CHEMISTRY

BOOKS - MODERN PUBLICATION

SOLID STATE

Exercise

1. Maximum ferromagnetism is found in:

A. Fe

B. Ni

C. Co

D. None

Answer: A

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2. Crystals can be classified into ..... basic crystal habits?

A. 7

B. 4

C. 14

D. 3

Answer: A

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3. The maximum proportion of available volume that can be filled by hard spheres in diamond is:

A. 0.52

B. 0.34

C. 0.32

D. 0.68

Answer: B

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4. Lubricating properties of graphite are diminished in presence of:

A. High pressure

B. Low pressure

C. Vaccum

D. None

Answer: C

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5. Which do not from amalgam with Hg ?

A. Pt

B. Fe

C. Both (a) and (b)

D. None

Answer: C

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6. High thermal conductivity of metals is due to transfer of heat through:

A. Molecular collisions

B. Electronic collisions

C. Atomic collisions

D. All

Answer: B

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7. The metal surfaces are excellent reflectors because of absorption and re-emission of light by:

A. Protons in atom

B. Electrons in atom

C. Neutrons in atom

D. None

Answer: B

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8. An increase in the charge of the positive ions that occupy lattice positions brings in a/an..... in methallic bonding.

A. Increase

B. Decrease

C. Neither increase or decrease

D. Either increase or decrease

Answer: A

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9. The hardness of metal increases with increase in number of ..... involved in metallic bonding.

A. Atoms

B. Molecules

C. Electrons

D. All

Answer: C

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10. Which shows the highest lattice energy?

A. $LiBr$

B. $LiCl$

C. LiI

D. LiF

Answer: D

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11. Each atom in bcc structure has ..... Nearest neighbours.

A. 8

B. 6

C. 4

D. 2

Answer: A

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12. The resistance of mercury becomes almost zero at :

A. 4k

B. 10k

C. 20k

D. 25k

Answer: A

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13. All the substances become diamagnetic at :

A. 4k

B. 10k

C. 20k

D. 25k

Answer: A

14. Extremely pure samples of Ge and Si are non-conductors ,but their conductivity increases suddenly on introducing ..... In their crystal lattice .

A. As

B. B

C. Both(a) and (b)

D. None

Answer: C

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15. Solids are characterised by their properties

:

A. Incompressability

B. Mechanical strength

C. Crystalline nature

D. All

Answer: D

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16. A solids having no definite shape is called :

A. Amorphous solid

B. Crystalline solid

C. Anisotropic

D. None

Answer: A

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17. A solid having no definite geometrical shape with flat faces and sharp edges is :

A. Amorphous solid

B. Crystalline solid

C. Isotropic solid

D. None

Answer: B

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18. The crystals are bounded by plane faces (f), straight edges (e) and interfacial angle (c). The relationship between these is :

A. f+c=e+2

B. f+e=c+2

C. c+e=f+2

D. None

Answer: A

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19. A cubic crystal possesses :

A. 9 plane of symmetry

B. 13 axis of symmetry

C. 1 centre of symmetry

D. All

Answer: D

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20. A cubic crystal possesses in all ..... Elements of symmetry .

A. 9

B. 13

C. 1

D. 23

Answer: D

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21. Which is (are) amorphous solids?

A. Rubber

B. Plastics

C. Glass

D. All

Answer: D

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22. Iodine crystals are:

A. Metallic solids

B. Ionic solids

C. Molecular solids

D. Covalent solids

Answer: C

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23. The number of molecules of NaCI in an unit cell of its crystal is:

A. 2

B. 4

C. 6

D. 8

Answer: B

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24. Zinc blende type structure has what co-ordination ratio?

A. 2

B. 6

C. 4

D. 8

Answer: C

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

A. 1:1

B. 1:2

C. 1:3

D. 2:1

Answer: B

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

A. 23

B. 7

C. 230

D. 14

Answer: D

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27. The vacant space in body centred cubic lattice bcc unit cell is about:

A. 0.32

B. 0.1

C. 0.23

D. 0.46

Answer: A

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28. A match box exhibits:

A. cubic geometry

B. monoclinic geometry

C. orthrohombic geometry

D. tetrahedral geometry

Answer: C

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29. Which stoichiometric defect decreases the density of the crystal?

A. Schottky

B. Frenkel

C. F-centre

D. Intrestitial

Answer: A

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30. Solid CO_2 is an example of:

A. Molecular crystal

B. Covalent crystal

C. Metallic crystal

D. Ionic crystal

Answer: A

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31. The three states of matter are solid, liquid and gas. Which of the following statements are correct about them ?

A. Gases and liquids have viscosity as a common property

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

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

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

Answer: A

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32. The intermetallic compound LiAg crystallises in cubic lattice in which both Li and Ag have co-ordination number of eight. The class of crystal is:

A. Simple cubic

B. Body centered cubic

C. Face centered cubic

D. None

Answer: B

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33. The number of atoms/molecules present in one body centred cubic unit cell is:

A. 1

B. 2

C. 4

D. 6

Answer: B

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34. Wax is an example of:

A. Ionic crystal

B. Covalent crystal

C. Molecular crystal

D. Metallic crystal

Answer: C

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35. In a crystal, the atoms are located at the position of.....potential energy.

A. Zero

B. Infinite

C. Minimum

D. Maximum

Answer: C

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36. In a solid lattice the cation has left a lattice site and is located at an interstitial position. The lattice defect is known as -

A. Interstitial defect

B. Valency defect

C. Frenkel defect

D. Schottky defect

Answer: C

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37. CaF_2 possesses:

A. Face centered cubic

B. Body centered cubic

C. Simple cubic

D. Hexagonal closed packing

Answer: A

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38. For an ionic crystal of the general formula A^+B^- and coordination number 6, the radius ratio will be:

A. Greater than0.73

B. Between 0.73 and 0.41

C. Between 0.41 and 0.22

D. Less than 0.22

Answer: B

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39. Which substance shows antiferromagnetism?

A. ZrO_2

B. CdO

C. CrO_2

D. MnO_3

Answer: D

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40. The coordination number of Ca^{2+} ion in fluorite crystal is:

A. 2

B. 8

C. 6

D. 4

Answer: B

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41. Metals have specific conductivity of the order of $(ohm - 1cm - 1)$:

A. 10^(12)

B. 10^(8)

C. 10^(2)

D. 10^(-6)

Answer: B

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42. In crystal structure of rock salt (NaCl), the arrangement of CI^- ion is:

A. f

B. b

C. Both(a) and (b)

D. None

Answer: A

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43. Which crystal is expected to be soft and have low melting point?

A. Covalent

B. Metallic

C. Molecular

D. Ionic

Answer: A

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44. The elements of symmetry in a crystal are:

A. Plane of symmetry

B. Axis of symmetry

C. Centre of symmetry

D. All

Answer: D

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45. Molecular crystals exist in:

A. Crystalline state

B. Amorphous state

C. Non- crystalline state

D. All

Answer: D

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46. Quartz is an example of:

A. Chain silicate

B. Infinite sheet silicate

C. Framework silicate

D. Cyclic silicate

Answer: C

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47. In antiflourite structure, the negative ions:

A. Occupy tetrahedral voids

B. Occupy octahedral voids

C. Are arranged in ccp

D. Are arranged in hcp

Answer: C

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48. The pure crystalline substance on being heated gradually first forms a turbid liquid at constant temperature and still at higher temperature turbidity completely disappears.

The behaviour is a characteristics of substance forming:

A. Allotropic crystal

B. Liquid crystal

C. Isomeric crystals

D. Isomorphous crystals

Answer: B

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49. Ionic solids with Schottky defects contain in their structure:

A. Equal number of cations and anion vacancies

B. Intrestitial anions and anion vacancies

C. Cation vacancies only

D. Cation vacancies and intrestitial cations

Answer: A

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50. In a cubic close packing of spheres in there dimensions the coordination number of each sphere is:

A. 6

B. 9

C. 3

D. 12

Answer: D

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51. When arrangement of electrons leads to ferromagnetism?

A. ↑↑↑↑↑↑↑

B. uarr darr uarr darr

C.

D.

Answer: A

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52. For which crystal anion-anion contact is valid?

A. NaF

B. NaI

C. $CsBr$

D. KCL

Answer: A

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53. The melting point of RbBr is $682^{\circ}C$, with that of $NaFis988^{\circ}C$. The principal reason that melting point of NaF is much higher than that of RbBr is that:

A. The two crystsls are not isomorphous

B. The molar mass of NaF is smaller than of RbBr

C. The intermolecular distance rc+ra is greater for RbBr than of NaF

D. The bond is RbBr has more covalent character than the bond in NaF

Answer: C

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54. The oxide which shows metallic conduction:

A. ReO_3

B. VO

C. CrO_2

D. All

Answer: D

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55. An insulstor oxide is:

A. CuO

B. CoO

C. Fe_2O_3

D. All

Answer: D

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56. Which species is diamagnetic?

A. Ca^{2+}

B. Hg_2Cl_2

C. Sb^{3+}

D. All

Answer: D

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57. Which oxide of chlorine is paramagnetic?

A. Cl_2O

B. ClO_2

C. Cl_2O_4

D. Cl_2O_6

Answer: B

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58. Which crystal has the largest lattice energy?

A. KCl

B. MgO

C. $LiBr$

D. NaF

Answer: B

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59. The structure of MgO is similar to NaCl. The co-ordination number of Mg is:

A. 2

B. 6

C. 4

D. 8

Answer: B

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60. 4 : 4 coordination is noticed in:

A. ZnS

B. $CuCl$

C. AgI

D. All

Answer: D

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61. The oxide which shows transition from metal to insulation, i.e., semiconductors are:

A. V_2O_3

B. VO_2

C. Ti_2O_3

D. All

Answer: D

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62. 8 : 8 coordination is noticed in:

A. MgO

B. Al_2O_3

C. $CsCl$

D. All

Answer: C

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63. The oxide that possesses electrical conductivity:

A. V_2O_5

B. CrO_2

C. NiO

D. MnO

Answer: B

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64. In the unit-cell of NaCI lattice there are:

A. $3Na^+ ion$

B. $6Na^+ ion$

C. $6Cl^- ion$

D. $4NaCl$ units

Answer: D

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65. Which species is paramagnetic ?

A. NO

B. Fe^{3+}

C. Fe^{2+}

D. All are correct

Answer: D

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66. The substance which possesses zero resistance as 0 K:

A. Conductor

B. super conductor

C. Insulator

D. Semiconductor

Answer: B

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67. Of the elements Sr,Zr,Mo,Cd and Sb, all of which are in V period, the paramagnetics are:

A. Se,Cd and Sb

B. Ze,Mo and Cd

C. Sr,$Zr$and Cd

D. Zr, $Mo|$ and Sb`

Answer: D

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68. The cation-anion bond have the largest amount of covalent character for:

A. $NaBr$

B. SrS

C. CdS

D. BaO

Answer: C

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69. Which is ferromagnetic?

A. Ni

B. Co

C. CrO_3

D. All

Answer: D

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70. Which one is diamagnetic?

A. ClO_2

B. Cu^{2+}

C. F^-

D. Ni^{2+}

Answer: C

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71. Ice is an example of_____type crystal

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72. Two examples of covalent crystals are____and____

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73. Fill in the blanks : The crystal structure of $CsCl$ is .....

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74. In simple ionic crystals_____or_____types of arrangement are generally -present.

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75. In ionic crystals_____ions adopt ccp or hcp arrangement, while____ions occupy interstitial sites

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76. In NaCl crystal_____ions occupy all the octahedral sites.

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77. Co-ordination numbers of Cs^+ and Cl^- in CsCl crystal are in the ratio ?

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78. In NaCl crystal, one Na^+ ion is surrounded by____Cl^- ions.

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79. Two metals showing cubic close packed (ccp) structure are____and____

Watch Video Solution

80. Zinc blende type structure has____co-ordination, while cesium chloride type, structure has _____co-ordination.

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81. Carborandum and dry ice are _____and_____type of crystal respectively

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82. Two metals exhibiting hcp arrangement are____and____

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83. Which stoichiometric defect in crystal increases the density of the solid ?

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84. The number of nearest neighbours with which a given sphere is in contact is called_____

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85. If radius ratio $\left(\frac{r_+}{r_-}\right)$ is in the range 0.414 to 0.732 , the possible arrangement is_____.

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86. Face-centred cubic unit cell has _____ atoms.

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87. Fill in the blanks : Glass is an example of ..... Solid .

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88. More efficient packing is found in_____.

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89. Crystal of diamond is _____.

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90. Most metals act as superconductors in the temperature range_____.

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91. Closest packing of spheres is found in _____.

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92. Cesium chloride has _____ structure.

Watch Video Solution

93. Mg atoms adopt _____ structure.

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94. The point defect which decreases the density of a solid is called as ____ .

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95. Iodine is _____type solid.

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96. In ZnS crystal, Zn^{2+} ions occupy _____void.

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97. Na_(2)O crystal shows _____ structure.

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98. Co-ordination number of rock salt type structure is -

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99. _____solids are isotropic in nature.

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100. _____solids are anisotropic in nature.

Watch Video Solution

101. In most close-packed lattices, _____ % of space is filled.

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102. Cubic close-packed (ccp) lattice is also called_____

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103. Two types of voids are_____and_____

Watch Video Solution

104. The point defect in a crystal that does not change the density of a solid is_____.

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105. Stoichiometric defects are _____ defects.

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106. $ZnS, AgBr, AgI$ exhibit _____ defect.

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107. $NaCl, KCl, KBr$ exhibit_____ defect.

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108. If all the domains are oriented in the direction of magnetic field,it is called _____ substance.

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109. If equal number of domains are oopsitely aligned, it is called _____ substance.

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110. Iron ,cobalt,nickel and `CrO_(2) are examples of _____ substances.

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111. Iodine is an ionic type solid.

Watch Video Solution

112. In most close-packed lattices, _____ % of space is filled.

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113. ccp lattice is also called bcc.

True / False

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114. Zinc blende type structure has what co-ordination ratio?

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115. Co-ordination numbers of Cs^+ and Cl^- in CsCl crystal are in the ratio ?

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116. Which stoichiometric defect in crystal increases the density of the solid ?

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117. Which type of defect does not affect the density of the crystal ?

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118. The presence of Frenkel defect increases the density of crystal. (true/false)

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119. Six atoms are present per unit cell in a bcc crystal. (Say True/ False)

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120. Eight atoms are present per unit cell in a fcc crystal.(Say True/False)

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121. Give one example of metal deficiency defect.

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122. What makes the alkali metal halides sometimes coloured which are otherwise colourless?

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123. Which stoichiometric defect decreases the density of the crystal?

Watch Video Solution

124. How does the presence of inteerstitial defect affect the density of crystal?

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125. Write an expression for the density (d) of unit cell, if a is edge of unit cell in cm ,Z is number of atoms in a unit cell,M is the molar mass and NA is the avogadro number.

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126. What is forbidden zone of an insulator?

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127. Write the wide range of electrical conductivities of solids in $ohm^{-1}m^{-1}$.

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128. What is the range of electrical conductivities of conducting solids?

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

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130. The insulators have very very low electrical conductivities of the order_____.

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131. Semiconductors have conductivities of the order _____.

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132. What is the effect of temperature on the conductivity of metals?

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133. What is the effect of temperature on the conductivity of semiconductors?

Watch Video Solution

134. what type of semiconductor is obtained when silicon is doped with arsenic?

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135. What type of semiconductors is obtained,when a group 14 element is doped with an element of group 13 as impurity?

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136. If all the domains are oriented in the direction of magnetic field,it is called _____ substance.

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137. Write the type of magnetism observed when the magnetic moments are oppositely aligned and cancel out each other.

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138. Name one ferromagnetic substance used to make magnetic tapes of cassette recorders.

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139. Give one common example of antiferromagnetic substance.

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140. In which type of substances the magnetic moments of the domains are aligned in parallel and antiparallel directions in equal numbers?

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141. Name the most symmetrical crystal system.

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142. Name the most unsymmetrical crystal system.

Watch Video Solution

143. How is unit cell related to space lattice?

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144. How many crystal systems are there?

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145. How many Bravais lattices are there?

Watch Video Solution

146. How many atoms are present in each unit cell of a simple cubic crystal?

Watch Video Solution

147. What is a body centered cubic?

Watch Video Solution

148. What is a face-centred cubic unit cell?

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149. Give the relationship between nearest neighbour distance (d) and radius (r) of an atom with edge length (a) of body-centred cubic system.

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150. Give the relationship between nearest neighbour distance (d) and radius (r) of an atom with edge length (a) of a face-centred cubic system.

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151. What is the coordination number of an atom in two dimensional square close packing(scp)?

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152. What is the coordination number in hcp and ccp ?

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153. Arrange simple cube,body-centred cube,face-centred cube and hexagonal close packing increasing order of packing efficiency.

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154. In close packing of N spheres,how many (i)octahedral and (ii)tetrahedral sites are present?

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155. How many atoms are present per unit cell in a hcp structure?

Watch Video Solution

156. What is the precentage of empty space in fcc structure?

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157. Empty space in BCC lattice is -

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158. What is vacancy defect?

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159. Which type of defect does not affect the density of the crystal ?

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160. Name one ionic solid,which shows both Frenkel defect and Schotty defects.

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161. Name one salt which is added to $AgCl$ so as to produce cation vacancies.

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162. What is the effect of the presence of schottky defect on the density of a crystal?

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163. What temperature Fe_2O_3 loses it's ferromagnetism and becomes paramagnetic.

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164. Which stoichiometric defect in crystal increases the density of the solid ?

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165. what type of semiconductor is obtained when silicon is doped with arsenic?

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166. A group 14 element is to be converted into n-type semiconductor by doping it with a suitable impurity. To which group should this impurity belong?

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167. What is primitive cell ?

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168. Give significance of a 'lattice point'.

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169. Crstyalline substances are isotropic in nature. (True/False)

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170. Which network solid is an exceptionally good conductor of electricity?

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171. Which non-stoichiometric point defect is responsible for colour in alkali metal halides?

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172. Which one of the following solid exhibits isotrypy ?

(Fe, Cu, Ag, $graphite$, $rubber$)

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173. Which one of the following exhibits anisotropy ?

`(Rubber, plastic, glass, diamond)

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174. What type of stochiometric defect is shown by $AgCl$?

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

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176. Which of the following are crystalline solids?

(*plastic*, *glass*, Zns, SiC, PVC`)

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177. Which of the following is not a molecular crystal ?

(I_2, P_4, Solid CO_2, ice, brass)

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178. Which of the following is not a covalent crystal ?

$(diamond, graphite, carborundum, ice)$

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179. Pick out the odd from the following ?

(diamond, AlN,carborundum, $SolidCO_2$)`

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180. Due to which type of defect Zno turns yellow on heating ?

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181. Name two substances showing ferromagnetism.

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182. Pure elemental semiconductors like Si and Ge are called _____.

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183. Define unit cell and 'space lattice'. What do you understand by simple, face-centred and body-centred unit cell.

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184. Discuss the formation of n-type semiconductors,

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185. How do metallic solid and ionic solid differ in conducting property ?

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186. Which one of the following gases turn lime water milky ?

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187. For a cubic crystal, the face diagonal is 4.25A. Calculate its face length.

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188. AgI crystallises in cubic close-packed ZnS structure. What fraction of tetrahedral sites is occupied by Ag^+ ions?

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189. Inspite of long range order in the arrangement of particles, why are the crystals usually not perfect?

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190. Why does the table salt, $Nacl$, sometimes appear yellow in colour ?

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191. Define ferromagnetism.

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192. Explain the following with suitable examples:

Ferrimagnetism

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193. Why does Frenkel defect not change the density of AgCl crystal?

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194. Why is the Frenkel defect not found in pure alkali metal halides?

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195. Crystalline solids anisotropic in nature. What does this statement mean ?

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196. What is the effect of temperature on the conductivity of metals and semiconductors ?

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197. What are ferromagnetic substances ?

Watch Video Solution

198. How may the conductivity of an intrinsic semiconductor be increased?

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199. What is the effect of the presence of schottky defect on the density of a crystal?

Watch Video Solution

200. What is meant by 'doping'in a semiconductor?

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201. What is F-centres ?

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

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203. Gold (atomic radius = 0.144 nm) crystallises in a face centred unit cell. What is the length of the side of the cell?

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204. Schottky defects lower the density of related solids. explain.

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205. Account for the following:

Conductivity of silicon increases on doping it with phosphorus.

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206. Aluminium crystallises in a fcc structure. Atomic radius of the metal is 125 pm. What is the length of the side of the unit cell of the metal?

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207. Why does presence of excess of lithium makes $LiCl$ crystals pink ?

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208. A cubic solid is made up of two elements P and Q. Atom Q is present at corners of the cube and atom P at the body centre. What is the formula of the compound? What are the coordination numbers of P and Q?

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209. Why is the Frenkel defect not found in pure alkali metal halides?

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210. Give reason: Zinc oxide becomes yellow on heating

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211. $CaCl_2$ will introduce schottky defect when added to $AgCl$ crystal. explain.

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212. Why solids have definite mass, volume and shape?

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213. What are Bravais Lattices ?

Watch Video Solution

214. Name two most efficient close packed lattices.

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215. How can you convert NaCl structure to CsCl structure and vice versa ?

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216. What are the common types of defects in solids ?

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217. What are different types of points defects ?

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218. Distinguish between anisotropy and isotropy.

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219. Calculate the number of atoms contained within face-centred cubic cm.

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220. Predict the percentage of space filled by particles in (a) fcc (b) bcc (c) simple cubic lattice.

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221. What is the number of atoms in a unit cell of

(a) a face-centred cubic structure?

(b) a body-centred cubic structure?

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222. Give two difference between crystalline and amorphous solids.

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223. An element crystallizes in a structure having fcc unit cell of an edge 200 pm .Calculate its density if 200 g this element contains 24 × 10^23 atoms.

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224. What is the difference between Schottky defect and Frenkel defect.

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225. Give two difference between crystalline and amorphous solids.

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226. Write the equation by which you can find atomic mass of a metal from its density and dimensions of unit cell.

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227. Niobium crystallises in a body-centred cubic structure. If its density is 8.55 g cm^{-3}, calculate the atomic radius of niobium using its atomic mass 93 u.

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228. If the radius of the octahedral void is r and radius of the atoms in close packing is R, derive a relation between r and R.

Draw a diagram showing octahedral void and derive the relation between r and R.

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229. Calculate packing étficiency of a face centred cubic metal crystal.

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230. Define the following terms : (i) ferromagnetism (ii) ferrimagnetism

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231. What is the difference between Schottky defect and Frenkel defect.

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232. The density of lead 11.35 gcm^{-3} and the metal crystallizes in fcc unit cell. Estimate the radius of lead atom $(at.\ mass of lead = 207 \text{g mol})$

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233. Why does presence of excess of lithium makes $LiCl$ crystals pink ?

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234. Calculate the packing efficiency of a metal crystal for a simple cubic lattice.

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235. How would you account for the following? Zinc oxide exhibit enhanced electrical conductivity on heating.

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236. Iron has a body centred cubic unit cell with the dimension of 286.65 pm.The density of iron is 7.874 gcm^{-3}.Use this information to calculate avogadro's number. $(Atmassof$Fe $= 55.845$u$)$

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237. What are different types of points defects ?

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238. Predict the percentage of space filled by particles in (a) fcc (b) bcc (c) simple cubic lattice.

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239. Distinguish between anisotropy and isotropy.

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240. What are the important consequences of schottky and frenkel defects in crystals ?

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241. An element occurs in bcc structure with cell edge of 288 pm.Its density is 7.2 gcm^{-3}.

calculate the atomic mass of the element.

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242. Account for the following:

(i) schottky defects lower the density of related solids.

(ii) Conductivity off silicon increases on doping it with phosphorus.

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243. What type of semiconductor is produced when silicon is doped with boron?

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244. What is the number of atoms in a unit cell of

(a) a face-centred cubic structure?

(b) a body-centred cubic structure?

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Problem

1. Tungsten crystallises in body centred cubic crystal. If the edge of the unit cell is 316.5 pm, what is the radius of tungsten atom?

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2. Iron has a body centred cubic unit cell with the dimension of 286.65 pm.The density of iron is 7.874 gcm^{-3}.Use this information to

calculate avogadro's number. $(Atmassof$Fe $= 55.845$u$)$

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3. Sodium crystallizes in a bcc unit cell. calculate the approximate number of unit cells in 9.2 g of sodium. $(Atomicmassof$Na $= 23$u $)$

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