

C. Density decrease in case of crystals with Schottky's defect

D. $NaCI_S$ is insulator, silicon is semiconductor, silver is conductor, quartz is piezo electric crystal.

Answer: A

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22. Iron exhibits bcc structure at room temperature. Above 900°C, it transforms to fee structure. The ratio of density of iron at room temperature to that at 900°C (assuming molar mass and atomic radii of iron remains constant with temperature) is

A. $\frac{3\sqrt{2}}{4\sqrt{2}}$

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

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

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

Answer: A

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OBJECTIVE EXERCISE -4

1. (A): Thermodynamically all solids possess a tendency to acquire defects

(R) : During defects the entropy of the system increases in solids.

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

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: B

Watch Video Solution

2. (A) Schottky and Frenkel defects are also called thermodynamic defects

(R) Both Schottky and Frenkel defects increases with increase in temperature.

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

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: A

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3. Assertion (A): White tin is an example of tetragonal system.

Reasoning (R): For a tetragonal system a = b = c and a = p = y $\cdot 90^{\circ}$.

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

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: C

Watch Video Solution

4. (A): A void surrounded by a triangle of spheres capped by another sphere is called tetrahedral void.

(R) : Tetrahedral voids are in tetrahedral arrangement

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

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: C

Watch Video Solution

5. (A) : With increase in temperature the condicutivity of metals decreases.

(R) : With increase in temperature lattice vibrations increase in metals.

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

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: A

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6. (A): Antiferromagnetic substances possess almost zero magnetic moment

(R): There are no unpaired electrons in anti ferromagnetic substances

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

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: C

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7. A : $K_4[Fe(CN_6)]$ is diamagnetic

R: The alignments of magnetic dipoles are in compensatory to give zero magnetic moment

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

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: C

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8. (A): Fe_3O_4 is ferrimagnetic at room temperature but becomes paramagnetic at 850 K

(R): The magnetic moments in Fe_3O_4 ale aligned equally in parallel and antiparallel directions which on heating randomise

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

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: C

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9. (A): ABAB ..... pattern of close packing gives hcp arrangement

(R): In hcp arrangement each sphere is associated with two tetrahedral voids

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

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: B

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10. (A) Schottky type defect is shown by crystals with high coordination number. (R) In crystals with Schottky defect cations always occupy interstitial positions

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

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: C

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11. (A) Crystals exhibiting Frenkel type defects do not show any change in density due to defect (R) In Frenkel defect the interstitial cations and cation vacancies are equal in number

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

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: A

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12. (A) Glass is an amorphous solid (R) Glass has an irregular, random arrangement of atoms.

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

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: A

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13. (A) Diamond and graphite do not have same crystal structure. (R) Diamond is crystalline while graphite is amorphous

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

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: C

Watch Video Solution

14. (A) Space or crystal lattice differ in symmetry of the arrangement of points. (R) $n\lambda. = 2d \sin \theta$ is known as Bragg's equation

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

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: B

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15. (A) In close packing of spheres a tetrahedral void is surrounded by four spheres whereas an octahedral void is surrounded by six spheres. (R) A tetrahedral void has a tetrahedral shape whereas an octahedral void has an octa-hedral shape.

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

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: C

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16. (A) The presence of a large number of Schottky defects in NaCZ lowers its density. (R) In NaCZ, there are approximately 10^6 Schottky pairs per 1 cm3 at room temperature.

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

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: B

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17. (A) Frenkel defects are found in silver halides (R) Frenkel defects are commonly found in ionic solids

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

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: B

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18. (A) Electrical conductivity of semiconductors increases with increasing temperature. (R) With increase in temperature, large number of electrons from the valence band can jump to the conduction band

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

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: A

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19. (A) On heating ferromagnetic or ferrimagnetic substances, they become paramagnetic (R) On heating randomsiation of magnetic domains occurs

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

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: A

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20. (A) Insulators are generally good conductors (R) Insulators have free electrons

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

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: D

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21. (A) Anti ferromagnetic substances posses zero magnetic moment. (R) MnO is an anti-ferromagnetic substance

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

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: B

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22. (A) Ionic solids conduct electricity in solid state. (R) Their conduction is due to the presence of electrons

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

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: D

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23. (A) Ionic solids are characterized by high melting and boiling point. (R) Ionic solids have coulombic forces of attraction between their ions.

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

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: A

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24. (A) Molecular solids are characterized by low melting point. (R) Molecular solids are made up of covalent molecules.

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

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: B

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25. (A) Amorphous Substances are isotropic (R) Properties like refractive index, electrical conductance have different value in diffe-rent direction for isotropic substances.

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

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: C

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26. (A) Conductivity of silicon increases by doping it with group-15 elements. (R) Doping means introduction of small amount of impurities like P, As or Bi into the pure crystal.

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

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: B

Watch Video Solution

27. (A) Cadmium sulphide is perfectly covalent (R) The difference of electronegativity between cadmium and sulphur is > 1.7

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

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: D

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28. (A) Crystalline solids are anisotropic in nature (R) Crystalline substances have short range order

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

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: C

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29. (A) Packing efficiency of hep and CCP are not equal (R) hep, ccp both have ABC ABC type packing

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

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: D

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30. (A) Visible light can not be used to study crystals (R) The wave length of visible light is much smaller than the atomic dimensions

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

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: C

Watch Video Solution

31. (A) All covalent solids are non conductors (R) Graphite is a ionic solid

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

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: D

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32. (A) I_2, CO_2 have low melting point (R) I_2, CO_2 have weak dispersive attractive forces between molecules

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

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: A

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33. (A) Metallic solids are electrical and thermal conductors (R) Metallic solids have mobile electrons

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

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: A

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34. (A) Orthorhombic crystal system has four Bravis lattices (R) Orthorhombic crystal system has equal sides and angles between faces.

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

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: C

Watch Video Solution

35. (A) F- centre brings about colour (R) Vacancy with a trapped cation is called F- centre

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

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: C

Watch Video Solution

36. (A) Zinc oxide is yellow coloured when hot (R) Zinc oxide has metal excess defect due to anionic vacancies

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

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: C

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37. (A) : Crystalline solids have sharp and chara cteric melting points.

(R) : Crystalline solids have definite heat of fusion.

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

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: B

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38. (A) Diamond and graphite are polymorphic forms (R) Carbon adopts different structural arrangements under different conditions to give these two forms.

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

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: A

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39. (A) : During vacancy defect the density of solid decreases

(R): The vacancies in the lattice lower the density of solid

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

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: A

Watch Video Solution

40. (A) : In many crystal structures of ionic substances cations occupy the voids created byanions.

(R) : Cations are smaller than anions.

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

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: A

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41. (A) Single crystals are formed when the process of crystallization is rapid (R) Single larger crystals have less defects compared to small crystals.

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

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: D

Watch Video Solution

42. (A): Crystalline solids are anisotropic

(R): Crystalline solids are not as closely packed as amorphous solids.

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

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: C

Watch Video Solution

43. (A) In any ionic solid with Schottky defects the number of positive and negative ions is same. (R) Equal number of cation and anion vacancies are present

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

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: A

Watch Video Solution

44. (A) Every substance is super conducting at room temperature. (R) A super conducting substance offers resistance to the flow of electricity

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

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: D

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45. (A) All types of magnetic solids become paramagnetic at elevated temperatures. (R) Magnetic solids on heating attains randomisation of spins

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

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: A

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LEVEL - I (EXERCISE - I)

1. Which of the following is amorphous in nature?

A. Quartz

B. $CuSO_4.5H_2O$

C. Dry ice

D. fused silica glass

Answer: D

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2. Which of the following is covalent solid

A. Fe

B. Diamond

C. NaCl

D. Cu

Answer: B

Watch Video Solution

3. NaCl is an example of

A. Ionic solid

B. Covalent solid

C. Metallic solid .

D. Molecular solid

Answer: A

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4. Which of the following melts below 298 k.

A. $NaCl(s)$

B. $Si(s)$

C. $Ar\ (s)$

D. $Na(s)$

Answer: C

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5. For a covalent solid, the units which occupy lattice points are

A. Atoms

B. Ions

C. Molecules or atoms

D. Electrons

Answer: A

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6. Which of the following does not give any diffraction bands with X-rays ?

A. $BaSO_4$

B. Graphite

C. Diamond

D. Plastic

Answer: D

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7. Which of the following is not a crystalline solid?

A. KC

B. CsCl

C. Glass

D. Rhombic S

Answer: C

Watch Video Solution

8. Covalent solid among the following is

A. solid Ar

B. MgO

C. Fe

D. BN

Answer: D

Watch Video Solution

9. (A): Glass possess sharp melting point.

(R) : Glass is a pseudo solid

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

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. (A) is false but (R) is true

Answer: D

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

A. Amorphous solids

B. Ionic solids

C. Pseudo solids

D. Molecular solids

Answer: B

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11. Which of the following is not a correct statement ?

A. Any material can be made amorphous by quenching it's melt (or) freezing it's vapour

B. The melt of an amorphous solid when slowly cooled becomes crystalline

C. Glass melts over a range of temperatures

D. Quartz has irregular chains of SiO_4 units.

Answer: D

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12.

Column A	Column B
A) Glass	1) Framework silica
B) Quartz	2) Malleable and ductile
C) Metallic crystal	3) Pseudo solid

The correct match is

A. $\begin{matrix} A & B & C \\ 1 & 3 & 2 \end{matrix}$

B. $\begin{matrix} A & B & C \\ 3 & 1 & 2 \end{matrix}$

C. $\begin{matrix} A & B & C \\ 2 & 1 & 3 \end{matrix}$

D. $\begin{matrix} A & B & C \\ 1 & 2 & 3 \end{matrix}$

Answer: B

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13. Which is not correct about valence bond theory of metals

A. It is also called resonance theory

B. It was proposed by Linus Pauling

C. The metallic bond is essentially a polar (or) non polar covalent bond

D. It explains metallic lustre.

Answer: D

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14. The maximum displacement perpendicular to the motion of the wave is known as

A. wavelength

B. intensity

C. amplitude

D. frequency

Answer: C

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15. By passing X-rays through copper sulphate crystals diffraction band is obtained. It was first observed by

A. Max Van Laue

B. W.L Bragg

C. W.H. Bragg

D. W.L.Bragg & W.H.Bragg

Answer: A

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16. The structural unit of a crystal is called

A. unit cell

B. crystal lattice

C. space lattice

D. structural motif

Answer: D

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17. The ratio of 'd' values in $NaCl$ crystal is

A. $0.707 : 1 : 1.154$

B. $1 : 0.707 : 1.154$

C. $1 : 1.154 : 0.707$

D. $0.707 : 1.154 : 1$

Answer: B

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18. The angle corresponding to maximum diffra ction of x-rays on solid crystal is determined by electrometre reading in

A. Bragg's experiment

B. Powder method

C. Debye- Hull method

D. Max Von Laue experiment

Answer: A

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19. The angle corresponding to maximum diffra ction of x-rays on solid crystal is determined by electrometre reading in

A. triangle

B. rectangle

C. Tetrahedron

D. parallelogram

Answer: D

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20. Graphically the total number of fundamental spatial arrangements possible are

A. 3

B. 7

C. 10

D. 14

Answer: D

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21. In case of a cubic system, the number of types of space lattices

A. 3

B. 7

C. 14

D. 12

Answer: A

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22. The number of points at the centre of the primitive unit cell is

A. 1

B. 0

C. 2

D. 3

Answer: B

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23. How many kinds of primitive unit cells are possible

A. 23

B. 7

C. 230

D. 14

Answer: B

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24.

(Unitcell)	(no of atoms per unitcell)
A) Simple cube	1) 4
B) fcc	2) 2
C) bcc	3) 1

The correct match is

A. $\begin{matrix} A & B & C \\ 2 & 3 & 1 \end{matrix}$

B. $\begin{matrix} A & B & C \\ 2 & 1 & 3 \end{matrix}$

C. $\begin{matrix} A & B & C \\ 3 & 1 & 2 \end{matrix}$

D. $\begin{matrix} A & B & C \\ 1 & 2 & 3 \end{matrix}$

Answer: C

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25. The number of space lattices possible for the crystalographic dimensions $\alpha \ne \beta \ne \gamma$

A. 1

B. 2

C. 3

D. 4

Answer: A

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26. In which of the following crystal systems F.C.C unit cells exists ?

A. Cubic, hexagonal

B. Tetragonal, orthorhombic

C. Orthorhombic

D. Triclinic, monoclinic

Answer: C

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27. Out of seven crystal systems how many have body centred unit cell ?

A. 4

B. 3

C. 2

D. 7

Answer: B

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28. How many unit cells are possible for the crystallographic dimensions as $a \neq b \neq c \alpha = \gamma = 90^{\circ}, \alpha \neq \beta$

A. 2

B. 1

C. 4

D. 3

Answer: A

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29. Which of the following systems is not correctly characterised ?

A. cubic : $a=b=c, \alpha=\beta=\gamma=90^{\circ}$

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

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

D. rhombohedral : $a=b \neq c, \alpha=\beta=\gamma=90^{\circ}$

Answer: D

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30. The crystal system having one 6 fold axis is

A. hexagonal

B. tetragonal

C. cubic

D. monoclinic

Answer: A

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31. The total number of crystal forms possible is around

A. 32

B. 14

C. 230

D. 7

Answer: C

Watch Video Solution

32. Which of the following may have hexagonal or trigonal crystals :

A. $K_4[Fe(CN)_6]$

B. ice

C. $K_2Cr_2O_7$

D. Diamond

Answer: B

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33.

List I	List II
A) ccp	1) ABAB
B) hcp	2) BCC
C) CsCl	3) ABC ABC

The correct match is

A. $\begin{matrix} A & B & C \\ 2 & 3 & 1 \end{matrix}$

B. $\begin{matrix} A & B & C \\ 3 & 1 & 2 \end{matrix}$

C. $\begin{matrix} A & B & C \\ 1 & 3 & 2 \end{matrix}$

D. $\begin{matrix} A & B & C \\ 3 & 2 & 1 \end{matrix}$

Answer: B

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34. Which of the following has hcp crystal structure ?

A. $NaCl$

B. $CaCl_2$

C. Zn

D. $RbCl$

Answer: C

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35. Coordination number for Cu is

A. 1

B. 6

C. 8

D. 12

Answer: D

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36. Which of the following is an example of body centred cube?

A. Mg

B. Zinc

C. Copper

D. Potassium

Answer: D

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37. The co-ordination number of a metal crystallising in a hexagonal close paced structure is :

A. 12

B. 4

C. 8

D. 6

Answer: A

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38. An octahedral void is surrounded by how many spheres ?

A. 6

B. 4

C. 8

D. 12

Answer: A

Watch Video Solution

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

A. 3

B. 4

C. 6

D. 8

Answer: C

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40. The void between two oppositly directed planar triangles of spheres in adjacent layers is called

A. Cubic void

B. Tetrahedral void

C. Octahedral void

D. Tetrahedral (or) Octahedrol void

Answer: C

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41. In a cubic close packed structure the number of nearest neighbours for a given lattice point is

A. 6

B. 8

C. 12

D. 14

Answer: C

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42. Which of the following structure is most uncommon for metals ?

A. simple cubic

B. B.C.C.

C. C.C.P.

D. H.C.P.

Answer: A

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43. Which of the following packing is more efficient:

A. square close - packing

B. hexagonal close - packing

C. tetrahedral arrangement

D. none of these

Answer: B

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44. The packing efficiency in a simple cubic cell system of crystals is

A. 68%

B. 52%

C. 74%

D. 92%

Answer: B

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45. The packing fraction for a body centred cube

A. 0.74

B. 0.76

C. 0.68

D. 0.86

Answer: C

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46. Density of a crystal is given by :

A. $\frac{a^3 \times M}{z \times N_0}$

B. $\frac{N_0 \times M}{z \times a^3}$

C. $\frac{z \times M}{a^3 \times N_0}$

D. $\frac{a^3 \times N^0}{z \times M}$

Answer: C

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47. The percent of void space in a body - centred cubic lattice is :

A. 32%

B. 48%

C. 52%

D. 68%

Answer: A

Watch Video Solution

48. The packing efficiency in a simple cubic cell system of crystals is

A. 52%

B. 68%

C. 74%

D. 92%

Answer: C

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49. The limiting radius ratio for tetrahedral shape is

A. $0 \text{ to } 0.155$

B. $0.155 - 0.225$

C. $0.225 - 0.414$

D. $0.414 - 0.732$

Answer: C

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50. AB is an ionic solid. If the ratio of ionic radii of A^+ and B^+ is 0.52. What is the co-ordination number of B?

A. 2

B. 3

C. 6

D. 8

Answer: C

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51. For an octahedral arrangement the lowest radius ratio limit is

A. 0.155

B. 0.732

C. 0.414

D. 0.225

Answer: C

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52. (A): Thermodynamically all solids possess a tendency to acquire defects

(R) : During defects the entropy of the system increases in solids.

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

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. (A) is false but (R) is true

Answer: A

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53. At zero kelvin, most of the ionic crystals possess

A. Frenkel defect

B. Schottky defect

C. Metal excess defect

D. No defect

Answer: D

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54. In stoichiometric defects, the ratio of positive and negative ions as indicated by chemical formula of the compound

A. Decreases

B. Increases

C. Remains same

D. Cannot be predicted

Answer: C

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

A. Metal excess defect

B. Vacancy defect

C. Frenkel defect

D. Schottky defect

Answer: C

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56. Non stoichiometric solid among the following

A. MgO

B. CaO

C. Na_2O

D. TiO

Answer: D

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57. Which of the following has both Schottky and Frenkel defects.

A. $AgBr$

B. ZnO

C. $NaCl$

D. KCl

Answer: A

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58. (A) Schottky and Frenkel defects are also called thermodynamic defects (R) Both Schottky and Frenkel defects increases with increase in temperature.

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

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. (A) is false but (R) is true

Answer: A

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59. On doping Ge metal with a little of gallium one gets

A. p - type semi conductor

B. n - type semi conductor

C. Insulator

D. Rectifier

Answer: A

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60. A solid with high electrical and thermal conductivity from the following is

A. Si

B. Li

C. $NaCl$

D. Ice

Answer: B

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61. Which substance will conduct the current in the solid state

A. Diamond

B. Graphite

C. Iodine

D. Sodium chloride

Answer: B

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62. Metals have conductivity in the order of $\left(\text{ohm}^{-1}\ \text{cm}^{-1}\right)$

A. 10^{12}

B. 10^{8}

C. 10^{2}

D. 10^{-6}

Answer: B

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63. An example for metallic conductor and semiconductor is

A. TiO

B. FeO

C. V_2O_3

D. NiO

Answer: C

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64. Moleten sodium chloride conducts electricity due to the presence of

A. Free electrons

B. Free ions

C. Free molecules

D. Atoms of sodium and chlorine

Answer: B

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65. A diode is

A. only n type of semiconductor

B. npn or pnp type of semiconductor

C. only p type of semiconductor

D. only npn type of semiconductor

Answer: B

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66. Which of the following is ferromagnetic

A. Ni

B. Co

C. CrO_2

D. All

Answer: D

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67. Ferromagnetic substances have

A. Zero magnetic moment

B. Small magnetic moment

C. Large magnetic moment

D. Any value of magnetic moment

Answer: C

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68. Extent of Ferromagnetism is maximum in

A. Fe

B. Ni^{2+}

C. Co^{3+}

D. Cu^{2+}

Answer: A

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LEVEL - I (EXERCISE - II)

1. Which of the following is not the true about crystalline solids

A. They are rigid and hard

B. They possess plane surfaces

C. They are obtained by rapid cooling of molten substances

D. They have definite geometric configuration.

Answer: C

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2. The consitutent particles in carborundum

A. atoms

B. molecules

C. $+ve$ ions

D. $-ve$ ions in a sea of electrons

Answer: A

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3. Among the following highest melting point is associated with

A. $NaCl$

B. Graphite

C. P_4

D. K

Answer: B

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4. Which is correct about electron sea model ?

A. It was proposed by Lorentz

B. It explains the lattice energies of ionic compounds

C. It can explain the electrical conductivity of metals

D. all

Answer: C

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5. The crystal system having rectangular prisms is

A. Triclinic

B. rhombic

C. trigonal

D. Hexagonal

Answer: B

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6. The crystal system without any element of symmetry is

A. monolinic

B. hexagonal

C. triclinic

D. cubic

Answer: C

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7. White Sn belongs to one of the seven crystal systems. The number of Bravis lattices possible for that monoclinic crystal system

A. 2

B. 1

C. 4

D. 3

Answer: A

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8. In $KMnO_4$ the crystallographic parameters are

A. $\alpha = \beta = \gamma \neq 90^\circ$

B. $\alpha = \beta = \gamma = 90^\circ$

C. $\alpha \neq \beta \neq \gamma = 90^\circ$

D. $\alpha = \gamma = 90^\circ \beta > 90^\circ$

Answer: B

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9. Among the unit cells given below, which two are highly symmetric and unsymmetric respectively

A. Hexagonal, cubic

B. Orthorhombic, cubic

C. Cubic, triclinic

D. Monoclinic, cubic

Answer: C

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10. Copper metal belongs to a crystal system represented by the crystal dimensions as

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

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

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

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

Answer: A

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11. From Bragg's equation which one of the following is wrong?

A. Incident angle (θ) value is in between 0° to 90°

B. $2d < n\lambda$

C. order of diffraction 'n' is an integer

D. as λ of x-rays increases, incident angle for first order diffraction increases

Answer: B

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12. For a crystal, the angle of diffraction (2O) is 90° and the second order line has a d value of $2.28A^\circ$. The wavelength (in A°) of X-rays used for Bragg's diffraction is

A. 1.61Å

B. 1.14Å

C. 2.28Å

D. 2.0Å

Answer: A

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13. X-rays of wavelength equal to 0.134 nm give a first order diffraction from the surface of a - crystal when the value of θ is 10.5^0, then the distance between the adjacent planes in the crystal is $(\sin 10.5^\circ = 0.1822)$

A. 0.1124 nm

B. 1.124 nm

C. 0.0578 nm

D. 0.578 nm

Answer: A

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14. In x-ray diffraction experiment at which one of the following path difference between the two waves, destructive interference is observed (α = wavelength of x-rays)

A. λ

B. 2λ

C. 3λ

D. 1.5λ

Answer: D

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15. At what angle for a first order diffraction, the distance between two adjacent planes of crystal is equal to the wavelength of x-rays used

A. 30°

B. 60°

C. 90°

D. 45°

Answer: A

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16. If two waves with the amplitude of E_0 each undergo constructive interference, the amplitude of the resulting wave is

A. 0

B. $< 2E_0$

C. $2E_0$

D. E_0^2

Answer: C

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17. How many atoms are there in a cube based unit cell having one atom on each comer and two atoms on each body diagonal ?

A. 8

B. 6

C. 4

D. 9

Answer: D

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18. point that is located at the corner of a unit cell is shared by how many unit cells ?

A. 2

B. 4

C. 6

D. 8

Answer: D

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19. The number of lattice points per unit cell in B.C.C and end centered lattice respectively

A. 6, 6

B. 9, 10

C. 6, 8

D. 6, 10

Answer: B

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20. What is the minimum radius ratio that can give a specific co-ordination number.

A. 0.225

B. 0.15

C. 0.415

D. 0.73

Answer: B

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21. The coordination numbers of oxygen and silicon in SiO_4 respectively

A. 1, 2

B. 2, 1

C. 2, 4

D. 4, 2

Answer: C

Watch Video Solution

22. In metal lattices the co-ordination number of metal atom is usually

A. 2 (or) 4

B. 4 (or) 6

C. 6 (or) 8

D. 8 (or) 12

Answer: D

Watch Video Solution

23. Na and Mg crystallize in BCC and FCC type of crystals respectively, then the number of atoms of Na and Mg present in the unit cell of their respective crystals is

A. 4, 2

B. 9, 14

C. 14, 9

D. 2, 4

Answer: D

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24. Potassium crystallises in a body centred cubic unit cell. The mass of one unit cell is

A. $1.29 \times 10^{-23} gm$

B. $1.295 \times 10^{-22} gm$

C. $6.2 \times 10^{-23} gm$

D. $1.29 \times 10^{-24} gm$

Answer: B

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25. A metal 'M' is crystallised in F.C.C lattice. The number of unit cells in it having 2.4×10^{24} atoms

A. N

B. N/2

C. 2N

D. 4N

Answer: A

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26. Among the following which has a different structure from others ?

A. Ba

B. Cr

C. Mo

D. Tl

Answer: D

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27.

List - I (Metal)	List - II (Co-ordination number)
A) Po	1) 6
B) K	2) 8
C) Co	3) 12
D) Pb	4) 4

The correct match is :

A. $\begin{matrix} A & B & C & D \\ 1 & 2 & 3 & 3 \end{matrix}$

B. $\begin{matrix} A & B & C & D \\ 1 & 2 & 3 & 4 \end{matrix}$

C. $\begin{matrix} A & B & C & D \\ 2 & 1 & 3 & 4 \end{matrix}$

D. $\begin{matrix} A & B & C & D \\ 2 & 1 & 4 & 3 \end{matrix}$

Answer: A

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28. In a hexagonal closest packing in two layers one above the other, the coordination number of each sphere will be

A. 4

B. 6

C. 8

D. 9

Answer: D

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29. In a close packed lattice containing 'n' particles, the number of tetrahedral and octahedral voids respectively

A. n

B. n/2

C. 2n

D. cannot say

Answer: C

Watch Video Solution

30. The number of octahedral voids in a unit cell of cubic close packed structure is

A. 1

B. 2

C. 4

D. 8

Answer: C

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31. In which of the following crystal the void efficiency is 32% ?

A. Zn

B. Po

C. Cu

D. Rb

Answer: D

Watch Video Solution

32. (A): A void surrounded by a triangle of spheres capped by another sphere is called tetrahedral void.

(R) : Tetrahedral voids are in tetrahedral arrangement

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

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. (A) is false but (R) is true

Answer: C

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33. A body centered cubic solid is made up of two elements A and B. Atoms of 'A' occupy two corners of the cube. Remaining positions of the unit cell are occupied by the atoms of 'B'. The formula of the compound is :

A. A_4B_7

B. A_7B_4

C. AB_7

D. A_7B

Answer: C

Watch Video Solution

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

A. $NaWO_2$

B. Na_2WO_3

C. $NaWO_3$

D. $NaWO_4$

Answer: C

Watch Video Solution

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

A. X_3Y

B. XY

C. XY_2

D. XY_3

Answer: D

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

A. AB

B. A_2B

C. AB_2

D. AB_6

Answer: A

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37. In a compound atoms of element 'Y' form C.C.P. lattice and those of element 'X' occupy 2/3rd of tetrahedral voids. The formula of the compound will be

A. X_2Y_3

B. X_2Y

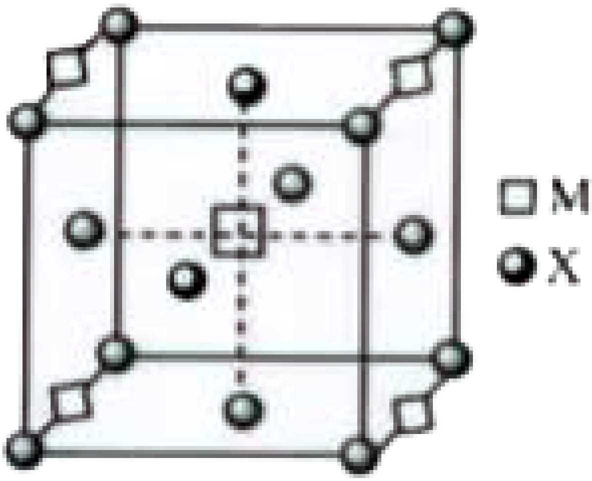
C. X_3Y_4

D. X_4Y_3

Answer: D

Watch Video Solution

38. A compound M_pX_q has cubic close packing (ccp) 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

D. M_5X_{14}

Answer: B

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39. The intermetallic compound LiAg crystallizes in cubic lattice in which both lithium and silver have co-ordination number of eight. The crystal class is

A. simple cubic

B. body centered cubic

C. face - centered cubic

D. none of these

Answer: B

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40. 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

Watch Video Solution

41. Gold crystallizes with a

A. fcc

B. bcc

C. simple cubic

D. orthorhombic

Answer: A

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42. 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. 8

C. 6

D. 12

Answer: D

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43. Sodium crystallizes in a bcc lattice, hence the coordination number of sodium in sodium metal is

A. 0

B. 4

C. 6

D. 8

Answer: D

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44. The metal having 26% void space in its crystal structure is

A. Cs

B. Po

C. Mo

D. Be

Answer: D

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45. The percentage of void space of a metallic element crystallising in a ABCABC .....type lattice pattern is

A. 24%

B. 26%

C. 34%

D. 74%

Answer: B

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46. A metal crystallises in a simple cubic unit cell of edge length 6.22Å. The radius of the metal atom

A. 1.55Å

B. 3.11Å

C. 6.22Å

D. 2.45Å

Answer: B

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47. Sodium metal crystallises in a body-centred cubic lattice with the cell edge, $'a' = 4.29\text{Å}$. The radius of the Na-atom will be

A. 5.78Å

B. 1Å

C. 1.86Å

D. 0.2Å

Answer: C

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48. Copper crystallises in a f.c.c. lattice, the length of the unit cell is 3.63Å. The radius of Cu-atom is:

A. 0.6Å

B. 2.9Å

C. 1.28Å

D. 5.7Å

Answer: C

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49. The radius of an atom of an element is 80 pm. If it crystallises as a body centred cubic lattice, what is th edge of its unit cell?

A. 140 pm

B. 184.7 pm

C. 209.2 pm

D. 147.5 pm

Answer: B

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50. A metal has bcc structure and the edge length of its unit cell is 3.04 A.

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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51. If the radius of K^{+} and F^{-} are 133 pm and 136 pm respectively, the distance between K^{+} and F^{-} in KF is......... pm

A. 269 pm

B. 134.5 pm

C. 136 pm

D. 0.625

Answer: A

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52. Schottky defect causes

A. Increase in the density of solid

B. Decrease in the density of solid

C. No change in the density of solid

D. Decrease in the conductivity of solid.

Answer: B

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

$$\left|\begin{array}{cccccc} Na^{+} & Cl^{-} & Na^{+} & Cl^{-} & Na^{+} & Cl^{-} \\ Cl^{-} & \square & Cl^{-} & Na^{+} & \square & Na^{+} \\ Na^{+} & Cl^{-} & \square & Cl^{-} & Na^{+} & Cl^{-} \\ Cl^{-} & Na^{+} & Cl^{-} & Na^{+} & \square & Na^{+} \end{array}\right|$$

A. Frenkel defect

B. Frenkel and Schottkydefects

C. Interstitial defect

D. Schottky defect

Answer: D

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54. Schottky - Wagner defects are mostly found in

A. Ionic compounds with high co-ordination number

B. Ionic compound with low co-ordination number

C. Covalent compounds with low coordination number

D. Covalent compound with high coordination number

Answer: A

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55. Which among the following is likely to have Schottky defect.

A. $AgCl$

B. $NaCl$

C. $TiCl$

D. $MgCl_2$

Answer: B

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56. (A) : During vacancy defect the density of solid decreases

(R): The vacancies in the lattice lower the density of solid

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

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. (A) is false but (R) is true

Answer: A

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57. Schottky defect in crystals is observed when

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

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

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

D. Density of the crystal is increased

Answer: B

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58.

List - I	List - II
A) Crystal defect	1) Amorphous
B) Carborundum	2) Frenkel
C) Pitch	3) Covalent crystal

The correct match is

A. $\begin{matrix} A & B & C \\ 3 & 1 & 2 \end{matrix}$

B. $\begin{matrix} A & B & C \\ 2 & 1 & 3 \end{matrix}$

C. $\begin{matrix} A & B & C \\ 2 & 3 & 1 \end{matrix}$

D. $\begin{matrix} A & B & C \\ 1 & 2 & 3 \end{matrix}$

Answer: C

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59. Which of the following is a "Berthollide Compound"?

A. MgO

B. Al_2O_3

C. Na_2O

D. ZrH

Answer: D

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

A. 2

B. 3

C. 1

D. 5

Answer: D

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61. The mechanism of electrical conductivity may be given in terms of

A. vacancy mechanism

B. interstitial mechanism

C. Interstitialcy mechanism

D. all

Answer: D

Watch Video Solution

62. The oxide that is insulator is

A. VO

B. MnO

C. ReO_3

D. Ti_2O_3

Answer: B

Watch Video Solution

63. In which of the following the conductivity would be in the order of $10^{-4} ohm^{-1} cm^{-1}$

A. $NaCl_{(s)}$

B. $Na_{(s)}$

C. diamond

D. Ge

Answer: D

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64. Which one of the following ratio gives the purity of the metal (ρ-resistivity (or) specific resistance)

A. $\frac{\rho_{300^{\circ}C}}{\rho_{4.2^{\circ}C}}$

B. $\frac{\rho_{300K}}{\rho_{4.2K}}$

C. $\frac{\rho_{27K}}{\rho_{4K}}$

D. $\frac{\rho_{300K}}{\rho_{4^{\circ}C}}$

Answer: B

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65. Germanium can be made n-type semi conductor by doping with

A. silicon

B. arsenic

C. Gallium

D. either As (or) Ga

Answer: B

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66. Which one of the following statements is wrong

A. With increasing temperature the electrical conductivity of Germanium decreases

B. Silicon dopped with phosphorus is n-type semi conductor

C. Germanium dopped with indium is p-type semi conductor

D. Doping increases the conductivity of semi conductor

Answer: A

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67. The magnetic behavior is different from others in

A. O_2

B. Cu

C. Al

D. Zn

Answer: C

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68. The magnetic susceptibility of a substance can be expressed as

A. gram susceptibility

B. volume susceptibility

C. molar susceptibility

D. all

Answer: D

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69. Which of the following is correct statement

A. silicon doped with boron is n-type semiconductor

B. silicon doped with arsenic is a p-type semiconductor

C. metals are good conductors of electricity

D. electrical conductivity of semiconductors decreases with increasing temperature

Answer: C

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70. The general formula of ferrites is MFe_2O_4. Where 'M' would not be

A. Mg

B. Cu

C. Al

D. Zn

Answer: C

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71. Which substance shows anti ferro magnetism?

A. ZnO_2

B. CdO

C. CrO_2

D. V_2O_3

Answer: D

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72. The alignment of magnetic dipoles shown below $\uparrow\downarrow\downarrow\uparrow\downarrow\downarrow$ represents which of the following ?

A. Diamagnetism

B. Ferri magnetism

C. Ferro magnetism

D. Anti-ferromagnetism

Answer: B

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73.

List - I	List - II
A) Crystal defect	1) Amorphous
B) Carborundum	2) Frenkel
C) Pitch	3) Covalent crystal

The correct match is

A. $\begin{matrix} A & B & C \\ 2 & 3 & 1 \end{matrix}$

B. $\begin{matrix} A & B & C \\ 3 & 2 & 1 \end{matrix}$

C. $\begin{matrix} A & B & C \\ 1 & 2 & 3 \end{matrix}$

D. $\begin{matrix} A & B & C \\ 1 & 3 & 2 \end{matrix}$

Answer: A

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74. (A) : With increase in temperature the condicutivity of metals decreases.

(R) : With increase in temperature lattice vibrations increase in metals.

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

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. (A) is false but (R) is true

Answer: A

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75. (A): Metals are generally good conductors of electricity

(R) : Electrical conductivity of metals is due to Schottky type defects

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

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. (A) is false but (R) is true

Answer: C

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76. (A): Antiferromagnetic substances possess almost zero magnetic moment

(R): There are no unpaired electrons in anti ferromagnetic substances

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

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. (A) is false but (R) is true

Answer: C

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77. (A): Fe_3O_4 is ferrimagnetic at room temperature but becomes paramagnetic at 850 K

(R): The magnetic moments in Fe_3O_4 ale aligned equally in parallel and antiparallel directions which on heating randomise

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

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. (A) is false but (R) is true

Answer: C

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LEVEL - II LECTURE SHEET (EXERCISE - I)

1. If 'a' stands for the edge length of the cubic systems: simple cubic, body centered cubic and face centred cubic, then the ratio of radii of the spheres in these systems will be respectively. 2.

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

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

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

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

Answer: C

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2. First three nearest neighbour distance for body centered cubic lattice are

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

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

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

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

Answer: C

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3. The space occupied by spheres in bcc arrangement is

A. 74%

B. 70%

C. 68%

D. 60.4%

Answer: C

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4. At very low temperature, oxygen O_2, freezes and forms a crystal. Which term best describes the solid

A. Covalent network

B. Molecular crystals

C. Metallic

D. Ionic

Answer: B

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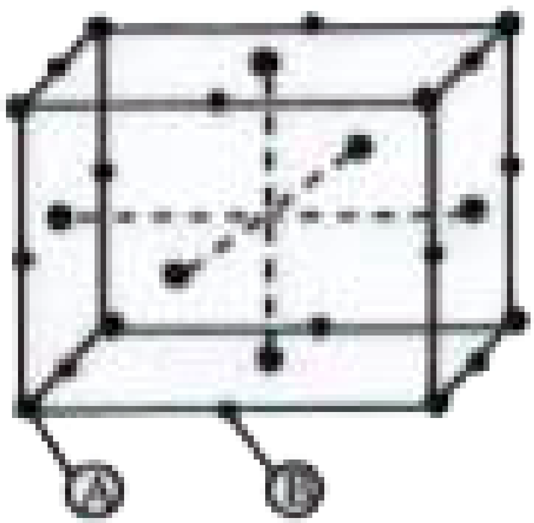
5. For a solid with the following structure, the coordination number of the point B is



A. 3

B. 4

C. 5

D. 6

Answer: D

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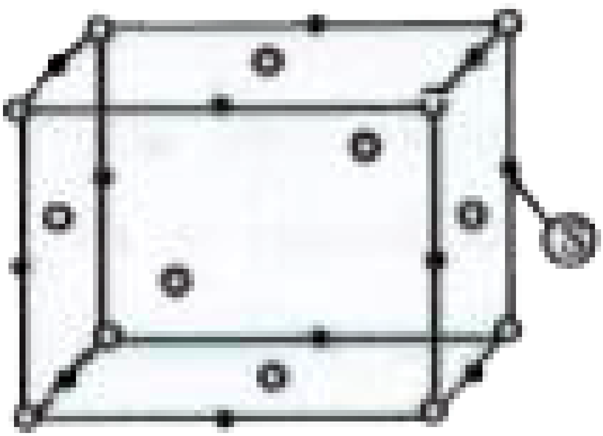
6. For the structure given below the site marked as S is a :



A. Tetrahedral void

B. Cubic void

C. Octahedral void

D. None of these

Answer: C

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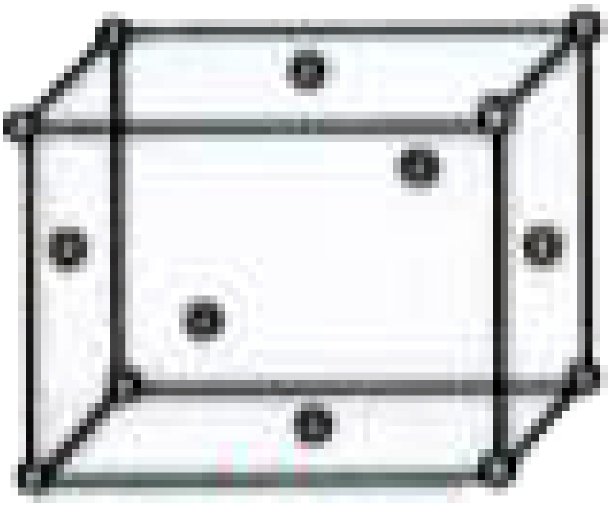
7. A solid A^+B^- has the B^- ions arranged as below. If the A^+ ions occupy half of the tetrahedral sites in the structure. The formula of solid is :



A. AB

B. AB_2

C. A_2B

D. A_3B_4

Answer: A

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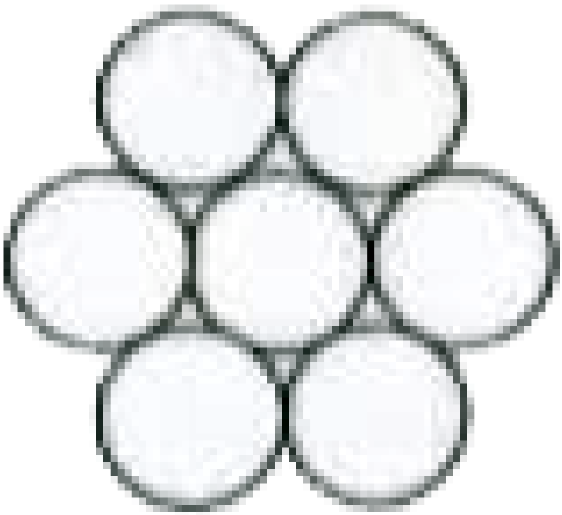
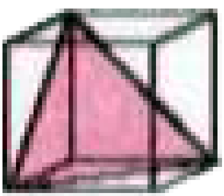
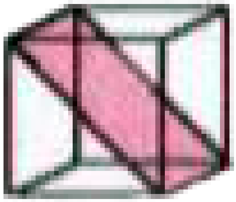
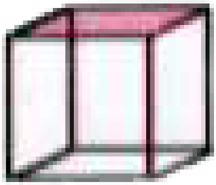
8. In FCC crystal, which of the following shaded planes contains the following type of arrangement of atoms

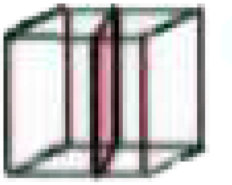




A.

B. 

C. 

D. 

Answer: A

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9. In the closest packing of atom B, the radius of atom A that can be fitted into octohedral void is

A. $r_A = 0.414 r_B$

B. $r_A = 0.155 r_B$

C. $r_B = 0.414 r_A$

D. $r_B = 0.155 r_A$

Answer: A

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10. Distance between tetrahedral void and octahedral void in the lattice will be (a = edge length of unit cell)

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

B. $\sqrt{3}a$

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

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

Answer: A

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11. The two types of holes which occur in any close-packed structures are

A. tetrahedral, octahedral

B. trigonal, octahedral

C. trigonal, tetrahedral

D. only octahedral

Answer: A::B::C

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12. In face centered cubic structure, the octahedral voids are located at :

A. edge centres

B. body centre

C. face centres

D. corners

Answer: A::B::C

Watch Video Solution

13. A non-stoichiometric compound $Cu_{1.8}S$ is formed due to incorporation of Cu^{2+} ions in the lattice of cuprous sulphide. What percentage of Cu^{2+} ions the total copper centent is present in the compound

A. 88.88

B. 11.11

C. 99.8

D. 89.8

Answer: B

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14. Consider following statements

I: If three Fe^{2+} are missing from its lattice site in FeO, then there must be two Fe^{3+} ions somewhere in the lattice to balance the electrical charges

II : Crystals with metal deficiency defects are called super-conductors

III: Crystals with metal deficiency defects are called semiconductors

The correct statements are

A. I,II

B. I,III

C. II only

D. I only

Answer: B

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15. The n-type semiconductor is obtained when Si is doped with

A. Al

B. Ge

C. B

D. Al

Answer: D

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16. Superconductors are technologically and commercially important substances. The correct information(s) about such conductors are :

A. phenomena of superconductivity was first discovered by Kammerlingh and Onnes

B. mercury acts as superconductor at 4K

C. superconductors offer zero resistance at zero kelvin

D. gallium acts as superconductor at 4K

Answer: A::B::C

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17. When ferromagnetic substances are heated strongly, its magnetic moment

A. Increases moderatly

B. remains constant

C. abnormally increases

D. decreases

Answer: D

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

I: crystalline

II: the SiO_4^{4-} tetrahedra are randomly joined giving rise to polymeric chains of three-dimensional sheets

III : have high and sharp m.p

Which of I, II and III are not matched with amorphous solids

A. I

B. III

C. I,III

D. II

Answer: C

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19. In a face centred cubic arrangement of A and B atoms whose A atoms are at the corner of the unit cell and B atoms at the face centred. One of the A atom is missing from one corner in unit cell. The simplest formula of compound is :

A. A_7B_3

B. AB_3

C. A_7B_{24}

D. $A_{7/8}B_3$

Answer: C

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20. Which of the following statements are false:

A. The radius of a metal atom is taken as half the nearest metal-metal distance in a metallic crystal.

B. One tetrahedral void per atom is present in hcp structure.

C. In the fluorite structure (CaF_2), the Ca^{2+} ions are located at the lattice points and the fluoride ions fill all the tetrahedral holes in the cep crystal.

D. In the antifluorite structure (Li_2O, Rb_2S) the cations are located at the lattice points and anions fill the tetrahedral holes in the ccp structure.

Answer: B::D

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21. Edge length of NaCl unit cell is 552 pm. Then which are correct statements

A. distance between Na^{+} and Cl^{-} ions is 276 pm

B. radii of Na^{+} and Cl^{-} ion will be 95 pm and 181 pm

C. nearest distance between two Na^{+} ions is $276\sqrt{2}$ pm

D. nearest distance between Cl^{-} ions is $95\sqrt{2}$ pm

Answer: A::B::C

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22. Which is true

A. Piezoelectricity is due to net dipole moment

B. Some electric current is produced on heating polar crystals, this is pyroelectricity

C. Ferroelectricity is due to alignment of dipoles in same direction

D. Ferroelectricity is due to alignment of dipoles in oppsite direction

Answer: A::B::C

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23. A metallic element crystallises into a lattice containing a sequence of layers of ABABAB... Any packing of spheres leaves out voids in the lattice. Volume percentage of empty space is

A. 52%

B. 26 %

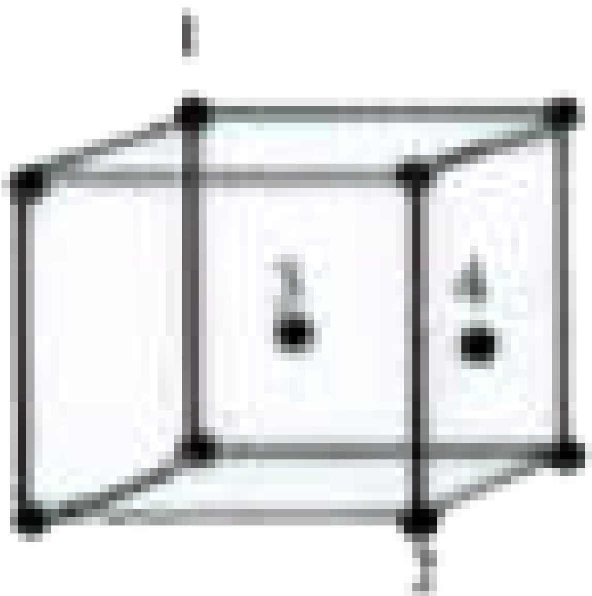
C. 50 %

D. 74 %

Answer: B

Watch Video Solution

24. In an FCC unit cell atoms are numbered as shown below the atoms not touching each other are (3 is back face centred)



A. $3\&4$

B. $1\&3$

C. $1\&2$

D. $2\&4$

Answer: C

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25. Ice crystallises in a hexagonal lattice having volume of the unit cell as $132 \times 10^{-24} cm$. If its density is $0.92 gcm^{-3}$ at a given temperature, then number of H_2O molecules per unit cell is

A. 1

B. 2

C. 3

D. 4

Answer: D

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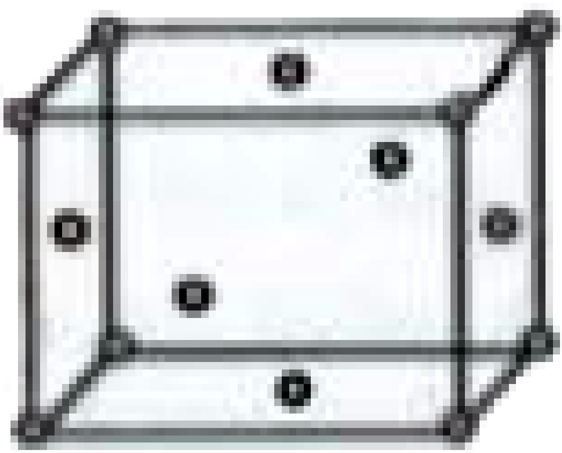
26. For the structure of solid given below if the lattice points represent A^{+} ions and the B^{-} ions occupy the tetrahedral voids then coordination number of A and B may be



A. 2, 4

B. 4, 6

C. 6, 4

D. 8, 4

Answer: D

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27. A certain solid mixed oxide crystallising in the cubic system contains cations M_1 and M_2 and the oxide ion O^{2-} Each M_1 ion is surrounded by 12 equidistant nearest neighbour oxide ions. If the oxide ions occupy face centers of the cubic unit cell, where are the M_2 ions situated ?

A. At the center of the until cell

B. At the corners of the cube

C. At the edge centers

D. Occupying half the number of edge centers

Answer: B

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28. It is stated that ZnS does not crystallise in the NaCl structure. It is due to

A. The $\frac{r_+}{r_-}$ ratio is 0.402, too low to avoid anion- anion contact in the NaCl structure

B. ZnS is water insoluble, NaCl is water soluble

C. ZnS is water soluble, NaCl is water insoluble

D. Zn belongs to d-block, Na belongs to s-block

Answer: A

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29. Frenkel defect appears in

A. AgI

B. ZnS

C. $AgBr$

D. all of these

Answer: D

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30. An electron trapped in an anion vacancy within the crystal is called...........

A. n - type conductor

B. p - type conductor

C. F - centre

D. insulator

Answer: C

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31. The presence of F-centres in a crystal makes it

A. conducting

B. colourless

C. coloured

D. non - conducting

Answer: A::C

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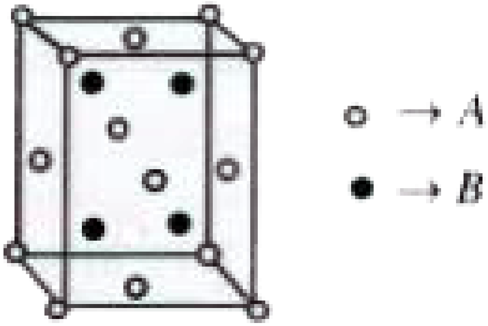
LEVEL - II LECTURE SHEET (EXERCISE - II)

1. 

If the molar mass AB is $100 gmol^{-1}$ and 'a' is edge length then the density of the crystal will be

A. $\dfrac{4N_A}{a^3 \times 100}$

B. $\dfrac{4 \times 100}{a^3 N_A}$

C. $\dfrac{2N_A}{a^3 100}$

D. $\dfrac{2 \times 100}{a^3 N_A}$

Answer: B

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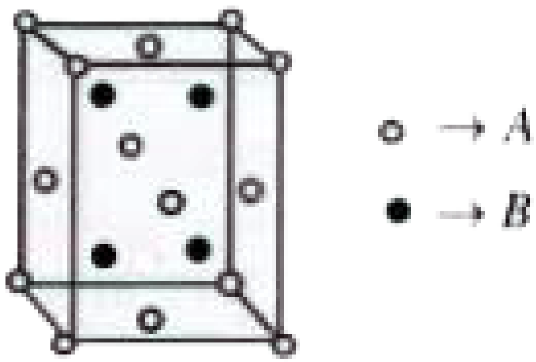
2. 

The given unit cell belongs to

A. $CsCl$ type

B. $TiCl$ type

C. rock salt type

D. zinc blende type

Answer: D

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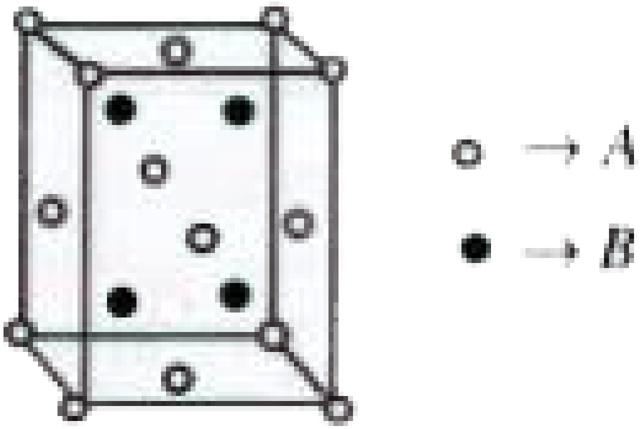
3. 

The coordination number of 'B' will be

A. 8

B. 6

C. 4

D. 12

Answer: C

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4. A spinel is an important class of oxides consising of two types of metal ions with the oxide ions arranged in cop layers. The normal spinel has one-eigth of the tetrahedral holes occupied by one type of metal ion and one-half of the octahedral holes occupied by another type of metal ion. Such a spinel is formed by Mg^{2+}, A^{2+} and O^{2-}. The neutratrality of the crystal is maintained.

The formula of the spinel is

A. Mg_2AlO_4

B. $MgAl_2O_4$

C. $Mg_3Al_2O_6$

D. None of these

Answer: B

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5. A spinel is an important class of oxides consising of two types of metal ions with the oxide ions arranged in cop layers. The normal spinel has one-eigth of the tetrahedral holes occupied by one type of metal ion and one-half of the octahedral holes occupied by another type of metal ion. Such a spinel is formed by Mg^{2+}, A^{2+} and O^{2-}. The neutratrality of the crystal is maintained.

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

A. Tetrahedral

B. Octahedral

C. Both (a) and (b)

D. None of these

Answer: B

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6. A spinel is an important class of oxides consising of two types of metal ions with the oxide ions arranged in cop layers. The normal spinel has one-eigth of the tetrahedral holes occupied by one type of metal ion and one-half of the octahedral holes occupied by another type of metal ion. Such a spinel is formed by Mg^{2+}, A^{2+} and O^{2-}. The neutratrality of the crystal is maintained.

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

A. Tetrahedral

B. Octahedral

C. Both (a)and (b)

D. None of these

Answer: A

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LEVEL - II LECTURE SHEET (EXERCISE - III)

1. Match the following closest packing of identical spheres listed in Column-I with the characteristics listed in Column-II. COLUMN - I

COLUMN - I	COLUMN - II
A) AAAA packing	p) CCP, $CN = 12$
B) ABAB packing	q) HCP, $CN = 12$
C) ABCABC packing	r) BCC, $CN = 8$
D) Square close packing	s) Primitive cubic, $CN = 6$

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2. Match the solid in Column - I with its characteristic in Column - II.

COLUMN - I (Solid)	COLUMN - II (Characteristic)
A) NaCl	p) Body centred cubic
B) CsCl	q) Packing fraction
C) Na	r) Packing fraction $= \frac{2\pi}{3}\frac{(r_+^3 + r_-^3)}{(r_+ + r_-)^3}$
D) TiCl	s) Packing fraction $\frac{\sqrt{3}}{2}\pi\frac{(r_+^3 + r_-^3)}{(r_+ + r_-)^3}$

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3. Match electrical properties listed in Column - II with materials listed in Column - I.

COLUMN - I	COLUMN - II
A) Pure crystal of silicon at 0 K	p) Semi conductor - p - ho
B) Pure crystal of silicon at 400K	r) Semi conductor - electr
C) Silicon crystal doped with arsenic impurity	r) Insulator
D) Silicon crystal dopped with gallium	s) Semi conductor - equal

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4. Match the crystalline solids listed in column I with the type/structure listed in column II :

COLUMN - I	COLUMN - II
A) Simple cubic	p) 0.68
B) FCC	q) 0.52
C) BCC	r) 0.74
D) HCP	s) 0.26

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5. Match cubic (in Column - I) with packing fraction (in Column - II)

COLUMN - I	COLUMN - II
A) Simple cubic	p) 0.68
B) FCC	q) 0.52
C) BCC	r) 0.74
D) HCP	s) 0.26

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LEVEL - II LECTURE SHEET (EXERCISE - IV)

1. How many effective Cl^- ions are present in the rock salt $NaCl$ if ions along one axis joining opposite faces are removed?

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2. How many effective Na^+ ions are present in the rock salt NaCl if ions along one axis joining opposite faces are removed?

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3. The edge length of unit cell of metal having molecular weight $75g/mol$ is 5Å which crystallises in simple cubic lattice. If the density is 2g/cc then the radius of metal atom in pm is $x \times 10^2$ then 'x' is $\left(N_A = 6 \times 10^{23}\right)$

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4. A compound AB has a rock salt type structure with $A : B = 1 : 1$. The formula weight of AB is 6.023y grams and the closest $A - B$ distance is $y^{1/3}\text{Å}$. If the density of lattice is 'x' g/cc then x is

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PRACTICE SHEET - 1

1. A match box exhibits

A. Cubic geometry

B. monoclinic geometry

C. orthorhombic geometry

D. tetragonal geometry

Answer: C

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2. First three nearest neighbour distance for primitive cubic unit cell will be (edge length of unit cell = a)

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

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

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

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

Answer: A

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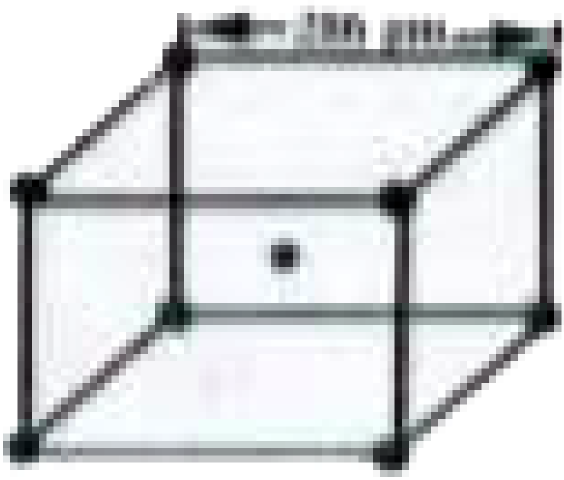
3. The crystal structure adopted by iron is shown below. The distance between the nearest iron atoms is



A. 286 pm

B. 124 pm

C. 143 pm

D. 247.6 pm

Answer: D

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4. Hexagonal closest packed structure and cubic closest packed structure for a given element would be expected to have the same density because of

A. same molar mass

B. same coordination number and packing fraction

C. both (a) and (b)

D. none of the above

Answer: B

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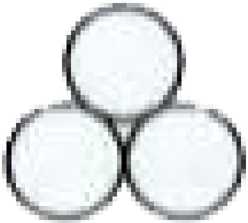
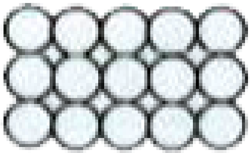
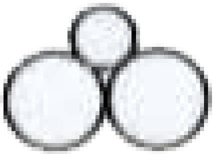
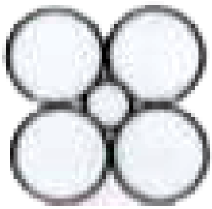
5. Which of the following figure represent the cross section of an octahedral site?

A. 

B. 

C. 

D. 

Answer: D

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

A. Li_2Se

B. $LiSe$

C. $LiSe_2$

D. Li_3Se

Answer: A

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7. In the closest packing of atom A, the radius of atom B that can be fitted into tetrahedral void is

A. $r_B = 0.155 r_A$

B. $r_B = 0.225 r_A$

C. $r_B = 0.414 r_A$

D. $r_B = 0.732 r_A$

Answer: B

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8. An alloy of Au and Cu crystallises with atoms of an occupying all lattice points at the corner's of cubic and atoms of Cu occupying the centres of all faces. Write the empirical formula of the alloy.

A. $AuCu$

B. Au_3Cu

C. Au_2Cu

D. $AuCu_3$

Answer: D

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9. A certain oxide of metal M crystallises in such a way that O^{2-} ions occupy hcp arrangement following AB AB....pattern. The metal ions, however, occupy 2/3rd of the octahedral voids. The formula of the compound is

A. M_2O_3

B. M_3O

C. $M_{8/3}O_3$

D. MO_2

Answer: A

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10. Each rubidium halide crystallising in the RbCl type lattice has a unit cell length 0.30Å greater than that for corresponding potassium salt $\left(r_{K^+} = 1.33\text{Å}\right)$ of the same halogen. Hence, ionic radius of Rb^+ is

A. 1.18Å

B. 1.48Å

C. 1.63Å

D. 1.03Å

Answer: B

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11. Which of the following are not the characteristics of crystalline solids?

A. They exhibit polymorphism

B. They are isotropic

C. They do not have thermodynamic defects

D. After melting, they become crystalline

Answer: B::C::D

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12. Glasses and plastics are

A. amorphous solids

B. supercooled liquids

C. anisotropic

D. ferromagnetic

Answer: A::B::C

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13. If the three interaxial angles defining the unit cell are all equal in magnitude, the crystal cannot belong to the

A. monoclinic system

B. cubic system

C. hexagonal system

D. triclinic system

Answer: A::C::D

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14. Which of the following statements are correct?

A. The co-ordination number of each type of ions in $CsCl$ crystals is 8.

B. A metal which crystallizes in bcc structure has co-ordination number of 12.

C. The length of a unit cell in NaCl is 552 pm. $\left(Na^{+} = 95\text{pm}, r_{Cl^{-}} = 181\text{pm}\right)$

D. A unit cell of an ionic crystals shares some of its ions with other unit cells.

Answer: A::C::D

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15. Which of the following statment(s) is (are) correct?

A. When the radius ratio is in the range $0.414 - 0.732$, a B.C.C arrangement with co-ordination no.8

B. When the radius ratio is in the range $0.225 - 0.414$, a tetrahedral arrangement with co-ordination no. 4.

C. When the radius ratio is in the range 0.155 - 0.225, an octahedral arrangement with co-ordination no. 6.

D. In B_2O_3, smaller cations occupy triangular voids and a planar trigonal arrangement with co-ordination no.3

Answer: B::D

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16. In the unit cell of NaCl, which of the following statements are correct?

A. Na^+ ions have six Cl^- ions in its nearest neighbourhood

B. Cl^- ions have six Na^+ ions in its nearest neighbourhood

C. Second ncarest neighour of Na^+ ion are twelve Na^+ ions

D. NaCl has 68% of occupied space

Answer: A::B::C

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17. Packing refers to the arrangement of constituent units in such a way that the forces of attraction among the constituent particles is maximum and the constituents occupy the maximum available space. In two dimension there are square close packing and hexagonal close packing, cubic close packing and body-centred cubic packing

i) hcp: AB AB AB AB .... arrangement Coordination no. = 12 , $\%$ occupied space $= 74\%$

ii) ccp: ABC ABC .... arrangement Coordination no. = 12, $\%$ occupied space = 74%

iii) bec: 68% space is occupied. Coordination no= 8 17.

The empty space left in hcp in three dimensions is

A. 26%

B. 74%

C. 52.4%

D. 80%

Answer: A

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18. In a close packed lattice containing 'n' particles, the number of tetrahedral and octahedral voids respectively

A. n, 2n

B. n, n

C. 2n, n

D. 2n, n/2

Answer: C

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19. Packing refers to the arrangement of constituent units in such a way that the forces of attraction among the constituent particles is maximum and the constituents occupy the maximum available space. In two dimension there are square close packing and hexagonal close packing, cubic close packing and body-centred cubic packing

i) hcp: AB AB AB AB .... arrangement Coordination no. = 12 , $\%$ occupied space $= 74\%$

ii) ccp: ABC ABC .... arrangement Coordination no. = 12, $\%$ occupied space = 74%

iii) bec: 68% space is occupied. Coordination no= 8 17.

The pattern of successive layers of cop arrange-ment can be designated as

A. AB AB AB.....

B. AB ABC AB ABC ....

C. ABC ABC ABC ...

D. AB BA AB BA ....

Answer: C

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20. Following is the fact about the newly discovered superconductor of C_{60} (fullerene). The alkali metal fulleride superconductor M_3C_{60} has a cubic closest-packed (face-centered cubic) arragement of nearly spherical C_{60}^{3-} anions with M^+ cations in the holes between the larger C_{60}^{3-} ions. The holes are of two types-octahedral holes, which are surrounded octahedrally by six C_{60}^{3-} ions, and tetrahedral holes, which are surrounded tetrahedrally by four C_{60}^{3-} ions.

How many C_{60}^{3-} ions, octahedral holes, and tetrahedral holes are present per unit cell

A. 5, 4, 4

B. 3, 8, 4

C. 4, 4 8

D. 2, 1, 2

Answer: C

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21. Following is the fact about the newly discovered superconductor of C_{60} (fullerene). The alkali metal fulleride superconductor M_3C_{60} has a cubic closest-packed (face-centered cubic) arragement of nearly spherical C_{60}^{3-} anions with M^+ cations in the holes between the larger C_{60}^{3-} ions. The holes are of two types-octahedral holes, which are surrounded octahedrally by six C_{60}^{3-} ions, and tetrahedral holes, which are surrounded tetrahedrally by four C_{60}^{3-} ions.

Specify fractional coordinates for the tetrahedral holes (Fractional coordinates are fractions of the unit cell edge lengths. For example, a hole at the centre of the cell has fractional coordinates $\frac{1}{2}, \frac{1}{2}, \frac{1}{2}$

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

B. $\frac{1}{3}, \frac{1}{3}, \frac{1}{3}$

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

D. $\frac{1}{2}, \frac{1}{2}, \frac{1}{4}$

Answer: C

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22. The ionic radii of Na^+, K^+ and Rb^+ are 97, 133 and 147 pm, respectively. Which of these ions will fit into the octachedral holes? (radius of C_{60}^{3-} is about 350 pm)

A. Na^+

B. K^+

C. Rb^{+}

D. all of these

Answer: C

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23. Match the nature of bonding mentioned in list I with the solids in list II :

COLUMN-1	COLUMN - II
(Nature of bonding)	(Material)
A) Metallic	p) Carborundum, silicon
B) Covalent	q) Mgo
C) vanderwaal's	r) Solid N_2
D) Ionic	s) Sodium

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24. Match the elements (in Column - I) with the shape of the crystal (in Column - II)

COLUMN - I	COLUMN - II
A) Be	p) Body - central cubic
B) Ca	q) Simple cubic
C) Ba	r) Face - centred cubic
D) Po	s) Hexagonal close - packed

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25. The number of atoms in HCP unit cell is _______

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26. Number of atoms per unit cell for body centered cubic system is ....

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27. A substance A_xB_y crystallises in a face centered cubic lattice. Atoms 'A' occupy each corner of unit cell and atoms of B occupy centre of each face of the cube. Total number of atoms of A and B in the unit cell is _________

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28. If 3 moles of atoms are present in the packing of pattern ABC ABC ABC. The number of moles of tetrahedral voids is equal to ______

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29. A spinel is an important class of oxides consisting of two types of metal ions with oxide ions arranged in CCP layers. The normal spinel has 1/8 th of the tetrahedral void occupied by one type of metal and one half of the octahedral voids occupied by another type of metal ions such a spinel is formed by Zn^{2+}, Al^{3+} and O^{2-} with Zn^{2+} in tetrahedral void. Then the simplest formula of that spinel is $Zn_xAl_yO_z$ then $x+y+z$ is

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30. The number of unit cells present in a cubic shaped ideal crystal of NaCl of mass 0.4gr is $x \times 10^{21}$, then 'x' is ______

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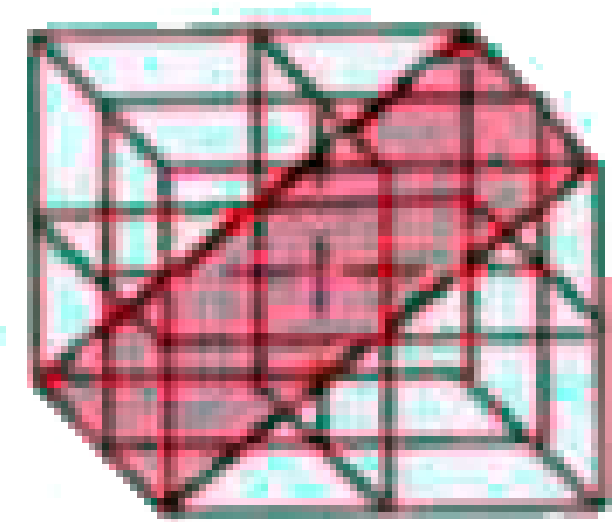
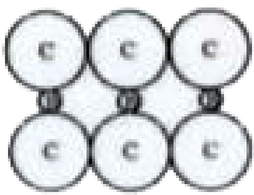
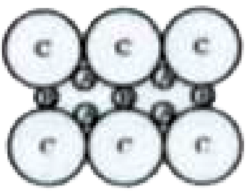
PRACTICE SHEET - 2

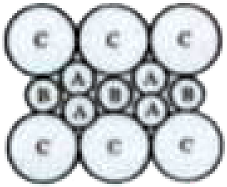
1. In a hypothetical solid C atoms are found to form cubical close packed lattice, A atoms occupy all tetrahedral voids while B atoms occupy all octahedral voids. A and B atoms are of appropriate size, so that there is no distortion in ccp lattice of C atoms. Now if a plane as shown in the following figure is cut, then the cross section of this plane will look like



A. 

B. 

C. 

D. 

Answer: C

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2. The intermediate compound LiAg crystallises in a cubic lattice in which both Li and Ag atoms have co-ordination number of 8. To what crystal class does the unit cell belong

A. $NaCl$

B. $CsCl$

C. ZnS

D. CsF_2

Answer: B

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3. AgI crystallises in the cubic close-packed zinc blend structure. Assuming that the iodide ions occupy the lattice points, fraction of the tetrahedral sites occupies by sliver ions are

A. 50%

B. 75%

C. 100%

D. 33.3%

Answer: A

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4. For which of the following crystals would you expect the assumption of anion-anion contact to be invalid

A. $CsBr$

B. NaI

C. $NaBr$

D. KCl

Answer: A

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5. In an atomic bcc, what fraction of edge is not covered by atoms ?

A. 0.32

B. 0.16

C. 0.134

D. 0.268

Answer: C

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

A. 0.48

B. 0.52

C. 0.73

D. 0.91

Answer: C

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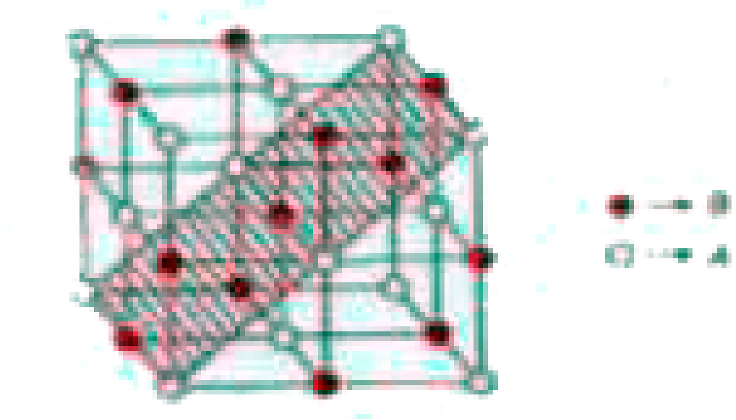
7. If all the atoms, on the shaded plane are removed then the molecular formula of the solid will be



A. A_5B_7

B. A_7B_5

C. AB

D. A_3B_4

Answer: C

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8. The formula of an oxide of iron is $Fe_{0.93}O_{1.00}$. If the compound has hundred O^{-2} ions, then it contains

A. $93Fe^{+2}$ ions

B. $93Fe^{+3}$ ions

C. $79Fe^{+2}, 14Fe^{+3}$

D. $93Fe^{+2}, 14Fe^{+3}$

Answer: C

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9. In a planar tetraatomic molecule, AB_3, A is at the centroid of the equilateral triangle formed by the atoms, B. If the A-B bond distance is 1Å, what is the distance between the centres of any two B atoms?

A. $1/\sqrt{3}\text{Å}$

B. $\sqrt{2}\text{Å}$

C. $\sqrt{3}\text{Å}$

D. $1/\sqrt{2}\text{Å}$

Answer: C

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10. The distance between the two tetrahedral voids (along the body diagonal) in an foc lattice with edge length "a"

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

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

C. a

D. $a/2$

Answer: B

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11. How many unit cell are present in 4.0 gm of crystal AB (formula mass of AB = 40) having rock salt type structure ? (N_A = Avogadro's no.)

A. N_A

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

C. $40N_A$

D. None of these

Answer: D

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12. Which of the following statement(s) is (are) correct for CaF_2,

A. Ca^{2+} ions are present only at the corners of a cube

B. c.c.p. type structure

C. F^{-} ions are present in all the octahedral voids

D. The structrue has $8:4$ co-ordination number

Answer: B::D

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13. Which of the following informations are correct about CsCl?

A. It has body centred cubic unit cell

B. Co-ordination number of both Cs^{+} and Cl^{-} ions are eight

C. Cl^{-} ions are present at face centre

D. Cs^{+} ions are present at body centre

Answer: A::B::D

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14. Select the correct statements

A. Nearest neighbour distance in $NaCl = \frac{a}{\sqrt{2}}$

B. Nearest neighbour distance in $CaF_2 = \frac{a\sqrt{3}}{4}$

C. Nearest neighbour distance in $Na_2O = \frac{a\sqrt{3}}{4}$

D. Nearest neighbour distance in $CsCl = \frac{a\sqrt{3}}{2}$

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

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15. Which of the follwing expression is correct for packing fraction of NaCl if the ions along the face are diagonally removed

A. $\frac{\frac{13}{2}\pi r_{-}^{3} + \frac{16}{3}\pi r_{+}^{3}}{8(r_{+} + r_{-})^{3}}$

B. $\frac{\frac{13}{2}\pi r_{-}^{3} + \frac{4}{3}\pi r_{+}^{3}}{8(r_{+} + r_{-})^{3}}$

C. $\frac{\frac{16}{3}\pi r_{-}^{3} + \frac{13}{3}\pi r_{+}^{3}}{8(r_{+} + r_{-})^{3}}$

D. $\frac{\frac{4}{3}\pi r_{-}^{3} + \frac{13}{3}\pi r_{+}^{3}}{8(r_{+} + r_{-})^{3}}$

Answer: A

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16. Ferrous oxide has a cubic structure and eged length of the unit cell is 5.0 A. Assuming the density of ferrous oxide to be $3.84g/cm^3$ the no. of Fe^{2+} and O^{-2}ions present in each unit cell are $\left(\text{use } N_A = 6 \times 10^{23}\right)$

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

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

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

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

Answer: A

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17. Cdo has NaCl structure with density 8.27 g/cc. If the ionic radius of O^{2-} is 1.24Å, determine ionic radius of Cd^{2+}

A. 1.5Å

B. 1.1Å

C. 1.9Å

D. 1.5Å

Answer: B

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18. O^{-2} : CCP

B^{3+} : Half of octahedral Voids

A^{2+} : $1/8^{\text{th}}$ of tetrahedral Voids

The space lattice describec refers to

A. fluorite structure

B. rock salt structure

C. spinel structure

D. inverse spinel structure

Answer: C

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19. O^{-2} : CCP

B^{3+} : Half of octahedral Voids

A^{2+} : $1/8^{\text{th}}$ of tetrahedral Voids

The formula of the compound is

A. ABO_2

B. A_2BO_3

C. AB_2O_4

D. A_2BO_4

Answer: C

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20. O^{-2} : CCP

B^{3+} : Half of octahedral Voids

$A^{2+} : 1/8^{\text{th}}$ of tetrahedral Voids

Which of the following is an example of this structure

A. $ZnAl_2O_4$

B. Zn_2AlO_4

C. $ZnAlO_2$

D. Zn_2AlO_3

Answer: A

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21. Density of a unit cell is represented as

$$\rho = \frac{\text{Effectiveno.ofatom(s)x Mass of a unit cell}}{\text{Volume of a unit cell}} = \frac{Z.\ M.}{N_A.\ a^3}$$

Where, mass of unit cell = mass of effective no. of atom(s) or ion(s).

M = At. wt./formula wt.

$N_A = \text{Avogadro's no.} \quad \Rightarrow 6.023 \times 10^{23}$

a = edge length of unit cell

Silver crystallizes in a foc lattice and has a density of $10.6g / cm^3$? What is the length of an edge of the unit cell?

A. 0.407 nm

B. 0.2035 nm

C. 0.101 nm

D. 0.407 nm

Answer: A

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22. Density of a unit cell is represented as

$$\rho = \frac{\text{Effectiveno.ofatom(s)x Mass of a unit cell}}{\text{Volume of a unit cell}} = \frac{Z.\ M.}{N_A.\ a^3}$$

Where, mass of unit cell = mass of effective no. of atom(s) or ion(s).

M = At. wt./formula wt.

$N_A = \text{Avogadro's no.} \quad \Rightarrow 6.023 \times 10^{23}$

a = edge length of unit cell

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

A. $41.66g/cm^3$

B. $4.166g/cm^3$

C. $10.25g/cm^3$

D. $1.025g/cm^3$

Answer: A

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23.

COLUMN - I	COLUMN - II
	(A - cation) (B - anion)
A Rock salt structure	p) general formula is AB
B) Zinc blende structure	q) general formula is AB_3
C) Fluorine structure	r) general formula is A_2B
D) Anti fluorite structure	s) general formula is AB_2

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COLUMN - I	COLUMN - II
A) Co - ordination no. of Sr^{2+} and F^{-} in fluorine structure	p) 8, 4
B) C.No of Zn^{+} and Cl^{-} in zinc blende Structure	q) 8,8
C) C. No of Cs^{+} and Cl^{-} in CsCl (bcc type) structure	r) 4, 8
D) C.No of Li^{+} and O^{2-} in antifluorine structure	s) 4, 4

24.

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25. An element assumes a cubical structure in which only 32% of the space is empty. If the density of the element is $7.2g/cm^3$, the number of atoms present in 100 g of that element is $x \times 10^{24}$ where 'x' is

$\left[\text{volume of the unit cell is } 2.39 \times 10^{-23} \text{ cc}\right]$

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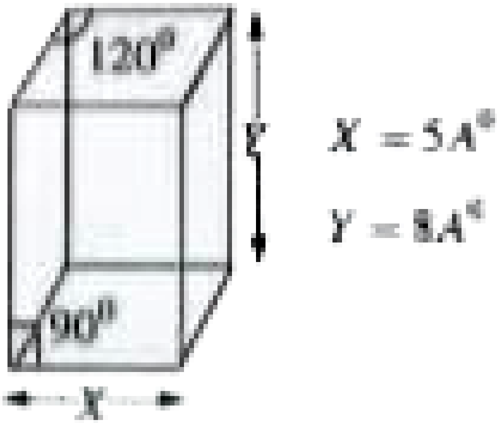

26.

$\text{Molar mass of solid} = 259.8 \text{ g mol}(- 1)$

A solid crystallises in hexagonal lattice as shown in above figure. Density of the solid is 5 g/cm3. How many molecules are their in the given unit cell? (Avogadro's number $= 6.023 \times 10^{23}$)

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27. A cubic solid is made up of two elements P and Q. Atoms of Q are present at the corners of the cube and atoms of P at the body centre. The co-ordination number of P will be ......

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28. The face diagonal length of fcc cubic cell of $NaCl$ type ionic crystal is $600\sqrt{2}$ pm , if the radius of the cation is 100 pm the radius of anion becomes $x \times 10^2$ pm, then x is ......

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29. In case of diamond that follows ZnS structure, the number of carbon atoms per unit cell is ______

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30. In KBr crystal structure, the number of second nearest neighbour of K^+ ions are 2x, then 'X' is________

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PRACTICE SHEET - 3

1. The p - type semiconductor is obtained when Si is doped with

A. Sn

B. Ge

C. Ga

D. As

Answer: C

Watch Video Solution

2. The substance whose resistance gets reduced to virtually zero at very low temperature is called

A. electrical conductor

B. hyper conductor

C. semiconductor

D. super conductor

Answer: D

Watch Video Solution

3. The allignment of magnetic dipoles in antiferro-magnetism is a)

A. $\downarrow \quad \downarrow \quad \downarrow \quad \downarrow \quad \downarrow$

B. {:(uarr,darr,uarr,darr):}`

C. both (a) and (b)

D. none of these

Answer: B

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4. Which is true

A. Rochelle's salt is ferroelectric while lead zirconate is antiferroelectric

B. Rochelle's salt is antiferroelectric and lead zirconate is ferroelectric

C. Both are ferroelectric

D. Both are antiferroelectric

Answer: A

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5. Which of the following is/are correct about the point defects?

A. In Frenkel defect, the dielectric constant of solid increases

B. In Schottky defect, the density of solid decreases

C. In Frenkel defect, the density of solid decreases

D. In Schottky defect, the dielectric constant of solid increases

Answer: A::B

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6. Frenkel defect is the

A. Schottky defect

B. interstitial defect

C. combination of (a) and (b)

D. none of the above

Answer: B

Watch Video Solution

7. The allignment of magnetic dipoles in Co is

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

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

C. $\uparrow \quad \uparrow \quad \uparrow \quad \downarrow \quad \downarrow$

D. none of these

Answer: A

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8. Select correct statement(s) about non-stoichiometric compounds

A. They are called Berthollide compounds

B. They do not obey the law of constant composition

C. Electrical neutrality is maintained either by having extra electrons in the structure or changing the charge on some of the metal ions

D. no effect on density of crystal due to these defects

Answer: A::B::C

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9. If an element (at. wt. = 50) crystal in foc lattice, with a = 0.50 nm. What is the density of unit cel if it contains 0.25%. Schottky defects (use $N_A = 6 \times 10^{23}$) ?

A. 2.0 g/ cc

B. 2.66 g/cc

C. 3.06 g/cc

D. None of these

Answer: B

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10. Select correct statement(s)

A. The non stoichiometric form of NaCl is yellow and that of KCl is blue - lilac

B. Solids containing F-centres are paramagnetic

C. conduction by electrons is called n-type semiconduction

D. Conduction by holes is called as p-type of semiconduction

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

Watch Video Solution

11. Which of the following statements are correct about the diamagnetic solids?

A. They have only paired electrons

B. They are weakly repelled in magnetic field

C. They have large number of unpaired electrons

D. Chromium is diamagnetic

Answer: A::B

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

A. Frenkel defects occur when difference in size of cations and anions are bigger

B. Schottky defects occur when cations and anions have similar ionic size

C. An ionic crystal can have both Frenkel and Schottky defects

D. Pure alkali metals do not have Frenkel defects

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

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13. Which of the following is/are ferromagnetic substance ?

A. CrO_2

B. Fe

C. Co

D. Ni

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

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14. The yellow colour of ZnO and conducting nature produced on heating is due to

A. Metal excess defects due to interstitial cation

B. Extra positive ions present in interstitial site

C. Trapped electrons

D. None of these

Answer: A::B::C

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15. Which of the following statement(s) is/are true ?

A. Conductivity of semiconductors increaseswith increase in temperature

B. Pure ionic solids are insulators

C. $NaCl$ is a diamagnetic substance

D. TiO_2 is a paramagnetic substance

Answer: A::B::C

Watch Video Solution

16. Which of the following is/are correct ?

A. In Schottky defect density of crystal decreases

B. In Frenkel defect density remains the same

C. Pyroelectricity is produced when some polar crystals are heated

D. In Frenkel defect density of crystal decreses.

Answer: A::B::C

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17. Ionic lattice has two major point defects, (1) Schottky (2) Frenkel defects, Schottky defects occurs due to the cation - anion pairs missing from the lattice sites, Frenkel defects occur when an ion leaves its lattice site and fits into an interstitial space. The neutrality of the crystals is being maintained and we considered all losses from interstitial postions Which defect decreases density of the crystal ?

A. Frenkel defect

B. Schottky defect

C. Both (a) and (b)

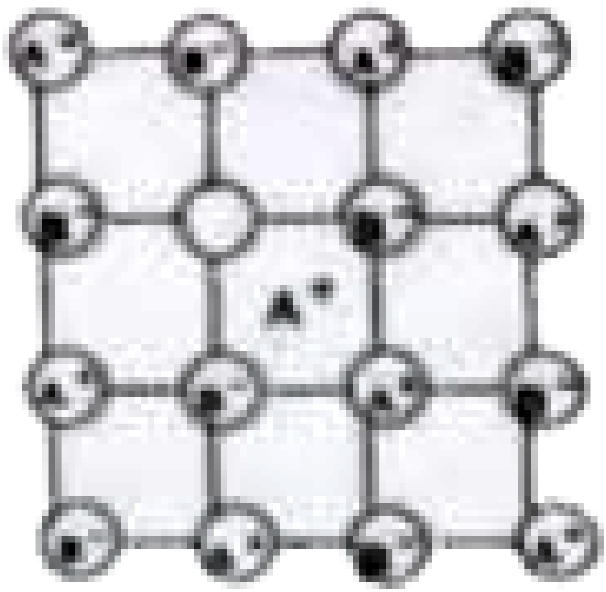
D. None of these

Answer: B

Watch Video Solution

18. Ionic lattice has two major point defects, (1) Schottky (2) Frenkel defects, Schottky defects occurs due to the cation - anion pairs missing from the lattice sites, Frenkel defects occur when an ion leaves its lattice site and fits into an interstitial space. The neutrality of the crystals is being maintained and we considered all losses from interstitial postions

Structure shown here represents



A. Schottky defect

B. Frenkel defect

C. Metal excess defect

D. None of these

Answer: B

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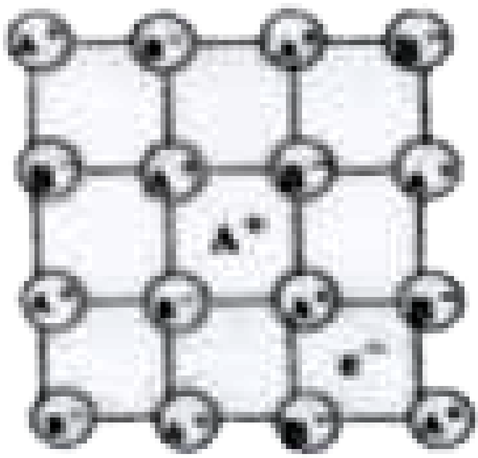
19. Ionic lattice has two major point defects, (1) Schottky (2) Frenkel defects, Schottky defects occurs due to the cation - anion pairs missing from the lattice sites, Frenkel defects occur when an ion leaves its lattice site and fits into an interstitial space. The neutrality of the crystals is being maintained and we considered all losses from interstitial postions

Structure shown here represents:



A. Schottky defect

B. Frenkel defect

C. Both defects

D. None of these

Answer: D

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20. Read the following passage and answer the questions at the end of it.

Conductivity of silicon increases if it is doped with certain other elements. Doping means introduction of small amount of impurities like phosphorus, arsenic or boron in the pure crystal. In pure silicon four valencies are used in bonding with other four adjacent silicon atoms. When a silicon crystal is doped with a group - 15 element (with five valence electrons) such as P, AsSb or Bi, the structure of the crystal lattice remains unchanged. Out of the five valence electrons of group - 15 doped element, four electrons are used in normal covalent bonding with silicon and fifth electron is delocalised and thus conducts electricity

Doping a silicon crystal with a group-13 element (with three valence electron) such as B, Al, Ga or In produces a semiconductor with three electrons in dopant. The place where fourth electron is missing is called as electron vacancy or hole.

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

A. p-type semiconductor

B. n-type semiconductor

C. electron vacancy or hole

D. e-type semiconductor

Answer: B

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

A. p-type semiconductor

B. n-type semiconductor

C. electron vacancy or hole

D. e-type semiconductor

Answer: A

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Doping a silicon crystal with a group-13 element (with three valence electron) such as B, Al, Ga or In produces a semiconductor with three electrons in dopant. The place where fourth electron is missing is called as electron vacancy or hole.

If NaCl is doped with 10^{-3} mol % $SrCl_2$ then concentration of cation vacancies is

A. 6.02×10^{23}

B. 6.02×10^{20}

C. 6.02×10^{18}

D. 6.02×10^{15}

Answer: C

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23. Match the following :

COLUMN - I	COLUMN - II
A) Quartz	p) Three corners of SiO_4^{4-} tetrahedron are share
B) Amorphous SiO_2	q) Two corners of SiO_4^{4-} are shared
C) Sheet Silicates	r) All four corners of SiO_4^{4-} are shared
D) Cyclic silicates	s) Corners of SiO_4^{4-} are randomly linked

Watch Video Solution

24.

COLUMN - I	COLUMN - II
A) Pizoelectric	p) Electric dipoles spontaneously aligned in one dire
B) Antipiezoelectric	q) Heating causes electric field
C) Ferroelectric	r) Mechanical stress causes electric field
D) Pyroelectric	s) Electric field causes elastic deformation

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25. The density of Ionic solid B^+A^- (Crystallises in rock salt type) is 4g/cc and the value of face diagonal unit cell is $600\sqrt{2}$ pm. If 1.296 g of an ionic solid B^+A^- (Salt of W.B. $+$ S.A.) dissolved in water to make one litre solution, then its pH is

$(\mathrm{T} = 298\mathrm{K}, \ K_b \ \text{for BOH is} \ 10^{-4}. N_A = 6 \times 10^{23})$

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26. A molecule A_2B (mol. wt 166.4) occupies triclinic lattice with a $a = 5\text{Å}, b = 8\text{Å} \text{ and } c = 4\text{Å}.$ If density of AB_2 is $5.2 gcm^{-3}$, calculate the number of molecules present in one unit cell

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27. Analysis shows that nickel oxide has formula $Ni_{0.98}O_{1.00}$, the $\%$ of Ni^{3+} is $x\ \%$. Then 'x' is

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28. The density of Cr atoms is 7.2 g/cm. If the unit cell has edge length 289 pm. Calculate the number of chromium atoms per unit cell (at mass of Cr

= 52)

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29. The density of KBr is 2.73 g/cm. The length of the unit cell is 654 pm. Find the number of molecules per unit cell in the cubic structure.

Watch Video Solution

30. Find the co-ordination number of sodium in Na_2O.

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PRACTICE SHEET - 4

1. A molecule $A_2B(MW = 166.4)$ occupies triclinic lattice with $a = 5Å, b = 8Å, C = 4Å$. If the density of A_2B is $5.2gm/cm^3$ the number of molecules present in one unit cell is?

A. 2

B. 3

C. 4

D. 5

Answer: B

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2. Bredig's arc method is

A. dispersion method

B. condensation method

C. both

D. none

Answer: C

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3. For a crystal, the angle of diffraction (2θ) is 90° and the second order line has a d value of $2.28A^{\circ}$. The wavelength (in A°) of X-rays used for Bragg's diffraction is

A. 1.61Å

B. 1.14Å

C. 2.28Å

D. 2.0Å

Answer: A

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4. Potassium crystallizes in a body centred cubic unit cell. The mass of one unit cell is

A. $1.29 \times 10^{-23} gm$

B. $1.295 \times 10^{-22} gm$

C. $6.2 \times 10^{-23} gm$

D. $1.29 \times 10^{-24} gm$

Answer: B

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5. Sodium metal crystallizes in a body-centred cubic lattice with the cell edge $'a' = 4.29 \text{Å}$". The radius of the Na atom will be

A. 5.78Å

B. 1Å

C. $1, 86 \text{Å}$

D. 0.2Å

Answer: C

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6. Which of the following is an example of body centred cube?

A. Mg

B. Zinc

C. copper

D. Potassium

Answer: D

Watch Video Solution

7. Potassium Zinc blende structure is obtained by when Zn^{2+} occupies.

A. All tetrahedral sites

B. half tetra hedral sites

C. All octahedral sites

D. half octa hedral sites

Answer: B

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8. At very low temperature oxygen freezes and forms a crystailine solid which term best describes the solid

A. Covacont net work

B. molecular crystals

C. metallic

D. ionic

Answer: B

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9. Doping of 'Ge' metal with a little of 'In produces

A. P - type semi conductor

B. n - type semi conductor

C. Insulator

D. Rectifier

Answer: A

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10. If R is the radius of the octahedral void and r is the radius of the atom in close packing, then r/R is equal to

A. 4.76

B. 3.22

C. 2.41

D. 9.1

Answer: C

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11. Schottky defect does not causes

A. Increase in the density of solid

B. Decrease in the density of solid

C. No change in the density of solid

D. Decrease in the conductivity of solid

Answer: A::C::D

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12. Which of the following having their radius ratio between 0.414 to 0.732 i.e for NaCl structure have their radius ratio not in this range but possess NaCl type structure

A. LiBr

B. KCl

C. RbCl

D. BaO

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

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13. Which of the following statements is or are true?

A. two ions A^{+} and B^{-} have radii 88 pm and 200 pm respectively. In the close packed crystal of compound AB, the coordination number of A^{+} is 6

B. in CsCl crystal, edge length is 404 pm. The distance between the nearest neighbours is 350 pm.

C. due to Frenkel defect, the density of the ionic solids does not changes

D. the volume of atoms present in a face centered cubic unit cell of a metal (r is atom radii) is $\frac{16}{3}\pi r^3$

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

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14. Schottkey defects -

A. Are common is alkalimetal halides

B. Are stoichiometric defects

C. Are thermodynamic defects

D. Cause drop in density

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

Watch Video Solution

15. Frenkel defects are

A. Caused by doping process

B. Interstitial as well as point defects

C. Most common in salts with high limiting radius ratio

D. Stoichiometric defects

Answer: B::D

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16. In α crystal with metal deficiency defect ....

A. Metal is usually an alkali metal

B. Metal shows valency

C. The cation vacanciece are more in number than an ion vacancies

D. An ion shows variable valency

Answer: B::C::D

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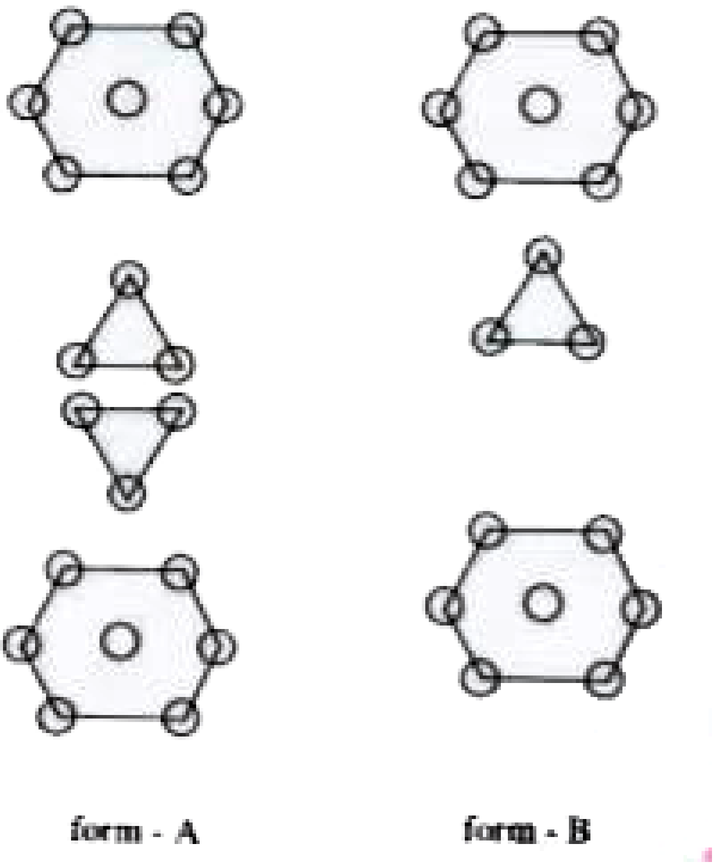
17. A metal adopts two allotropic forms with the following types of arrangements

Which of the following statements is correct?



A. Density of 'A' is more than that of 'B'

B. Co-ordination number of 'A' is more than that of 'B'

C. For a given mass of the metal 'A' gives more unit cells than 'B'

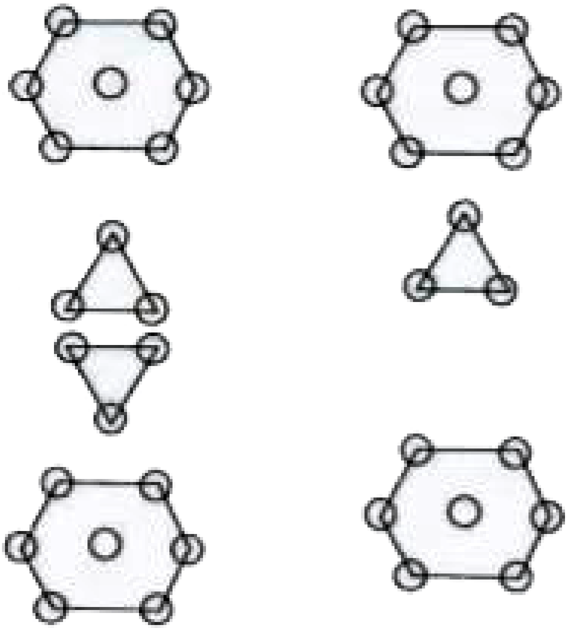
D. For a given mass of the metal 'B' gives more unit cells than 'A'

Answer: B

Watch Video Solution

18. A metal adopts two allotropic forms with the following types of arrangements

In the allotrope 'A' what is the maximum inter atomic distance in its unit cell, if the minimum inter atomic distance in the unit cell is d'?



form - A form - B

A. $\sqrt{6}d$

B. $\sqrt{3}d$

C. $6\sqrt{d}$

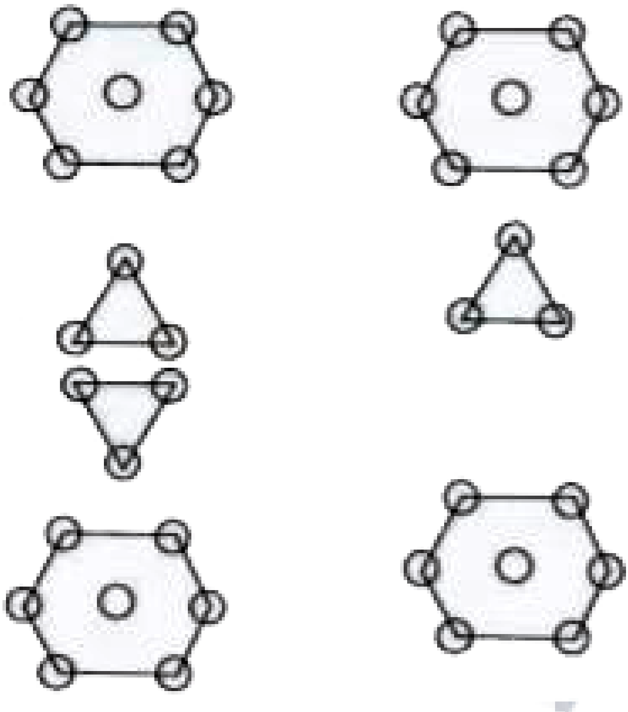
D. $2\sqrt{3}d$

Answer: B

Watch Video Solution

19. A metal adopts two allotropic forms with the following types of arrangements

What is the ratio of number of unitcells in equal masses of A and B ?



form - A form - B

A. $3:2$

B. $2:3$

C. $1:3$

D. $3:1$

Answer: B

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20. Crystal defects give some important properties to solids. The defects are due to either metal excess of metal defficiency of doping

ZnO an strong heating becomes yellow due to

A. Oxidation of metal ions

B. Oxidation of oxide

C. Reduction of metal ions

D. dislocation of metal ion

Answer: B

Watch Video Solution

21. Crystal defects give some important properties to solids. The defects are due to either metal excess of metal defficiency of doping

Colour Causing F-Center is created when ----

A. In sufficient iron is oxidised with excess oxygen

B. Potasium vapour is blown into KCl crystals

C. Strong hcating of MgO

D. Doping of $SrCl_2$ into $NaCl$

Answer: B

Watch Video Solution

22. When 'Na' vapour is blown over $NaCl$ solid. The crystals attin yellow colur. This is due to __

A. Formation of F^- Centres in calionic sites

B. Formation of F^- Centres in animic sites

C. Escape of Na^+ ions

D. Dscape of Cl^- ions

Answer: B

Watch Video Solution

23. Match the following :

COLUMN - I	COLUMN - II
A) 50% 'Td' voids filled	p) CsCl
B) 100% 'oh' voids	q) NaCl
C) 100% 'Td' voids filled	r) ZnS
D) No 'Td' voids present	s) Na_2O

Watch Video Solution

24. Match the following :

COLUMN - I	COLUMN - II
A) I_2	p) Electrostatic force
B) SiO_2	q) Electron sea
C) Mg	r) Network solid
D) MgO	s) vander Waal solid

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25. If solid $A^{+}B^{-}$ having ZnS Structure is heated so that the ions along two of the axis passing through the face center particles are lost and bivalent ion (Z) enters here to maintain the electrical neutrality,so that new formula unit becomes $A_xB_yZ_c$ Report the value of $x+y+c$

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26. The density of a crystal 'AB' with rock saltstructure is fund to be 5gm/cc. The edge length of cell is 4Å. Formula weight of AB is 60.23. If the percentage of shotky defect pairs is 4x, What is x?

Watch Video Solution

27. A metal crystallizes in f.c.c. Then, the ratio of number of its first nearest neighbours to the second nearest neighbours is ....

Watch Video Solution

28. In $Fe_{0.96}O$, per one Avogadro number of oxide ions, $x \times 10^{22}$ Avagadro number of cation vacancies are present x value is

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29. Potassium crystallizes in a body centered cubic lattice. The approximate number of unit cells in 4.0g of potassium is X x 10^(22)` then the value of X is (Atomic mass of potassium = 39)

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30. Compute the percentage void space per unit volume of unit cell in zinc-sulphide structure. If the answer is X^2?, then the value of X is

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PRACTICE SHEET - 5

1. The closest-packing sequence ABAB....... represents

A. Primitive cubic packing

B. body - centred cubic packing

C. face - centred cubic packing

D. hexagonal packing

Answer: B::D

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2. The percent of void space in a body - centred cubic lattice is :

A. $32\ \%$

B. $48\ \%$

C. $52\ \%$

D. $92\ \%$

Answer: A

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3. In rock salt structure, what percentage of the octahedral sites are occupied by cations?

A. $50\ \%$

B. $33\ \%$

C. $75\ \%$

D. $100\ \%$

Answer: D

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4. Determine the simplest formula of an ionic compound in which cations present at the corners and anions occur at the centre of each face

A. A_2B_3

B. AB_3

C. AB_2

D. AB_4

Answer: B

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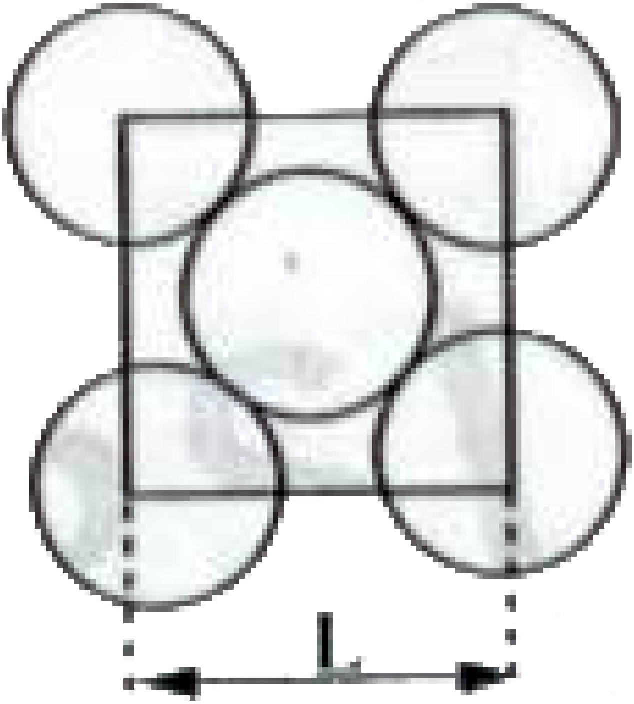
5. The packing efficiency of the two-dimensional square unit cell shown below is



A. $39.27\ \%$

B. $68.02\ \%$

C. $74.05\ \%$

D. $78.54\ \%$

Answer: D

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

A. 6

B. 4

C. 8

D. 2

Answer: B

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7. Total volume of atoms present in a face centered cubic unit cell of a metal is

A. $\frac{24}{3}\pi r^3$

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

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

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

Answer: C

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8. In b.c.c structure of lattice constant 'a' the minimum distance between atoms is

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

B. $a\sqrt{2}$

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

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

Answer: A

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

A. A_7B_6

B. A_7B_{12}

C. A_7B_{24}

D. $A_{24}B_7$

Answer: C

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10. A TV in FCC is formed by atoms at

A. 3 corners $+1$ facecenter

B. 2 facecenters $+2$ corners

C. 3 facecenters $+1$ corner

D. 2 facecenters $+2$ corners $+$ bodycenter

Answer: C

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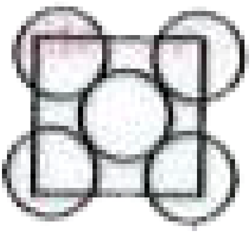
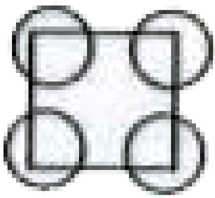
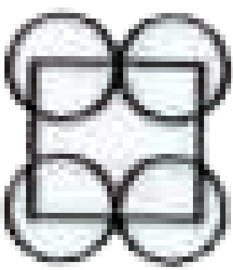
11. Which planes can be found in a bcc unit cell?

A. 

B. 

C. 

D. 

Answer: A::B::C

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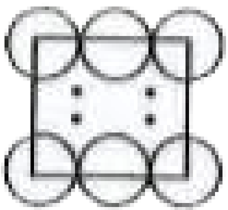
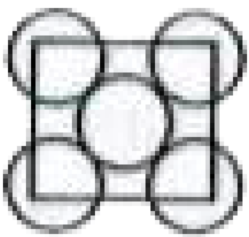
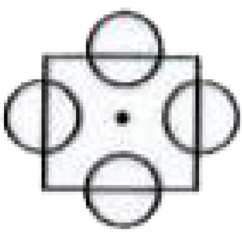
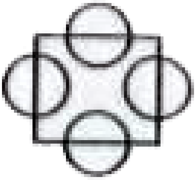
12. Which planes can be found in fluorite structure (unit cell)?

A. 

B. 

C. 



D.

Answer: A::B::D

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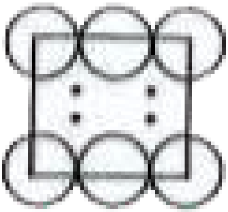
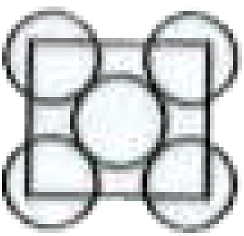
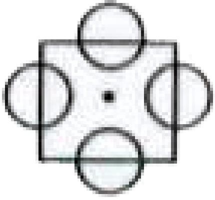
13. Which planes are present in Na_2O structure (unit cell)

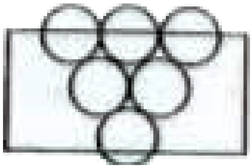


A.



B.

C. 

D. 

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

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14. Which of the following solids fuse at modulate temperature ?

A. Ga_2

B. SiO_2

C. Solid CO_2

D. SiC

Answer: A::C

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15. Which systems have more than one unit cell ?

A. Triclinic

B. Hexagonal

C. Monoclinic

D. Orthorhombic

Answer: C::D

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16. Which statements are correct ?

A. The size of octahedral void is larger than that of tetrahedral void.

B. BCC arrangement does not provide tetrahedral voids.

C. In an FCC arrangement each octahedral void has 2 more octahedral voids in equal distance.

D. InFCC octahedral voids amount 26% of space.

Answer: A::B::C

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17. Rocksalt structure consists of FCC arrangment of Cl^{-} ions in which Na^{+} inos occupy all the Octahedral vois. Each unit cell consists of four Na^{+} ions and four Cl^{-} ions effectively.

How many tetrahedral voids are kept unocupied in one unit cell of rocksalt ?

A. 4

B. 6

C. 8

D. 0

Answer: C

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18. Rocksalt structure consists of FCC arrangment of Cl^- ions in which Na^+ inos occupy all the Octahedral vois. Each unit cell consists of four Na^+ ions and four Cl^- ions effectively.

How many nearest Cl^- inons are present around each Cl^- in the lattice ?

A. 4

B. 6

C. 8

D. 12

Answer: D

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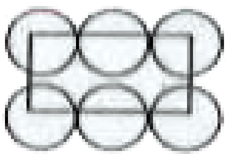
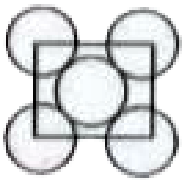
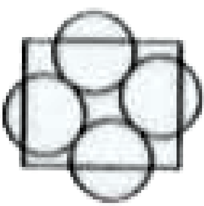
19. Rocksalt structure consists of FCC arrangment of Cl^- ions in which Na^+ inos occupy all the Octahedral vois. Each unit cell consists of four Na^+ ions and four Cl^- ions effectively.

Which layer of Clions is not present (Na^+ not shown)

A. 

B. 

C. 

D. 

Answer: D

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20. In Zns structure S^{-2} ions make FCC lattice in which Zn^{+} occupies alternate tetrahedral voids. $CIWCaF_2$ structure Ca^{+2} ions make FCC lattice and F^{-} ions occupy all the tetrahedral voids.

How many Zns formula with are present per unit cell?

A. 1

B. 2

C. 3

D. 4

Answer: D

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21. In Zns structure S^{-2} ions make FCC lattice in which Zn^{+} occupies alternate tetrahedral voids. $CIWCaF_2$ structure Ca^{+2} ions make FCC lattice and F^- ions occupy all the tetrahedral voids.

One mole each of Zns and CaF_2 are taken. What is the ratio of number of unitcells in the sample ?

A. $1:1$

B. $2:3$

C. $1:2$

D. $2:1$

Answer: A

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22. If CaF_2 structure the nearest inter cationic distance in 'x' what is the nearest inter anionic distance ?

A. $\left(\sqrt{\frac{3}{2}}\right)x$

B. $\left(\frac{1}{\sqrt{2}}\right)x$

C. $\sqrt{2}x$

D. $\left(\sqrt{\frac{3}{2}}\right)x$

Answer: A

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23. Match the following :

COLUMN - I	COLUMN - II
A) ABAB ....(closed)	p) C • N = 8
B) AAA.......	q) 4 spheres permit cell
C) ABCABC......	r) 74% packing efficiency
D) ABABAB ......(less effective)	s) C • N = 6

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24. Match the following :

COLUMN - I	COLUMN - II
A) 'Na' vapour blown into NaCl	p) doping
B) $Fe_{(1-x)}O$	q) F - centres
C) Hot ZnO	r) variable metal valency
D) Mixture of NaCl, $NaCl_2$	s) Metal excers

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25. How many unit crystal systems contain only one unit cell ?

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26. What is the maximum number of unit cells may be present in any crystal system?

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27. '5x' percent of ion pairs are missing from an 'MX' crystal with FCC structure with density 5gm/cc, lenth of unit cell 4A and mol.wt of $MX = 60.$ What is x ?

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28. A metal exists in 'hep' and 'ccp allotropic forms. The density of 'hcp' form in 9gm/cc, what is the density of its 'ccp' form in 'gm/cc'units ?

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29. In an oxide Ore half of tetrahedral voids are occupied by A^{+x} ions and half of the octahedral voids are occupied by B^{+y} y in the ‘hcp' arrangement of oxide ions. What is $(x+y)$?

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30. 10 moles of NaF and 10 moles of AlF_3 are mixed and uniformly recrystallised to get an FCC Lattice of Fluoride ions. The number of cationic octahedral vacancies formed due to this is 5x. What is x ? (Cations occupy 'oh' voids)

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