**ACTIVE SITE TUTORIALS**

**Date :** 20-08-2019 **TEST ID: 492**

**Time :** 11:12:00 **CHEMISTRY**

**Marks :** 697

1.THE SOLID STATE

**Single Correct Answer Type**

| 1. | In the crystals of which of the following ionic compounds would you expect maximum distance between the centers of the cations and anions? | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 2. | The edge length of a face-centered cubic unit cell is 508 pin. If the radius of the cation is 110 pm, the radius of the anion is | | | | | | | |
|  | a) | 144 pm | b) | 288 pm | c) | 618 pm | d) | 398 pm |
| 3. | A TV in fcc is formed by atoms at | | | | | | | |
|  | a) | 3 corners + 1 face center | | | | | | | |
|  | b) | 3 face centers + 1 corner | | | | | | | |
|  | c) | 2 face centers + 2 corners | | | | | | | |
|  | d) | 2 face centers + 1 corner + 1 body center | | | | | | | |
| 4. | Analysis show that nickel oxide consists of nickel ion with 96% ions having configuration and 4% having configuration. Which amongst the following best represents the formula of the oxide? | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 5. | The -form of iron has fcc-structure (edge length 386 pm) and -form has bcc structure (edge length 290 pm). The ratio of density in -form and -form is | | | | | | | |
|  | a) | 0.9788 | b) | 1.02 | c) | 1.57 | d) | 0.6344 |
| 6. | What is the maximum number of layers of atoms in close packed planes that will lie within two imaginary parallel planes having a distance between them of (where is the radius of atom) in the copper crystal (fcc)?  (Consider the atoms to be within the parallel planes if their centers are on or with in the two parallel planes) | | | | | | | |
|  | a) | 5 | b) | 6 | c) | 7 | d) | 8 |
| 7. | The packing fraction for a body-centered cube is | | | | | | | |
|  | a) | 0.42 | b) | 0.53 | c) | 0.68 | d) | 0.82 |
| 8. | The coordination number of Al in the crystalline state of is | | | | | | | |
|  | a) | 2 | b) | 4 | c) | 6 | d) | 8 |
| 9. | When molten zinc is cooled to solid state, it assumes hcpstructure. Then the number of nearest neighbours of zinc atom will be | | | | | | | |
|  | a) | 4 | b) | 6 | c) | 8 | d) | 12 |
| 10. | A molecule occupies triclinic lattice with and . If the density of is , the number of molecules present in one unit cell is | | | | | | | |
|  | a) | 2 | b) | 3 | c) | 4 | d) | 5 |
| 11. | What type of crystal defect is indicated in the diagram given below | | | | | | | |
|  | a) | Both Frenkel and Schottky defects | | | b) | Schottky defect | | |
|  | c) | Interstitial defect | | | d) | Frenkel defect | | |
| 12. | The number of hexagonal faces that are present in a truncated octahedron is | | | | | | | |
|  | a) | 2 | b) | 4 | c) | 6 | d) | 8 |
| 13. | What are types of following semiconductors I and II  C:\Users\Whalesoft\Desktop\Untitled-2.jpg | | | | | | | |
|  | a) | -type-type | | | b) | -type-type | | |
|  | c) | Both -type | | | d) | Both -type | | |
| 14. | Which of the following is not a ferroelectric compound? | | | | | | | |
|  | a) | Rochelle salt | b) |  | c) |  | d) |  |
| 15. | The number of unit cells in 58.5 g of is nearly | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 16. | In the closest packing of atoms | | | | | | | |
|  | a) | The size of TV is greater than that of OV | | | | | | | |
|  | b) | The size of TV is smaller than that of OV | | | | | | | |
|  | c) | The size of TV is equal to that of OV | | | | | | | |
|  | d) | The size of TV may be greater or smaller or equal to that of OV depending upon the size of atoms | | | | | | | |
| 17. | The density of an ionic compound () is 2.165 and the edge length of unit cell is 562 pm, then the closest distance between and of unit cell is | | | | | | | |
|  | a) | 281 pm,4 | b) | 562 pm,2 | c) | 562 pm,4 | d) | 281 pm,4 |
| 18. | In a hypothetical solid, C atoms are found to form cubical close-packed lattice. A atoms occupy all tetrahedral voids and B atoms occupy all octahedral voids  C:\Users\Whalesoft\Desktop\Untitled-2.jpg  A and B atoms are of appropriate size, so that there is no distortion in the 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) |  |
| 19. | The interionic distance for cesium chloride crystal will be | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 20. | The number of nearest neighbours and next nearest neighbours of an ion in a crystal of are, respectively, | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 21. | A metal of density has an fcc crystal structure with lattice parameter pm. Calculate the number of unit cells present in 0.015 kg of the metal | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 22. | Superconductors are derived from the compounds of | | | | | | | |
|  | a) | p-block elements | b) | Lanthanides | c) | Actinides | d) | Transition elements |
| 23. | If is the radius of the octahedral voids and is the radius of the atom in close packing, then is equal to | | | | | | | |
|  | a) | 2.41 | b) | 4.76 | c) | 3.22 | d) | 9.1 |
| 24. | An ionic solid crystallizes as a bcc structure. The distance between cation and anion in the lattice is 338 pm. The edge length of cell is | | | | | | | |
|  | a) | 338 pm | b) | 390.3 pm | c) | 292.7 pm | d) | 507 pm |
| 25. | Every atom or ion that forms an fcc unit cell is surrounded by | | | | | | | |
|  | a) | Six OVs and eight TVs | | | b) | Eight OVs and six TVs | | |
|  | c) | Six OVs and six TVs | | | d) | Eight OVs and four TVs | | |
| 26. | How many kinds of space lattices are possible in a crystal? | | | | | | | |
|  | a) | 23 | b) | 7 | c) | 230 | d) | 14 |
| 27. | In cubic (II-VI) compounds, if the radii of Zn and S atoms are 0.74 and 1.70 , the lattice parameter of cubic is | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 28. | A metal crystallizes in bcc lattice. The percent fraction of edge length not covered by atom is | | | | | | | |
|  | a) | 10.4% | b) | 13.4% | c) | 12.4% | d) | 11.4% |
| 29. | Which of the following is a ferroelectric compound? | | | | | | | |
|  | a) |  | b) |  | c) |  | d) | None of these |
| 30. | Silver (atomic weight ) has a density of 10.5 g The number of silver atoms on a surface of area can be expressed in scientific notation as The value of is | | | | | | | |
|  | a) | 3 | b) | 5 | c) | 7 | d) | 9 |
| 31. | The lattice parameter of (radius of ) is | | | | | | | |
|  | a) | 5.635 | b) | 2.852 | c) | 5.774 | d) | 4.94 |
| 32. | An ionic solid crystallizes as an fcc structure. If the edge length of cell is 508 pm and the radius of anion is 144 pm, the radius of cation is | | | | | | | |
|  | a) | 110 pm | b) | 364 pm | c) | 220 pm | d) | 288 pm |
| 33. | The coordination number of a metal crystallizing in a hexagonal close-packed structure is | | | | | | | |
|  | a) | 12 | b) | 4 | c) | 8 | d) | 6 |
| 34. | The range of radius ratio (cationic to anionic) for an octahedral arrangement of ions in an ionic solid is | | | | | | | |
|  | a) |  | b) |  | c) | 0 | d) |  |
| 35. | A semiconductor of can be made -type by adding | | | | | | | |
|  | a) | Trivalent impurity | | | b) | Tetravalent impurity | | |
|  | c) | Pentavalent impurity | | | d) | Divalent impurity | | |
| 36. | The material used in solar cells contains | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 37. | has bcc structure with edge length of 43 pm. The shortest interionic distance between cation and anion is | | | | | | | |
|  | a) | 3.72 pm | b) | 1.86 pm | c) | 7.44 pm | d) | 4.3 m |
| 38. | 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% |
| 39. | In body-centered cubic lattice given below, the three distances AB, AC, and AA'' are | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 40. | How many unit cells are present in a cubic shaped ideal crystal of of mass 1.0 g? | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 41. | Silicon dopped with group 13 and group 15 member elements is, respectively, called……semiconductor | | | | | | | |
|  | a) | -type, -type | b) | -type, -type | c) | -type | d) | -type |
| 42. | A solid has a structure in which W atoms are located at the corners of a cubic lattice, atoms at the center of edges, and Na atom at the center of the cube. The formula of thecompound is | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 43. | In which of the following crystals alternate tetrahedral voids are occupied? | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 44. | Two ionic solids AB and CB crystallize in the same lattice. If and are 0.50 and 0.70, respectively, then the ratio of edge length of AB and CD is | | | | | | | |
|  | a) | 0.68 | b) | 0.78 | c) | 0.88 | d) | 0.98 |
| 45. | In an fcc unit cell, atoms are numbered as shown below. The atoms not touching each other are (Atom numbered 3 is face center of front face) | | | | | | | |
|  | a) | 3 and 4 | b) | 1 and 3 | c) | 1 and 2 | d) | 2 and 4 |
| 46. | What is the density of having antifluorite-type crystal structure, if the edge length of cube is 100 pm and what is the effect on density by 0.05% Frenkel defect? | | | | | | | |
|  | a) | , density decrease | | | b) | , density decreases | | |
|  | c) | , density remains same | | | d) | , density remains same | | |
| 47. | An fcc lattice has a lattice parameter pm. Calculate the molar volume of the lattice including all the empty space | | | | | | | |
|  | a) | 10.8 mL | b) | 96 mL | c) | 8.6 mL | d) | 9.6 mL |
| 48. | Which of the following metal oxides is anti-ferromagnetic in nature? | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 49. | In the cubic lattice given below, the three distances between the atoms , and are, respectively, | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 50. | Which of the following figures represents the cross-section of an OV? | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 51. | Schottky defect to 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 site | | | | | | | |
|  | d) | Density of the crystal is increased | | | | | | | |
| 52. | A crystal is made up of particles X, Y, and Z. X forms fccpacking. Y occupies all octahedral voids of X and Z occupies all tetrahedral voids of X. It all the particles alongone body diagonal are removed, then the formula of crystal would be | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 53. | An elemental crystal has a density of . The packing efficiency is 0.68. If the closest distance between neighbouring atoms is , the mass of one atom is | | | | | | | |
|  | a) | 186 amu | b) |  | c) |  | d) |  |
| 54. | A compound formed by elements A and B crystallizes in the cubic structure where A atoms are at the face-centers. The formula of the compound is | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 55. | In a tetragonal crystal | | | | | | | |
|  | a) |  | | | b) |  | | |
|  | c) |  | | | d) |  | | |
| 56. | Pure silicon and germanium are | | | | | | | |
|  | a) | Conductors | | | b) | Insulators | | |
|  | c) | Semiconductors | | | d) | May be any one of the above | | |
| 57. | Which of the following has Frenkel defect? | | | | | | | |
|  | a) | Sodium chloride | b) | Graphite | c) | Silver bromide | d) | Diamond |
| 58. | In the calcium fluoride structure, the coordination number of the cations and the anions are, respectively, | | | | | | | |
|  | a) | 6 and 6 | b) | 8 and 4 | c) | 4 and 4 | d) | 4 and 8 |
| 59. | In a solid AB having the structure, A atom occupies 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) |  | b) |  | c) |  | d) |  |
| 60. | and crystallize in bcc- and fcc-type crystals, the ratio of number of atoms present in the unit cell of their respective crystal is | | | | | | | |
|  | a) | 1 | b) | 0.5 | c) | 3 | d) | 4 |
| 61. | The volume of atoms present in a face-centered cubic unit cell of a metal is atomic radius) is | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 62. | The edge length of unit cell of a metal ( = 24) having cubic structure is . Ifthe density of metal is , the radius of metal is () | | | | | | | |
|  | a) | 180 pm | b) | 160 pm | c) | 140 pm | d) | 190 pm |
| 63. | To get -type doped semiconductor, impurity to be added to silicon should have the following number of valence electrons | | | | | | | |
|  | a) | 2 | b) | 5 | c) | 3 | d) | 1 |
| 64. | The number of atoms in 100 g of an fcc crystal with density and cell edge equal to 200 pm is equal to | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 65. | The electrical conductivity of semiconductor is | | | | | | | |
|  | a) |  | | | b) |  | | |
|  | c) | In the range of to | | | d) | None of the above | | |
| 66. | The ratio of the volume of a tetragonal lattice unit cell to that of a hexagonal lattice unit cell is(both having same respective lengths) | | | | | | | |
|  | a) |  | b) |  | c) |  | d) | 1 |
| 67. | The number of octahedral sites per sphere in fcc structure is | | | | | | | |
|  | a) | 8 | b) | 4 | c) | 2 | d) | 1 |
| 68. | Consider the structure of (8:8 co-ordination). How many ions occupy the second nearest neighbour locations of a ion? | | | | | | | |
|  | a) | 8 | b) | 24 | c) | 6 | d) | 16 |
| 69. | The following diagram shows the arrangement of lattice points with and . Choose the correct options | | | | | | | |
|  | a) | The arrangement is sc with each lattice point surrounded by 6 nearest neighbours | | | | | | | |
|  | b) | The arrangement is sc with each lattice point surrounded by 8 nearest neighbours | | | | | | | |
|  | c) | The arrangement is fcc with each lattice point surrounded by 12 nearest neighbours | | | | | | | |
|  | d) | The arrangement is bcc with each lattice point surrounded by 8 nearest neighbours | | | | | | | |
| 70. | In a closed packed structure of mixed oxides, the lattice is composed of mixed oxides ions. One-eighth of tetrahedral voids are occupied by divalent cations () while one-half of octahedral voids are occupied by trivalent cations( ). The formula of mixed oxide is | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 71. | and crystallize in bcc- and fcc-type crystals, respectively, then the number of atoms of andpresent in the unit cell of their respective crystal is | | | | | | | |
|  | a) | 4 and 2 | b) | 9 and 14 | c) | 14 and 9 | d) | 2 and 4 |
| 72. | Potassium crystallizes with a | | | | | | | |
|  | a) | Face-centered cubic lattice | | | b) | Body-centered cubic lattice | | |
|  | c) | Simple cubic lattice | | | d) | Orthorhombic lattice | | |
| 73. | The intermetallic compound crystallizes in cubic lattice in which both lithium and silver have co-ordination number of 8. The crystal class is | | | | | | | |
|  | a) | Simple cubic | b) | Body-centered cubic | c) | Face-centered cubic | d) | None of these |
| 74. | The atomic fraction of tin in bronze (fcc) with a density of and a lattice parameter of is ( | | | | | | | |
|  | a) | 0.01 | b) | 0.05 | c) | 0.10 | d) | 3.8 |
| 75. | The ratio of packing density in fcc, bcc, and cubic structure is, respectively, | | | | | | | |
|  | a) | 1:0.92:0.70 | b) | 0.70:0.92:1 | c) | 1:0.70:0.92 | d) | 0.92:0.70:1 |
| 76. | A metallic crystal crystallizes into a lattice containing a sequence of layers ABABAB... …any packing of spheres leaves out voids in the lattice. What percentage by volume of this lattice is empty space? | | | | | | | |
|  | a) | 74% | b) | 26% | c) | 50% | d) | None of these |
| 77. | In , the chloride ions occupy the space in a fashion of | | | | | | | |
|  | a) |  | b) | bcc | c) | Both | d) | None |
| 78. | If the lattice parameter of and the mass of atom is kg, the density of silicon in is (Given: Silicon has diamond cubic structure) | | | | | | | |
|  | a) | 2330 | b) | 1115 | c) | 3445 | d) | 1673 |
| 79. | Due to Frenkel defect, the density of the ionic solids | | | | | | | |
|  | a) | Increases | b) | Decreases | c) | Does not change | d) | changes |
| 80. | In the structure of diamond, carbon atoms appears at | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |

**Multiple Correct Answers Type**

| 81. | For the spinet structure the correct statement is/are | | | | | | | |
|  | a) | 50% OVs are occupied by ions | | | b) | is equally distributed in TVs and OVs | | |
|  | c) | Oxide ions occupy ccp lattice | | | d) | 12.5% TVs are occupied by ions | | |
| 82. | Which of the following statements is/are correct about TVs in an fcc unit cell?  Given: Edge length  Body diagonal | | | | | | | |
|  | a) | Each TV lies at a distance from the nearest corner | | | | | | | |
|  | b) | Each TV lies at a distance from the farthest corner | | | | | | | |
|  | c) | Each TV lies at a distance of from the nearest corner | | | | | | | |
|  | d) | The distance between two TVs is | | | | | | | |
| 83. | Which of the following statements is/are correct about TVs in an fcc unit cell? | | | | | | | |
|  | a) | Number of TVs per atom in fcc unit cell is 2 | | | | | | | |
|  | b) | Number of TVs per unit cell is 8 | | | | | | | |
|  | c) | Number of TVs is twice the number of atoms in the fccunit cell | | | | | | | |
|  | d) | Number of TVs is equal to the number of atoms in the fcc unit cell | | | | | | | |
| 84. | The elements of symmetry in a crystal is/are : | | | | | | | |
|  | a) | Plane of symmetry | b) | Axis of symmetry | c) | Centre of symmetry | d) | None of these |
| 85. | Bragg’s law is given by the equation : | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 86. | Select the correct statement(s) | | | | | | | |
|  | a) | The non-stoichiometric form of is yellow and that of is blue-lilac | | | | | | | |
|  | b) | Solids containing F-centers (Farbe) are paramagnetic | | | | | | | |
|  | c) | Non-stoichiometric compounds are called Berthollidecompounds | | | | | | | |
|  | d) | Conduction by electrons is called -type semiconductors | | | | | | | |
| 87. | In the fluorite structure if the radius ratio is, how many ions does each cation touch? | | | | | | | |
|  | a) | 4 anions | b) | 12 cations | c) | 8 anions | d) | No cations |
| 88. | Recently discovered superconductivity materials are | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 89. | What is true about a bcc unit cell? | | | | | | | |
|  | a) | The number of atoms in the unit cell is 2 | | | | | | | |
|  | b) | In addition to an atom at the center of the body, in a unitcell there are 8 atoms at 8 different corners | | | | | | | |
|  | c) | One-eighth of an atom at a corner of the unit cell | | | | | | | |
|  | d) | None of the above | | | | | | | |
| 90. | The space in which atoms are not present in unit cell is | | | | | | | |
|  | a) | In sc 48% | b) | In fcc 26% | c) | In bcc 32% | d) | In hexagonal 26% |
| 91. | Diamond is | | | | | | | |
|  | a) | A covalent solid | b) | A non-conductor | c) | A lubricant | d) | hybridized |
| 92. | In which of the following systems primitives ? | | | | | | | |
|  | a) | Orthorhombic | b) | Monoclinic | c) | Triclinic | d) | Hexagonal |
| 93. | Graphite is | | | | | | | |
|  | a) | A good conductor | b) | hybridised | c) | An amorphous solid | d) | A covalent crystal |
| 94. | If a mixture of and is melted and then cooled, | | | | | | | |
|  | a) | A solid solution is formed | | | | | | | |
|  | b) | Mixture formed is called eutectic mixture | | | | | | | |
|  | c) | is non-stochiometric solid solution of and | | | | | | | |
|  | d) | Neither nor seperates | | | | | | | |
| 95. | Which is/are not amorphous solid(s)? | | | | | | | |
|  | a) | Rubber | b) | Graphite | c) | Glass | d) | Plastics |
| 96. | Select the correct statement(s) about three-dimensional hcpsystem | | | | | | | |
|  | a) | The number of atoms in hcp unit cell is six | | | | | | | |
|  | b) | The volume of hcp unit cell is | | | | | | | |
|  | c) | The empty space in hcp unit cell is 26% | | | | | | | |
|  | d) | The base area of hcp unit cell is | | | | | | | |
| 97. | Which of the following statements is/are correct? | | | | | | | |
|  | a) | The coordination number of each type of ion in crystal is 8 | | | | | | | |
|  | b) | A metal that crystallizes in bcc structure has a coordination number of 12 | | | | | | | |
|  | c) | A unit cell of an ionic crystal shares some of its ions with other unit cells | | | | | | | |
|  | d) | The length of the unit cell in is 522 pm | | | | | | | |
| 98. | Select the correct statement(s) | | | | | | | |
|  | a) | The conductance through electrons is called -type conduction | | | | | | | |
|  | b) | The conductance through positive holes is called -type conduction | | | | | | | |
|  | c) | The conductance through electrons is called -type conduction | | | | | | | |
|  | d) | The band gap in germanium is small | | | | | | | |
| 99. | Which of the following having their radius ratio between 0.414 and 0.732, i.e., for structure, have their radius ratio not in this range but possess -type structure? | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 100. | Which of the following statements is/are correct? | | | | | | | |
|  | a) | Dislocation of ion from lattice site to interstitial site is called Frenkel defect | | | | | | | |
|  | b) | Missing of and ions from their respective position producing a pair of holes is called Schottkydefect | | | | | | | |
|  | c) | The presence of ions in the vacant interstital sites along with lattice point is called interstital defect | | | | | | | |
|  | d) | Non-stoichiometric is yellow solid | | | | | | | |
| 101. | Which of the following is/are covalent solids? | | | | | | | |
|  | a) |  | b) | Diamond | c) |  | d) | Graphite |
| 102. | Which of the following statements is/are correct? | | | | | | | |
|  | a) | If three ions are missing from their lattice in then there must be two ions somewhere in the lattice | | | | | | | |
|  | b) | Crystals with metal deficiency defects are called super conductors | | | | | | | |
|  | c) | Crystals with metal deficiency are called semiconductors | | | | | | | |
|  | d) | 1 Bohr Magneton = | | | | | | | |
| 103. | What is true about simple cubic type of unit cells? | | | | | | | |
|  | a) | Eight constituents are at different corners of the cube | | | | | | | |
|  | b) |  | | | | | | | |
|  | c) | Contribution by one corner is th of an atom | | | | | | | |
|  | d) | None of the above | | | | | | | |
| 104. | Which of the following statements is/are correct for bothfluorite and antifluorite structures? | | | | | | | |
|  | a) | Cation is present in alternate TVs | | | | | | | |
|  | b) | Anion constitutes lattice | | | | | | | |
|  | c) | Number of formula unit in one unit cell is 4 | | | | | | | |
|  | d) | 100% tetrahedral voids are occupied | | | | | | | |
| 105. | A mineral having the formula crystallizes in the ccp lattice, with A atoms occupying the lattice points. Select the correct statement(s) | | | | | | | |
|  | a) | The coordination number (CN) for A atoms = 8 | | | | | | | |
|  | b) | The CN for B atom = 4 | | | | | | | |
|  | c) | 100% of TVs are occupied by B atoms | | | | | | | |
|  | d) | 50% of TVs are occupied by B atoms | | | | | | | |
| 106. | Identical spheres are undergoing two-dimensional packing in square close packing and hexagonal close packing. Which is correct regarding the spheres? | | | | | | | |
|  | a) | The ratio of coordination number for a sphere in first case to that in second case is 2:3 | | | | | | | |
|  | b) | Packing in second case is more effective | | | | | | | |
|  | c) | Packing in first case is more effective | | | | | | | |
|  | d) | The stacking of layer on first type packing produces simple cubic structure | | | | | | | |
| 107. | Position of OVs in an fcc structure are | | | | | | | |
|  | a) | Corners of unit cell | | | b) | Edge center of unit cell | | |
|  | c) | Body center of unit cell | | | d) | Face center of unit cell | | |
| 108. | The density of is . The length of the unit cell is 654 pm. Atomic mass of Then what is true about the predicted nature of the solid? | | | | | | | |
|  | a) | The unit cell is fcc | | | | | | | |
|  | b) |  | | | | | | | |
|  | c) | There are four constituents/unit cells | | | | | | | |
|  | d) | There are 8 ions at corners and 6 at the centers of the faces | | | | | | | |
| 109. | If the radius of anion is 0.20 nm, the maximum radius of cations which can be filled in respective voids is correctly matched in | | | | | | | |
|  | a) | nm for tetrahedral void | | | b) | nm for triangular void | | |
|  | c) | nm for octahedral void | | | d) | None of the above | | |
| 110. | For which of the following cases, answer is 4? | | | | | | | |
|  | a) | Coordination number of in Zinc blende | | | b) | Number of body diagonal planes in a cube | | |
|  | c) | Formula units in rock salt structure | | | d) | Formula units in structure | | |
| 111. | The correct statement (s) regarding defects in solids is (are): | | | | | | | |
|  | a) | Frenkel defect is usually favoured by a very small difference in the sizes of cation and anion | | | | | | | |
|  | b) | Frenkel defect is a dislocation defect | | | | | | | |
|  | c) | Trapping of an electron in the lattice leads to the formation of F-centre | | | | | | | |
|  | d) | Schottky defects have no effect on the physical properties of solids. | | | | | | | |
| 112. | Which is/are amorphous solid(s)? | | | | | | | |
|  | a) |  | b) |  | c) | Glass | d) | Plastics |
| 113. | Molecular crystals exist in : | | | | | | | |
|  | a) | Crystalline state | b) | Amorphous state | c) | Non-crystalline state | d) | None of these |
| 114. | Select the correct statement(s) | | | | | | | |
|  | a) | Solids with F-centers are paramagnetic | | | | | | | |
|  | b) | Ferrimagnetic character of at room temperature changes to paramagnetic character at 850 K | | | | | | | |
|  | c) | Anti-ferrimagnetic changes to paramagnetic at 150 K | | | | | | | |
|  | d) | Non-stoichiometric is a -type semiconductor | | | | | | | |
| 115. | Following three planes in an fcc unit cell are shown in the figure below. Consider the following statements and choose the correct option/options that follow:  C:\Users\Whalesoft\Desktop\Untitled-2.jpg | | | | | | | |
|  | a) | contains no three dimensional voids | | | | | | | |
|  | b) | contains only octahedral voids | | | | | | | |
|  | c) | contains both octahedral and tetrahedral voids | | | | | | | |
|  | d) | All of these | | | | | | | |
| 116. | Aluminium metal has a density of 2.72 g and crystallizes in a cubic lattice with an edge of 404 pm. Which is/are correct? | | | | | | | |
|  | a) | It forms an fcc unit cell | | | b) | It forms a bcc unit cell | | |
|  | c) | Its coordination number is 8 | | | d) | Its coordination number is 12 | | |
| 117. | Non-stoichiometric compounds are | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 118. | An octahedron has | | | | | | | |
|  | a) | 8 corners | b) | 8 faces | c) | 8 edges | d) | 12 edges |
| 119. | If the radius of and then which of the following is/are correct statement? | | | | | | | |
|  | a) | The edge length of unit cell is 4.2 | | | b) | The coordination number for is 6 | | |
|  | c) | has bcc-type structure | | | d) | ions touch each other along the edge | | |
| 120. | Position of octahedral voids in fcc structure is/are | | | | | | | |
|  | a) | Edge center of unit cell | | | b) | Body center of unit cell | | |
|  | c) | Corners of unit cell | | | d) | Face center of unit cell | | |
| 121. | In which of the following systems interfacial angles but ? | | | | | | | |
|  | a) | Monoclinic | b) | Rhombohedral | c) | Triclinic | d) | Hexagonal |
| 122. | Given is the arrangement of atoms in a crystllographic plane. Which plane correctly represent(s) the adjacent drawn structure? | | | | | | | |
|  | a) | Face plane in fcc | | | b) | Body diagonal plane in fcc | | |
|  | c) | Face plane in bcc | | | d) | Body diagonal plane in bcc | | |
| 123. | An hcp and a ccp structure for a given element would be expected to have | | | | | | | |
|  | a) | The same co-ordination number | | | b) | The same density | | |
|  | c) | The same packing fraction | | | d) | All of these | | |
| 124. | Ions of which are touched by 1 body diagonal are | | | | | | | |
|  | a) | ions present at the corner of cube | | | b) | ions present at the face center of cube | | |
|  | c) | ions present at the edge center of cube | | | d) | present at body center of cube | | |
| 125. | Position of TVs in closest packed structure is/are | | | | | | | |
|  | a) | Edge center of unit cell | | | | | | | |
|  | b) | Two TVs on each body diagonal | | | | | | | |
|  | c) | Position of each TV from corner is | | | | | | | |
|  | d) | Face center of unit cell | | | | | | | |

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| **Assertion - Reasoning Type** | | | |
| This section contain(s) 0 questions numbered 126 to 125. Each question containsstatement 1(Assertion) and statement 2(Reason). Each question has the 4 choices (a), (b), (c) and (d) out of which **only one** is correct. | | | |
|  | a) | Statement 1 is True, Statement 2 is True; Statement 2 **is** correct explanation for Statement 1 | |
|  | b) | Statement 1 is True, Statement 2 is True; Statement 2 **is not** correct explanation for Statement 1 | |
|  | c) | Statement 1 is True, Statement 2 is False | |
|  | d) | Statement 1 is False, Statement 2 is True | |

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| 126 |  | | |
|  | **Statement 1:** | | The conductance through electrons is called *n-*type conduction and if through positive holes it is called *p-*type conduction. |
|  | **Statement 2:** | | Doping involves preparation of semiconductors by the presence of impurities in the intrinsic semiconductor. |

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| 127 |  | | |
|  | **Statement 1:** | | Ferromagnetic substances are strongly attracted by magnetic field. |
|  | **Statement 2:** | | Ferromagnetism arises due to spontaneous alignment magnetic moments of ions or atoms in the same direction. |

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| 128 |  | | |
|  | **Statement 1:** | | In any ionic solid [MX] with Schottky defect, the number of positive and negative ions are same |
|  | **Statement 2:** | | An equal number of cation and anion vacancies is present |

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| 129 |  | | |
|  | **Statement 1:** | | In crystal, ions adopt bcc arrangement |
|  | **Statement 2:** | | For atoms adopting bcc arrangement, there are TVs |

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| 130 |  | | |
|  | **Statement 1:** | | Diamond and graphite are polymorphic forms. |
|  | **Statement 2:** | | Carbon adopts different structural arrangements under different conditions to give there two forms. |

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| 131 |  | | |
|  | **Statement 1:** | | Triclinic system is the most unsymmetrical system |
|  | **Statement 2:** | | No axial angle is equal to in triclinic system |

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| 132 |  | | |
|  | **Statement 1:** | | Covalent crystals have higher melting point |
|  | **Statement 2:** | | Covalent bonds are stronger than ionic bonds |

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| 133 |  | | |
|  | **Statement 1:** | | Co-ordination number of changes from 8 : 8 to 6 : 6 on heating. |
|  | **Statement 2:** | | The crystal structure of changes to on heating. |

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| 134 |  | | |
|  | **Statement 1:** | | Solids containing F centers are paramagnetic |
|  | **Statement 2:** | | Solids containing F centers conduct electricity and it is -type semiconduction |

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| 135 |  | | |
|  | **Statement 1:** | | Graphite is an example of tetragonal crystal system. |
|  | **Statement 2:** | | For a tetragonal system a=b |

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| 136 |  | | |
|  | **Statement 1:** | | Group-15-doped crystals of are called -type semi conductors |
|  | **Statement 2:** | | Neutrons are responsible for the semi-conducting properties |

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| 137 |  | | |
|  | **Statement 1:** | | The electrical conductivity of a semiconductor increases with increase in temperature |
|  | **Statement 2:** | | With increase in temperature, large number of electrons from the valence band can jump to the conduction band |

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| 138 |  | | |
|  | **Statement 1:** | | Group-13-doped crystals of are called a -type semiconductors |
|  | **Statement 2:** | | Positive holes are responsible for the semiconducting properties |

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| 139 |  | | |
|  | **Statement 1:** | | Graphite is an example of tetragonal crystal system |
|  | **Statement 2:** | | For a tetragonal system, and |

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| 140 |  | | |
|  | **Statement 1:** | | In sodium chloride crystal, ions occupy OVs while ions occupy vertices of octahedron |
|  | **Statement 2:** | | The radius ratio of lies between 0.4 and 0.7 |

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| 141 |  | | |
|  | **Statement 1:** | | Glasses can be moulded and blows into various shapes. |
|  | **Statement 2:** | | Glasses have a low melting point. |

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| 142 |  | | |
|  | **Statement 1:** | | For ionic solids exhibiting Frenkel defects, the density remains unaltered. |
|  | **Statement 2:** | | Doping of group 14 elements with suitable elements of group 13 produces *p*-type of semiconductors. |

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| 143 |  | | |
|  | **Statement 1:** | | In crystal, the coordination number of ion is 8 |
|  | **Statement 2:** | | ions in adopt bcc type of packing |

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| 144 |  | | |
|  | **Statement 1:** | | In the rock salt type structure, all the OVs are occupied by ions |
|  | **Statement 2:** | | Number of OVs = Number of ions in the packing |

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| 145 |  | | |
|  | **Statement 1:** | | Equivalent conducting power of and ion is maximum and abnormally high among all the ions. |
|  | **Statement 2:** | | There occurs a proton jump from one water molecule to other leading to grothus type conductance. |

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| 146 |  | | |
|  | **Statement 1:** | | Frenkel defects are found in silver halides. |
|  | **Statement 2:** | | Frenkel defects are commonly found in ionic solids. |

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| 147 |  | | |
|  | **Statement 1:** | | In sodium chloride crystal, the coordination number of is 6 |
|  | **Statement 2:** | | The sodium atom is smaller than chlorine atom |

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| 148 |  | | |
|  | **Statement 1:** | | In any ionic solid (*MX)* with Schottky defects, number of positive and negative ions are same. |
|  | **Statement 2:** | | Equal number of cation and anion vacancies are present. |

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| 149 |  | | |
|  | **Statement 1:** | | Space or crystal lattice have symmetry of the arrangement of points. |
|  | **Statement 2:** | | nλ=2dSin ; is known as Bragg’s equation. |

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| 150 |  | | |
|  | **Statement 1:** | | Initially term pseudo solid was given for solids which were easily distorted by bending and compressing forces. They even tend to flow slowly under of own weight and lose shape. |
|  | **Statement 2:** | | These characteristics are shown by pseudo solids as in pinch. Glass and thus the name pseudo solid was replaced by super cooled liquids. |

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| 151 |  | | |
|  | **Statement 1:** | | Frenkel defects are shown by |
|  | **Statement 2:** | | ions have small size |

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| 152 |  | | |
|  | **Statement 1:** | | In hexagonal close packing voids are between three touching spheres whose centres lie at the corners of an equilateral triangle. |
|  | **Statement 2:** | | In hexagonal close packing voids are called square voids. |

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| 153 |  | | |
|  | **Statement 1:** | | Band gap in germanium is small. |
|  | **Statement 2:** | | The energy spread of each germanium atomic energy level is infinitesimally small. |

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| 154 |  | | |
|  | **Statement 1:** | | Bragg’s equation has no solution if and . |
|  | **Statement 2:** | | Bragg’s equation is : |

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| 155 |  | | |
|  | **Statement 1:** | | 6 : 6 co-ordination at normal temperature and pressure changes to 8 : 8 co-ordinations at high pressure. |
|  | **Statement 2:** | | Pressure influences the structure of solids. |

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| 156 |  | | |
|  | **Statement 1:** | | The density of crystal having Schottky defect is lowered |
|  | **Statement 2:** | | The crystals suffering from Schottkydefect have same number of cations and anions missing from their normal lattice sites |

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| 157 |  | | |
|  | **Statement 1:** | | Solids having more F-centres possess intense colours. |
|  | **Statement 2:** | | Excess of in solid having F-centres makes it appear to pink. |

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| 158 |  | | |
|  | **Statement 1:** | | The size of a cation is larger in TV than in OV |
|  | **Statement 2:** | | Cations occupy more space than anions is crystal packing |

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| 159 |  | | |
|  | **Statement 1:** | | The close packing of atoms in cubic structure is in the order, fcc > bcc > sc. |
|  | **Statement 2:** | | Packing density = |

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| 160 |  | | |
|  | **Statement 1:** | | Antiferromagnetic substances on heating to high temperature become paramagnetic |
|  | **Statement 2:** | | On heating, the randomization of spins occurs |

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| 161 |  | | |
|  | **Statement 1:** | | Zinc blende and wurtzite both have fcc arrangement of ions |
|  | **Statement 2:** | | A unit cell of both has four formula units of |

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| 162 |  | | |
|  | **Statement 1:** | | Non-stoichiometric compounds are called Bertholide compounds. and crystal, when heated in an atmosphere of vapours, respectively, they impart violet and yellow colours to respectively |
|  | **Statement 2:** | | Metal excess defect is due to the presence of extra cations at the interstitial sites. The excess metal ions move to the interstitial sites and the electrons to the neighbouring sites. The colour results by the excitation of these electrons by absorbing suitable energy from visible light. When the excited electron comes back to the ground state, there is emission of radiation in the visible region and gives complimentary colour |

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| 163 |  | | |
|  | **Statement 1:** | | is more closely packed than ccp |
|  | **Statement 2:** | | has a CN of 12, whereas ccp has a CN of 8 |

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| 164 |  | | |
|  | **Statement 1:** | | Solids containing F-centres are paramagnetic. |
|  | **Statement 2:** | | F-centres solids possess holes occupied by unpaired electrons. |

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| 165 |  | | |
|  | **Statement 1:** | | bcc arrangement is less closely packed than ccp arrangement. |
|  | **Statement 2:** | | In ccp 74% of the available space is occupied by spheres bcc in bcc only 68% of the space is occupied by spheres. |

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| 166 |  | | |
|  | **Statement 1:** | | In NaCl crystal each Na+ ion is touching 6Cl- ions but these Cl- ions do not touch each other. |
|  | **Statement 2:** | | The radius ratio r Na /r Cl- is greater than 0.414 required for exact fitting. |

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| 167 |  | | |
|  | **Statement 1:** | | 8 : 8 co-ordination of at low temperature changes to 6:6 co-ordination at 760K. |
|  | **Statement 2:** | | Temperature also influence the structure of solids. |

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| 168 |  | | |
|  | **Statement 1:** | | A crystal having fcc structure is more closely packed than a crystal having bcc structure. |
|  | **Statement 2:** | | Packing fraction for fcc structure is double that of bcc structure. |

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| 169 |  | | |
|  | **Statement 1:** | | In rock salt structure, all the octahedral voids in the close packing of anions are occupied by cations. |
|  | **Statement 2:** | | In rock salt structure, the distance of closest approach between two anions equal to half the face diagonal of unit cell. |

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| **Matrix-Match Type** | | | | | | | | | |
| This section contain(s) 0 question(s). Each question contains Statements given in 2 columns which have to be matched. Statements (A, B, C, D) in **columns I** have to be matched with Statements (p, q, r, s) in **columns II**. | | | | | | | | | |

| 170. |  | | | | | | | | |

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|  | **Column-I** | | | **Column- II** | | | |
|  | **(A)** | Hcp | | (p) | |  | |
|  | **(B)** | Ccp | | (q) | | 0.48 | |
|  | **(C)** | Bcc | | (r) | |  | |
|  | **(D)** | Sc | | (s) | |  | |
|  | **(E)** | Dc(diamond cubic) | | (t) | |  | |
|  | **CODES :** | | | | | | | |

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|  |  | **A** | **B** | **C** | **D** |  |  |
|  | **a)** | r | p | q | s |  |  |
|  | **b)** | p | r | s | q |  |  |
|  | **c)** | s | q | p | r |  |  |
|  | **d)** | p | s | q | s |  |  |

| 171. |  | | | | | | | | |

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|  | **Column-I** | | | **Column- II** | | | |
|  | **(A)** | Depature from regularity in the arrangement of constitutent particles in a crystal | | (p) | | Zinc blende | |
|  | **(B)** | Cubic | | (q) | | Defect or imperfection | |
|  | **(C)** | Glass and fused silica | | (r) | |  | |
|  | **(D)** | Tetrahedral | | (s) | | Amorphous solid | |
|  | **CODES :** | | | | | | | |

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|  |  | **A** | **B** | **C** | **D** |  |  |
|  | **a)** | p | r | q | s |  |  |
|  | **b)** | q | p | s | r |  |  |
|  | **c)** | s | q | r | p |  |  |
|  | **d)** | r | s | p | q |  |  |

| 172. |  | | | | | | | | |

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|  | **Column-I** | | | **Column- II** | | | |
|  | **(A)** | Simple cubic and face-centred cubic parameters | | (1) | | have these cell | |
|  | **(B)** | Cubic and rhombohedral | | (2) | | Are two crystal system | |
|  | **(C)** | Cubic and tetragonal | | (3) | | Have only two crystallo-graphic angles of 900 | |
|  | **(D)** | Hexagonal and monoclinic | | (4) | | Belong to same crystal system | |
|  | **CODES :** | | | | | | | |

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|  |  | **A** | **B** | **C** | **D** |  |  |
|  | **a)** | 1,4 | 1,2 | 2 | 2,3 |  |  |
|  | **b)** | 3,2 | 3 | 4,2 | 1,2 |  |  |
|  | **c)** | 2 | 2,3 | 1,4 | 4,2 |  |  |
|  | **d)** | 1,2 | 4,1 | 3 | 2,3 |  |  |

| 173. |  | | | | | | | | |

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|  | **Column-I** | | | **Column- II** | | | |
|  | **(A)** | C:\Users\Whalesoft\Desktop\Untitled-2.jpg | | (p) | | 101 | |
|  | **(B)** | C:\Users\Whalesoft\Desktop\Untitled-2.jpg | | (q) | | 110 | |
|  | **(C)** | C:\Users\Whalesoft\Desktop\Untitled-2.jpg | | (r) | | 022 | |
|  | **(D)** | C:\Users\Whalesoft\Desktop\Untitled-2.jpg | | (s) | |  | |
|  | **(E)** | C:\Users\Whalesoft\Desktop\Untitled-2.jpg | | (t) | | 220 | |
|  | **CODES :** | | | | | | | |

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|  |  | **A** | **B** | **C** | **D** | **E** |  |
|  | **a)** | q | p | s | r | t |  |
|  | **b)** | s | r | t | q | t |  |
|  | **c)** | t | q | r | s | t |  |
|  | **d)** | p | t | q | r | t |  |

| 174. |  | | | | | | | | |

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|  | **Column-I** | | | **Column- II** | | | |
|  | **(A)** | Body diagonal | | (p) | | Only 2 face center ions | |
|  | **(B)** | axis (tetrad axis) | | (q) | | Only 2 corners ions | |
|  | **(C)** | Rectangular plane | | (r) | | Body center ion | |
|  |  |  | | (s) | | Only one octahedral void | |
|  | **CODES :** | | | | | | | |

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|  |  | **A** | **B** | **C** | **D** |  |  |
|  | **a)** | Q,r,s | p,r,s | r |  |  |  |
|  | **b)** | p,r,s | q,r,s | q |  |  |  |
|  | **c)** | r | p,r | q,s |  |  |  |
|  | **d)** | p,r | r | q,r,s |  |  |  |

| 175. |  | | | | | | | | |

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| --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Column-I** | | | **Column- II** | | | |
|  | **(A)** | F –centers | | (p) | | Extra cations present in interstitial sites | |
|  | **(B)** | Metal excess defect | | (q) | | Some cations are replaced by one of higher valence | |
|  | **(C)** | Metal deficinecy defect | | (r) | | Both cations and anions are missing from lattices | |
|  | **(D)** | Schottky defects | | (s) | | Electrons trapped in anionic vacancies | |
|  | **CODES :** | | | | | | | |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | **A** | **B** | **C** | **D** |  |  |
|  | **a)** | p | q | r | s |  |  |
|  | **b)** | s | r | p | q |  |  |
|  | **c)** | r | s | q | p |  |  |
|  | **d)** | s | p | q | r |  |  |

| 176. |  | | | | | | | | |

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| --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Column-I** | | | **Column- II** | | | |
|  | **(A)** | Rochelle salt | | (p) | | Ferroelectric | |
|  | **(B)** | Ferrites | | (q) | | Paramagnetic | |
|  | **(C)** | Nitric oxide (NO) | | (r) | | Antiferromagnetic | |
|  | **(D)** | Manganese dioxide | | (s) | | Ferrimagnetic | |
|  | **(E)** | (barium titnate) | | (t) | |  | |
|  | **CODES :** | | | | | | | |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | **A** | **B** | **C** | **D** | **E** |  |
|  | **a)** | p | q | r | t | p,q |  |
|  | **b)** | p,q | s | q | r | p,q |  |
|  | **c)** | s | p,q | r | s | p,q |  |
|  | **d)** | r | q | s | p,q | p,q |  |

| 177. |  | | | | | | | | |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Column-I** | | | **Column- II** | | | |
|  | **(A)** |  | | (p) | | Rutile structure | |
|  | **(B)** | and | | (q) | | Inverse 2:3 spinel structure | |
|  | **(C)** | and | | (r) | | Normal 2:3 spinel structure | |
|  | **(D)** |  | | (s) | | Perovskite structure | |
|  | **(E)** | and | | (t) | | Fluorite-type structure | |
|  | **CODES :** | | | | | | | |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | **A** | **B** | **C** | **D** | **E** |  |
|  | **a)** | q | r | p | s | t |  |
|  | **b)** | r | s | t | q | t |  |
|  | **c)** | p | q | r | t | t |  |
|  | **d)** | t | p | q | r | t |  |

| 178. |  | | | | | | | | |

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| --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Column-I** | | | **Column- II** | | | |
|  | **(A)** | For spinel structure, | | (p) | | 2:1 | |
|  | **(B)** | For spinel structure | | (q) | | 1:2 | |
|  | **(C)** | For inverse spinel structure | | (r) | | 7:2 | |
|  | **(D)** | For inverse spinel structure | | (s) | | 2:7 | |
|  | **CODES :** | | | | | | | |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | **A** | **B** | **C** | **D** |  |  |
|  | **a)** | r | s | q | p |  |  |
|  | **b)** | q | r | p | p |  |  |
|  | **c)** | p | q | r | s |  |  |
|  | **d)** | s | p | s | r |  |  |

| 179. |  | | | | | | | | |

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| --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Column-I** | | | **Column- II** | | | |
|  | **(A)** |  | | (p) | |  | |
|  | **(B)** |  | | (q) | |  | |
|  | **(C)** |  | | (r) | |  | |
|  | **CODES :** | | | | | | | |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | **A** | **B** | **C** | **D** |  |  |
|  | **a)** | q | r | p |  |  |  |
|  | **b)** | s | p | q |  |  |  |
|  | **c)** | p | q | r |  |  |  |
|  | **d)** | r | s | p |  |  |  |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Linked Comprehension Type**  This section contain(s) 14 paragraph(s) and based upon each paragraph, multiple choice questions have to be answered. Each question has atleast 4 choices (a), (b), (c) and (d) out of which **only one** is correct.  **Paragraph for Question Nos. 180 to -180** | | | | | | | | |
| The "OLIVINE" series of minerals consists ofcrystals in which Fe2+ and Mg2+ions may substitute for each other causing substitutional impurity defects without changing the volume of unit cell. In "OLIVINE" series of minerals,O2-ions exist as fcc with Si4+ occupying one-fourth of OVs and divalent metal ions occupying one-fourth of TVs. The density of “forsterite" (magnesium silicate) is 3.21 g cm-3 and that of "fayalite” (ferrous silicate) is 4.34 g cm-3 | | | | |

| 180. | The formula of "fayalite mineral” is: | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| **Paragraph for Question Nos. 181 to - 182** | | | | | | | | |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| AX, AY, BX, and BY have rock salt type structure with following internuclear distances:SaltAnion-aniondistance in ÅCation-aniondistance in ÅAX2.401.70AY1.631.15BX2.661.88BY2.091.48 | | | | |

| 181. | Ionic radii of and , respectively, are | | | | | | | |
|  | a) | and | b) | 0.68 and 0.35 | c) | 1.20 and 0.80 | d) | 0.80 and 1.20 |
| **Paragraph for Question Nos. 182 to - 183** | | | | | | | | |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| The length of a unit (a) in the Ni crystal is 0.352 nm. The diffraction of X-rays of 0.154 nm wavelength λ from a Ni crystal occurs at 22.2°, 25.9°, and 38.2°. By using Bragg’s law, nλ=2dsinθ), and assuming that the diffractions are first order (n=1), the distances are calculated to be 0.204 nm, 0.176 nm, and 0.124 nmThe various structures for the Ni crystal are represented as: | | | | |

| 182. | The distance of 0. represent which structure? | | | | | | | |
|  | a) | I | b) | II | c) | III | d) | All |
| **Paragraph for Question Nos. 183 to - 183** | | | | | | | | |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| In crystalline solids atoms or molecules are arranged in a regular and long range order fashion in a three dimensional pattern. These have sharp melting point, flat faces, sharp edges, bounded by well defined planes. A large number of unit cells, each of which possess a definite geometry bounded by plane faces give rise to the formation of a crystal. A point at the corner of unit cell contributes for 1/8 of each such point to unit cell. A point along an edge contributes for 1/4 of each such point to unit cell. A body centred point contributes for 1 each such points to unit cell. Coordination number is the number of nearest neighbours that each ion is surrounded by an oppositely charged ions. Radius of unit cell in sc, fcc and bcc is a2,a22 and 3a4 where a is edge length of cell. | | | | |

| 183. | A mineral having the formula crystallises in the cubic closed packed lattice, with atoms occupying the lattice points and tetrahedral voids. The co-ordination number of and fraction of the tetrahedral sites occupied by atom respectively are: | | | | | | | |
|  | a) | 8, 4, 100% | b) | 4, 8, 100% | c) | 8, 6, 57% | d) | 6, 8, 57% |
| **Paragraph for Question Nos. 184 to - 184** | | | | | | | | |

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

| 184. | The number of atoms in this HCP unit cell is : | | | | | | | |
|  | a) | 4 | b) | 6 | c) | 12 | d) | 17 |

**Integer Answer Type**

| 185. | Number of Al atoms per unit cell of Al in its crystal lattice is …. | | | | | | | |
| 186. | Give the total score of the correct statements of the following   |  |  |  | | --- | --- | --- | |  | **Statements** | **Score** | | a. | First two nearest neighbour distances for sc lattice are, respectively, and | 4 | | b. | First two nearest neighbour distances for bcc lattice are, respectively, and | 3 | | c. | In (wurtzite), ions occupy lattice point while in (zinc blende), ions occupy alternate TVs | 2 | | d. | In point defects, volume and geometry of the crystal do not change | 1 | | | | | | | | |
| 187. | crystallises in type lattice. The crystal is however non-stoichiometric as and deficient in iron. Some cation sites are vacant and some contain so that it becomes electrically neutral. The % of cation sites vacant are …. | | | | | | | |
| 188. | Number of hexagonal faces that are present in a truncated octahedran. | | | | | | | |
| 189. | If the distance between in lattice is the edge length of cube is ….. | | | | | | | |
| 190. | A solid has a structure in which X atoms are located at cubic corners of unit cell, O atom are at the edge centers and Y atoms at cube center  Then the formula of compound is  If two atoms of O are missing from any of two edge centers per unit cell, then the molecular formula is .  Then, find the value of | | | | | | | |
| 191. | In HCP arrangement of atoms, coordination no. of atoms in the middle layer is … | | | | | | | |
| 192. | If a solid having structure is heated so that the ions along two of the axis passing through the face center particles are lost and bivalent ion enters here to maintain the electrical neutrality, so that the new formula unit becomes Report the value of | | | | | | | |
| 193. | The number of tetrahedral voids present in bcc lattice is …… | | | | | | | |
| 194. | The following figure shows the unit cell of a compound, i.e., a mixed oxide of yttrium, barium, and copper. The formula of mixed oxide is . Find the value of | | | | | | | |
| 195. | The no. of octahedral sites per square are in a ccp (fcc) structure ….. | | | | | | | |
| 196. | If edge length of a bcc crystallized is the atomic radius is …. | | | | | | | |
| 197. | A bcc lattice is made up of hollow spheres of B. Spheres of solidsA are present in hollow spheres of B. The radius of A is half of the radius of B. The ratio of total volume of spheres of B unoccupied by A in a unit cell and volume of unit cell is . Find the value of A | | | | | | | |
| 198. | Caesium atoms are the largest naturally occurring atoms. The radius of Cs atom is . The number of moles of Cs atoms to be laid side by side to give a row of Cs atoms 2.50 cm long is . Find the value of | | | | | | | |
| 199. | Find the coordination number of in | | | | | | | |
| 200. | ions are arranged in ccp in a spinel structure. ions occupy 1/8 of TVs and ions occupy half of OV. The void volume of unit cell A. Find the value of A | | | | | | | |
| 201. | Silver (at. wt. = ) has a density of . The number of silver atoms on a surface area of  can be expressed in scientific notations as . The value of is : | | | | | | | |
| 202. | Given the total score of the correct statements of the following   |  |  |  | | --- | --- | --- | |  | **Statements** | **Score** | | a. | In an antifluorite structure, cations are present in all TVs | 1 | | b. | If the radius of cation is 0.35 pm and that of anion is 0.95 pm, then the CN of the crystal is 4 | 2 | | c. | An atom or ion is transfered from a lattice site to an interstitial position in Frenkel defect | 3 | | d. | The density of a crystal always decreases in point defects | 4 | | | | | | | | |
| 203. | Lattice energy of is kcal/mol and solution enthalpies of cation and anion respectively are and kcal/mol. The enthalpy of solution of in kcal is … | | | | | | | |
| 204. | Metal M of radius 50 nm is crystallized in fcc type and made cubical crystal such that face of unit cells aligned with face of cubical crystal. If the total number of metal atoms of M at all faces of cubical crystal is , then the area of one face of cubical crystal is . Find the value of A | | | | | | | |
| 205. | A mineral having the formula crystallises in cubic close packed lattice, with atoms occupying the lattice point. The radio of coordination no. of and is …. | | | | | | | |
| 206. | A crystal of sodium hydride has fcc unit cell of ions with ions at the body centres of unit cell and in the centre of edges. The no. of that touch each is ….. | | | | | | | |
| 207. | The ratio of coordination no. of Al and no. of Al atoms per unit cell in fcc lattice is… | | | | | | | |
| 208. | Co-ordination number of Al in the crystalline state of is : | | | | | | | |
| 209. | In the figure given below, four parallelogram are shown. How many parallelograms are unit cells? | | | | | | | |

**ACTIVE SITE TUTORIALS**

**Date :** 20-08-2019 **TEST ID: 492**

**Time :** 11:12:00 **CHEMISTRY**

**Marks :** 697

1.THE SOLID STATE

|  |
| --- |
| **: ANSWER KEY :** |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **1) c 2) a 3) b 4) d**  **5) a 6) c 7) c 8) c**  **9) d 10) b 11) b 12) d**  **13) b 14) b 15) c 16) b**  **17) a 18) c 19) c 20) b**  **21) c 22) a 23) a 24) b**  **25) a 26) d 27) b 28) b**  **29) a 30) c 31) b 32) a**  **33) a 34) c 35) a 36) b**  **37) a 38) d 39) a 40) c**  **41) a 42) b 43) b 44) c**  **45) c 46) d 47) d 48) a**  **49) a 50) a 51) b 52) d**  **53) b 54) a 55) b 56) b**  **57) c 58) b 59) d 60) b**  **61) d 62) b 63) b 64) a**  **65) c 66) b 67) d 68) c**  **69) a 70) d 71) d 72) b**  **73) b 74) b 75) a 76) b**  **77) a 78) a 79) c 80) a**  **1) a,c,d 2) a,b,c,d 3) a,b,c 4) a, b, c**  **5) b, d 6) a,b,c,d 7) b,c 8) a,b,d**  **9) a,b,c 10) a,b,c,d 11) a,b,d 12) a,b,c**  **13) a,b,d 14) a,b,c,d 15) b 16) a,b,c,d**  **17) a,c,d 18) b,c,d 19) a,b,c,d 20) a,b,c,d**  **21) b,d 22) a,c,d 23) a,b,c 24) c,d**  **25) a,b,c 26) a,b,d 27) b,c 28) a,b,c,d**  **29) a,b,c 30) a,c 31) b, c 32) c, d**  **33) a, b, c 34) a,b,c,d 35) a,b,c,d 36) a,d**  **37) a,b,c,d 38) b,d 39) a,c 40) a,b**  **41) a,b 42) a,d 43) a,c 44) a,d**  **45) b,c 1) d 2) c 3) a 4) c**  **5) a 6) b 7) c 8) c**  **9) b 10) d 11) c 12) a**  **13) a 14) e 15) d 16) a**  **17) d 18) a 19) b 20) c**  **21) b 22) b 23) c 24) b**  **25) d 26) a 27) a 28) a**  **29) c 30) c 31) a 32) a**  **33) e 34) c 35) a 36) e**  **37) d 38) e 39) c 40) d**  **41) a 42) c 43) a 44) d**  **1) a 2) b 3) a 4) a**  **5) a 6) d 7) b 8) a**  **9) b 10) c 1) a 2) a 3) c 4) a**  **5) a 1) 4 2) 8 3) 4 4) 8**  **5) 4 6) 4 7) 6 8) 7**  **9) 4 10) 13 11) 1 12) 6**  **13) 7 14) 8 15) 4 16) 2**  **17) 7 18) 6 19) 4 20) 2**  **21) 2 22) 6 23) 3 24) 4**  **25) 2** | | | | |

**ACTIVE SITE TUTORIALS**

**Date :** 20-08-2019 **TEST ID: 492**

**Time :** 11:12:00 **CHEMISTRY**

**Marks :** 697

1.THE SOLID STATE

|  |
| --- |
| **: HINTS AND SOLUTIONS :** |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1 | **(c)**  andions have largest sizes | | | | | | | |
| 2 | **(a)**  For face-centered cubic unit cell (e.g., that of ), edge length = Distance between cation and anion pm (given). Putting 110 pm, we get pm | | | | | | | |
| 3 | **(b)**  A TV in fcc is formed by 3 face center atoms and one corner atom. In total, 8 such tetrahedrons are possible | | | | | | | |
| 4 | **(d)**  (At no.=28)  and  Hence, 96% ion of and 4% ions of are present  Let number of ion present in the crystal =  Applying electroneutrality rule,  Total positive charge = Total negative charge  So formula of crystalor | | | | | | | |
| 5 | **(a)**  forand for/unit cell | | | | | | | |
| 6 | **(c)**  Distance between two layer (A and B)  Let is the number of imaginary planes  Hence,  Thus, maximum number of layers = 7 (see figures below) | | | | | | | |
| 7 | **(c)**  Factual statement | | | | | | | |
| 8 | **(c)**  Coordination number of Al in in (solid) crystalline state is 6. | | | | | | | |
| 9 | **(d)**  hcp has 12 nearest neighbours | | | | | | | |
| 10 | **(b)**  Volume of unit cell  Mass of unit cell g  Number of molecules in one unit cell | | | | | | | |
| 11 | **(b)**  Since equal number of cations and anions are missing in the figure given, so it Schottky defect | | | | | | | |
| 12 | **(d)**  The truncated octahedron is the 14-faced Archimedean solid, with 14 total faces : 6 squares and 8 regular hexagons.  The truncated octahedron is formed by removing the six right square pyramids one from each point of a regular octahedron as :  D:\Common Folder\Data Typing Files\Sujata\scan\scan\chemistry\15.The solid state2.1.jpg  Truncated Octachedron | | | | | | | |
| 14 | **(b)**  Factual statement | | | | | | | |
| 15 | **(c)**  units  One unit cell contains 4 units. Hence, number of the unit cell present = | | | | | | | |
| 16 | **(b)**  For a given radius of anion  Radius ratio for OV and TV is as follows:  Hence, size of OV is larger than that of TV | | | | | | | |
| 17 | **(a)**  -type structure)  For fcc, | | | | | | | |
| 18 | **(c)**  From figure, it is clear 4 corners and 2 face centers lie on the shaded plane. Therefore, there will be six C atoms, and atoms (marked A) in TVs do not touch other.  Fig. (a) is not possible; four atom marked C  Fig. (b) is not possible, atoms A in TVs are not shown in figure  Fig. (c) is possible, since atoms A in TVs are not touching each other  Fig. (d) is not possible, since atoms A in TVs are touching each other | | | | | | | |
| 19 | **(c)**  As is body-centered, | | | | | | | |
| 20 | **(b)**  lies in OVs formed by ( touches six ions)    are not shown touching in the figure. Each atom shown is present at the face center of each cube    Try to visualize two cubes exactly above these two cubes.Each atom shown is present at the edge center and body center of each cube  Distance between two nearest  Thus, the number of nearest neighbours of ion = 6 ions  The number of next nearest neighbours of ion = 12 ions | | | | | | | |
| 21 | **(c)**  The volume available  (Number of unit cells)  Number of unit cell | | | | | | | |
| 22 | **(a)**  Factual statement | | | | | | | |
| 23 | **(a)**  For OV, | | | | | | | |
| 24 | **(b)**  For bcc, | | | | | | | |
| 25 | **(a)**  Look at corner atom of fcc unit cell. A corner atom can support 8 unit cell. In each cube, at a distance of from corner atom, there is a tetrahedral void; it implies each atom is surrounded by eight tetrahedral voids. At the center of edge, there is an octahedral void. Each corner can support six edges and hence it is surrounded by six octahedral voids | | | | | | | |
| 26 | **(d)**  All factual statements | | | | | | | |
| 27 | **(b)**  From radius ratio, it is expected that ion occupy OVs; however, the value of 0.44 is only slightly larger than for OV. There is also some covalent character in the interaction, which tends to shorten the interaction distance | | | | | | | |
| 28 | **(b)**  For bcc,  Edge length not covered by atom  % of fraction not covered = | | | | | | | |
| 29 | **(a)**  Factual statement | | | | | | | |
| 30 | **(c)**  Volume of one mole of silver atoms  Volume of one silver atom  So,  Area of each silver atom,  So, number of silver atoms in given area  So, | | | | | | | |
| 31 | **(b)**  From radius ratio, it is clear that cation ion) lies in body centered or cubic void, where | | | | | | | |
| 32 | **(a)**  For fcc, | | | | | | | |
| 33 | **(a)**  In hcp, a particle as shown here is surrounded by 12 particles, six in its own plane and three each above and below the plane | | | | | | | |
| 34 | **(c)**  Factual statement | | | | | | | |
| 35 | **(a)**  is Group 14 elements. Positive holes can be created by adding Group 13 element, i.e., trivalent impurity | | | | | | | |
| 36 | **(b)**  is used in solar cells | | | | | | | |
| 37 | **(a)**  Body diagonal  Distance between and is | | | | | | | |
| 38 | **(d)**  Packing fraction | | | | | | | |
| 39 | **(a)**  Edge length  (body diagonal)  Therefore | | | | | | | |
| 40 | **(c)**  For fcc,  of  Number of atoms in 1.0  Number of unit cells in 1.0 | | | | | | | |
| 41 | **(a)**  -type (factual statement) | | | | | | | |
| 42 | **(b)**  W atoms/unit cell  O atoms/unit cell  Na atoms/unit cell =1  Hence, formula is | | | | | | | |
| 43 | **(b)**  In structure, sulphide ions occupy all (fcc) lattice points while ions are present in alternate tetrahedral sites.  Therefore, there is one ion for every ion. | | | | | | | |
| 44 | **(c)**  Similarly,  Also, and | | | | | | | |
| 45 | **(c)**  In fcc structure, corner atoms do not touch each other (atoms 1 and 2), but every face center atom touches corners. Moreover, every face center atom touched every other face center atom provided it is not the opposite face center atom in an fcc unit cell  Atoms 3 and 4 are touching each other where center-to-center distance  Atoms 1 and 2 are not touching each other  Atoms 2 and 4 are touching each other where center-to-center distance | | | | | | | |
| 46 | **(d)**  Density  (For antifluorite, /unit cell) | | | | | | | |
| 47 | **(d)**  Number of atoms  Number of unit cells  atoms in each unit cell]  Volume of 1 mol lattice = Volume of unit cell | | | | | | | |
| 48 | **(a)**  Factual statement | | | | | | | |
| 49 | **(a)**  Edge length | | | | | | | |
| 51 | **(b)**  All factual statements | | | | | | | |
| 52 | **(d)**  For fcc, number of X atoms = 4/unit cell  Number of TVs = 8Z  Number of OVs = 4Y  Number of atoms removed along one body diagonal = 2X (corner) and 2Z (TVs) and 1Y (OV at body center)  Number of X atoms left  Number of Y atom left =  Number of Z atom left =  The simplest formula = | | | | | | | |
| 53 | **(b)**  Let the volume of unit cell  Volume occupied by atoms  Thus,  Also,  Applying another formula of | | | | | | | |
| 54 | **(a)**  Formula | | | | | | | |
| 55 | **(b)**  Factual statement | | | | | | | |
| 56 | **(b)**  Factual statement | | | | | | | |
| 57 | **(c)**  has frenkel defects due to large difference in the size of andions | | | | | | | |
| 58 | **(b)**  In fluorite-type structure, (factual statement) | | | | | | | |
| 59 | **(d)**  AB has -type structure (fcc system)  Number of A atoms  (corner)(per corner share)(per face center share)  Number of B atoms  (corner)(per edge corner share)(body center)  Number of A atoms removed (face centered atom of one axis)  (faces) (per face center share)  unit cell  Number of A atoms left unit cell  Formula = | | | | | | | |
| 60 | **(b)**  For bcc, /unit cell  For fcc, /unit cell  Ration | | | | | | | |
| 61 | **(d)**  For fcc,  Volume of atoms in the unit cell | | | | | | | |
| 62 | **(b)**  structure)  For fcc, the radius of atom is: | | | | | | | |
| 63 | **(b)**  For -type, impurity added to silicon should have more than 4 valence electrons | | | | | | | |
| 64 | **(a)**  Thus, contains | | | | | | | |
| 65 | **(c)**  Electrical conductivity of semiconductors lies in the range | | | | | | | |
| 66 | **(b)** | | | | | | | |
| 67 | **(d)**  Number of octahedral sites = Number of ions in the packing.  Number of octahedral sites per share =1 | | | | | | | |
| 68 | **(c)**  The next nearest neighbours to are of neighbour unit which are 6 in number | | | | | | | |
| 69 | **(a)**  It is clear from the figure that the arrangement is sc, with coordination number (CN) of each point = 6  (The arrangement shown in figure consists of 4 unit cells. Taking a view of one unit cell, the atoms are not present at the face centers of each unit cell, hence it cannot be fcc, since in fcc lattice points are occupied at corners and face centers of each unit cell) | | | | | | | |
| 70 | **(d)**  For close-packed structure (fcc type)  Number of /unit cell  Number of  Number of  Formula: | | | | | | | |
| 71 | **(d)**  Number of unit cell for bcc is 2 and fcc is 4 | | | | | | | |
| 72 | **(b)**  All factual statements | | | | | | | |
| 73 | **(b)**  CN of (8:8) of and suggest bcc structure | | | | | | | |
| 74 | **(b)**  Atomic fraction | | | | | | | |
| 75 | **(a)**  Packing fraction ion fcc, bcc, and sc are 0.74, 0.68 and 0.52, respectively | | | | | | | |
| 76 | **(b)**  ABAB type of packing means ccp packing in which 74% space is occupied and 26% is empty | | | | | | | |
| 77 | **(a)**  Factual statement | | | | | | | |
| 78 | **(a)**  has fcc structure and is also present in alternate TVs (=4). So the total number of atom /unit cell | | | | | | | |
| 79 | **(c)**  Due to Frenkel defects, density does not change | | | | | | | |
| 80 | **(a)**  The space lattice of diamond is fcc. The primitive basis has two identical atoms at 0, 0,0 and associated with each point of the fcc lattice as shown in the figure | | | | | | | |
| 81 | **(a,c,d)**  For spinel structure, ions form fcc arrangement  Number of ions =4  Number of TV=8, Number of OV=4  Number of ions =  Number of ions =  So, 50%, OVs are occupied and 1/8th, i.e., 12.5% TVs are occupied | | | | | | | |
| 86 | **(a,b,c,d)**  All factual statements | | | | | | | |
| 87 | **(b,c)**  Hence, it is the limiting case where cation in the void of fcc structure is not distorted  -  So, number of cations surrounding the particular cation= 12. But at the same time 8 anions (present in TVs) touch the particular cation | | | | | | | |
| 88 | **(a,b,d)**  All factual statements | | | | | | | |
| 89 | **(a,b,c)**  All factual statements | | | | | | | |
| 90 | **(a,b,c,d)**  All factual statements | | | | | | | |
| 91 | **(a,b,d)**  Factual statement | | | | | | | |
| 92 | **(a,b,c)**  Factual statements | | | | | | | |
| 93 | **(a,b,d)**  Graphite is a good conductor, hybridized, a covalent crystal and crystalline (not amorphous) | | | | | | | |
| 94 | **(a,b,c,d)**  All factual statements | | | | | | | |
| 95 | **(b)**  All factual statements | | | | | | | |
| 97 | **(a,c,d)**    has body-centered cubic unit cell  Each ion in this structure has a coordination number of 8. In structure (rock salt structure), chloride ions are arranged in fcc manner, whereas sodium ions occupy edge centers as well as body centers. The ions present on corners, edges, face centers are shared by adjacent unit cells | | | | | | | |
| 98 | **(b,c,d)**  Factual statements | | | | | | | |
| 99 | **(a,b,c,d)**  For  But radius ratio for and are 0.34, 0.38, 0.77, and 0.83, respectively, which are not in the range of | | | | | | | |
| 100 | **(a,b,c,d)**  Non-stoichiometric has F-centers due to anion vacancy defect | | | | | | | |
| 101 | **(b,d)**  All factual statements | | | | | | | |
| 102 | **(a,c,d)**  All factual statements | | | | | | | |
| 103 | **(a,b,c)**  All factual statements | | | | | | | |
| 104 | **(c,d)**  In both fluorite and antifluorite, 100% TVs are occupied and (number of formula unit) for both is 4 | | | | | | | |
| 105 | **(a,b,c)**  Number of atoms =4 (for ccp crystal)  Formula  ofofNumber of B atoms  of ofNumber ofatoms]  In ccp arrangement, all TVs are occupied (fluorite-type structure) | | | | | | | |
| 106 | **(a,b,d)**  In square close packing, whereas in hcp, . So, the ratio is  2 : 3 | | | | | | | |
| 107 | **(b,c)**  OVs are formed at the edge center and body center of fcc per unit cell | | | | | | | |
| 108 | **(a,b,c,d)**  , suggest fcc structure  Thus, there are four units. There are 8 ions at the corners and 6 at the face centers | | | | | | | |
| 109 | **(a,b,c)**  =0.732, 0.414, and 0.225 maximum for OV, TV, and triangular void | | | | | | | |
| 110 | **(a,c)**  ofion in  Number of body diagonal planes in a cube = 6  Formula unit is rock salt structure = 4  Formula unit in structure= 1 | | | | | | | |
| 114 | **(a,b,c,d)**  Factual statements | | | | | | | |
| 115 | **(a,b,c,d)**  represents one of the close-packed layer having triangular voids only  contains location of OVs (edge centers of unit cell)  contains 3 OVs locations (one at body center and two at edge center). Also, plane contains the body diagonals, hence it contains TVs location (TVs lie at body diagonal) | | | | | | | |
| 116 | **(a,d)**  Use any relation:  **a**. , means fcc structure  **d**. of fcc structure = 12 | | | | | | | |
| 117 | **(a,b,c,d)**  All factual statements | | | | | | | |
| 118 | **(b,d)**  An octahedron has 8 faces and 12 edges | | | | | | | |
| 119 | **(a,c)**  (bcc structure)  Hence, ion lies at the “body center of cubic void” where of.  has bcc structure with forming simple cubic lattice and ion in the void (at body center)  For bcc, | | | | | | | |
| 120 | **(a,b)**  OVs are present at edge centers and body center in an fcc unit cell | | | | | | | |
| 121 | **(a,b)**  Factual statements | | | | | | | |

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| 122 | **(a,d)**  C:\Users\Whalesoft\Desktop\Untitled-2.jpg  Hence, answer is (a) and (d) |

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| 123 | **(a,c)**  The hcp and ccp structures have same CN (12), same packing fraction (0.74), but different density as the number of atoms as well as the volume of unit cell differ in both | | | | | | | |
| 124 | **(a,d)**  On a body diagonal, two corner ions and one ion in OV (at body center) are present | | | | | | | |
| 125 | **(b,c)**  Two TVs are present on each body diagonal of a fcc unit cell at a distance of from each corner | | | | | | | |
| 126 | **(d)**  Both are facts. | | | | | | | |
| 127 | **(c)**  Explanation is correct reason for statement. | | | | | | | |
| 128 | **(a)**    Schottky defect arises when equal number of cations and anions are missing from the lattice | | | | | | | |
| 129 | **(c)**  (A) is correct but (R) is wrong  **Correct(R ):** For atoms adoping fcc arrangement, there are TVs | | | | | | | |
| 130 | **(a)**  Same substance adopt different structural arrangements under different conditions, such arrangements are called polymorphic froms. So, diamond and graphite have same molecular formula but different structure. Diamond is tetrahedral and graphite is hexagonal. | | | | | | | |
| 131 | **(b)**  Assertion is correct  **Correct (R):**Axial angles are not equal to each other | | | | | | | |
| 132 | **(c)**  Assertion is correct since higher melting points of covalent crystals are due to network structures  **Correct (R):**Covalent bonds are weaker than ionic bonds | | | | | | | |
| 133 | **(c)**  These are the correct facts. | | | | | | | |
| 135 | **(d)**  Liken quartz and ice, graphite is an example of hexagonal system.  For this  For a tetragonal system | | | | | | | |
| 136 | **(c)**  (A) is correct  **Correct (R**): stands for negative so electrons are responsible for semiconducting properties | | | | | | | |
| 139 | **(e)**  **Correct (A):**Graphite is an example of hexagonal crystal system in which each C-atom is hybridized and is linked to three other C-atoms in a hexagonal planer structure  **Correct (R):** For tetragonal system, and . For hexagonal systems, and | | | | | | | |
| 140 | **(d)**  **Correct(A**): ions occupy all OVs but ions occupy lattice points (corner+ face centers)  (R) is correct; for OV, | | | | | | | |
| 141 | **(a)**  Glasses are Morphours solid which change their shape on change the melting point. So they do not have the sharp melting point. | | | | | | | |
| 142 | **(d)**  Both statement and explanation are correct but reason for the statement is different. | | | | | | | |
| 144 | **(b)**  **Correct explanation**: ions can be placed only in OVs since TVs are too small to accommodate them | | | | | | | |
| 145 | **(c)**  The given statement and its explanation are correct. | | | | | | | |
| 146 | **(b)**  Frenkel defect are commonly found in silver halide Agx. Because ion is small in size due to this reason, it changes its position to crystal lattice to interstitial position. | | | | | | | |
| 148 | **(c)**  Explanation is correct reason for statement | | | | | | | |
| 149 | **(b)**  Space or crystal lattice is a regular repeating arrangement of point in space and from the basis forms the basis of classification of all structures. | | | | | | | |
| 150 | **(d)**  Both are facts. | | | | | | | |
| 152 | **(a)**  In hexagonal close packing voids are triangular voids. | | | | | | | |
| 153 | **(a)**  Follow text. | | | | | | | |
| 154 | **(c)**  If and then sin θ > 1 which is not possible. | | | | | | | |
| 155 | **(c)**  Explanation is correct reason for statement. | | | | | | | |
| 157 | **(a)**  Excess of in solid at F-centres develops yellow colour. | | | | | | | |
| 158 | **(e)**  **Correct (A):** OV is larger in size than TV  **Correct (R):**Cations are generally smaller. They occupy voids instead of lattice points and hence occupy less space | | | | | | | |
| 159 | **(c)**  Explanation is correct reason for statement. | | | | | | | |
| 161 | **(e)**  **Correct (A):**Zinc blende has fcc arrangement of ions while wurtzite has hcp arrangement of ions  **Correct (R):**A unit cell of zinc blende has 4 formula units while that of wurtzite has 6 formula units of | | | | | | | |
| 162 | **(d)**  **Correct (A):** and impart yellow and violet colour, respectively  (R) is correct but not correct explanation of (A) | | | | | | | |
| 163 | **(e)**  **Correct (A):**hcp and ccp are equally closest packed since space occupied in both = 74%  **Correct (R):**Both have CN=12 | | | | | | | |
| 164 | **(c)**  Explanation is correct reason for statement. | | | | | | | |
| 165 | **(d)**  Both statement and explanation are correct but the reason is different. | | | | | | | |
| 166 | **(a)**  Nacl has fcc structure in which each is surrounded by six ions and *vic versa.*In this octahedral arrangement, coordination, number of both is six for which radius ratio lies between 0.414 and 0.732. The radius ratio does not allow ions to touch each other. | | | | | | | |
| 167 | **(c)**  Explanation is correct reason for statement. | | | | | | | |
| 168 | **(a)**  Packing fraction in fcc = 74%  Packing fraction in bcc = 67.9% | | | | | | | |
| 169 | **(d)**  Both statement and explanation are correct but reason for the statement is different. | | | | | | | |
| 170 | **(a)**  **(a, b→ r)**hcp and ccp, closest packed structure.  Volume occupied = 0.78  Void volume  **(c → p)** For bcc, volume occupied = 0.62  Void volume  **(d → q)** For sc, volume occupied = 0.52  Void volume  **(e s)** For dc, volume occupied = 0.34  Void volume | | | | | | | |
| 171 | **(b)**  (**a → q**) Defect  (**b →p**) belongs to cubic system  (**c → s**) Glass and are amorphous solid  (**d → r**) have tetrahedron structure | | | | | | | |
| 173 | **(a)**  (**a q**) Intercepts at are 1, 1,  So Miller indices  (**b p**) Intercepts at are  Miller indices  (**c s**) Intercepts at are  Miler indices  (**d r**) Intercepts at are  Miler indices  (**e t**) Intercepts at are  Miler indices | | | | | | | |
| 174 | **(a)**  **(a → q, r**,**s)**At body diagonal, two corner ions and one OV (at body center) lies  **(b p, r, s)** Axis (tetrad axis) passes through two face-centered ions, body-centered ion (OV)  **(c r)** Rectangular plane passes through 4 face-centered ions, 4 edge-centered ions, body-centered ion | | | | | | | |
| 178 | **(b)**  (a,b)  a. Ratio of TV/OV occupied in spinel structure  Number of TV occupied  Number of OV occupied  b. Ratio of TV/OV unoccupied in spinel structure  Number of TV unoccupied  Number of OV unoccupied  (c,b)  a. Ratio of TV/OV occupied in inverse spinel structure  Number of TV occupied  Number of OV occupied  This ratio in inverse spinal structure is reverse to that of the spinel structure. Hence, this is called inverse spinel structure  b. Ratio of TV/OV unoccupied in inverse spinel structure  Number of TV unoccupied  Number of OV unoccupied | | | | | | | |

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| 179 | **(c)**  Face-centered cubic unit cell and a face plane |

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| 180 | **(a)**  For fcc,  Number of ions (corners)per corner share  per face share  Number of ions /unit cell  Number ions /unit cell | | | | | | | |
| 181 | **(a)**  **a**. is smaller than  The difference in internucleardistance between AX and BX indicates that the cation must not be touching all the anions in AX (smaller cation, larger anion)    There must be anion-anion contact is this compound  Anion-anion distance  The remaining radius ratio is represented in    **b**. Radius of  Radius of  **c**. Similarly, radius of  Radius of  ,  Radius of and respectively, are =and | | | | | | | |
| 182 | **(c)**  The distance 0.204 nm comes out to be which corresponds to the perpendicular distance between a corner of unit cell and the plane of the three adjacent corners (Fig. III) | | | | | | | |
| 183 | **(a)**  has bcc structure, possess face centred cubic lattice.  ions occupy all the (100%) tetrahedral voids. Thus each  is in contact with and each with ions. | | | | | | | |
| 184 | **(a)**  In three dimensional closest packing of hcp or ccp (although both are different) only 74% of the available space is occupied by spheres. The remaining 26% space which is vacant, constitutes interstitial voids or interstices sites or interstices. The given packing is three dimensional close packing as shown in given figure. In this arrangement three atoms are arranged in the body centred position in such a way, so that it forms equilateral triangle and twelve atoms are places at 12 corners and two atoms at two face centres.  **(i)** **No. of atoms per unit cell**    **(ii)** Thus **coordination number** of three dimensional hcp lattice becomes 12, i.e., 6 from own layer and 3 from above and 3 from lower layer.    **(iii) Base Area (*A)* of unit cell :**  Base area of hcp unit cell is given by :      **(iv) Height of unit cell**  or  or  ∴  Now  ∴    **(v) Packing fraction :** Each corner atom would be common to 6 other unit cell. If is the radius of each sphere, then  Packing fraction =  Where, = volume of hexagon = Area of base height  ∴ Packing fraction =  = 0.74 or 74%  **(vi)** | | | | | | | |
| 186 | **(8)**  Statements (a), (b), and (d) are correct  **a**. So total score  Nearest neighbour of atom 2 are 1 and 3  Distance between atom 1 and 2  Distance between atom 2 and 3    **b**. Nearest neighbour of atom D are E and F (F atom is in body center)  body diagonal  Distance DF    Distance ED  **c**. Option (c) is wrong. (wurtzite) and (zinc blende) are polymorphs. Same substance occurring in different crystal forms is called polymorphism  But in both the compounds, cations ions) occupy alternate TVs  In both compounds, occupies lattice points  **d**. Correct statement | | | | | | | |
| 190 | **(4)**  **a**. Number of X atoms /unit cell  Number of Y atoms /unit cell  Number of O atoms /unit cell  Formula is:  **b**. Number of O atoms missing from two edge centers per unit cell /unit cell  Number of O atoms left unit cell  Formula is  The value of | | | | | | | |
| 192 | **(7)**  For structure, of  Number of /unit cell (corner + face center)  Number of /unit cell (in alternate TVs)  Number of ion removed  (Two from each face center) (per face center share) = 2  Number of ions left /unit cell  Number of ions entering in place of  [To maintain electrical neutrality, ]  Formula | | | | | | | |
| 194 | **(13)**  Single unit cell consist of three cubes  Number of ions per unit cell  Number of ions =1 per unit cell  Number of ions = 8 in each cube at corners)  (in three cubes) (per corner share)  unit cell  Number of ions (at edge center of cube 1) + 8 (at edge center of cube 2) + 10 (at edge center of cube 3)  (edge center) (per edge center share)  /unit cell  Formula: | | | | | | | |
| 197 | **(7)**  Let radius of hollow sphere B  Edge length  Volume of unit cell  Volume of B unoccupied by A (having radius )  In unit cell | | | | | | | |
| 198 | **(8)**  Diameter of  Number of atoms in 2.50 cm row  Cs atoms  Moles of Cs atoms | | | | | | | |
| 199 | **(4)**  has fcc structure  /unit cell  Formula  Coordination number of  Antifluorite-type structures have (4 : 8) CN and ions are in all TVs | | | | | | | |
| 200 | **(2)**  Void volume unit volume of unit cell | | | | | | | |
| 202 | **(6)**  Statements (a), (b), and (c) are correct  So total score  Statement (a, b) are factual  Statement (c):  The radius ratio lies in the range of which corresponds to TV and the CN of TV = 4 | | | | | | | |
| 204 | **(2)**  Consider one face of unit cell as shown below    Number of atoms on one face  (corners) (Per corner share) + 1(face center) (face center share)  Given number of atoms on all faces  Given number of atoms on one face  atoms  Number of unit cells at one face of crystal  So, number of unit cells at the edge of crystal  Now, edge length of unit cell  Edge length of cubical crystal  So, area of face of crystal | | | | | | | |