



# 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 form 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**



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

A.  $A_s$

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 NaCl 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 coordination 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. orthorhombic 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. Interstitial

**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 possess 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  $\text{LiAg}$  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:

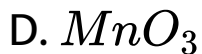
- A. Greater than 0.73
- B. Between 0.73 and 0.41
- C. Between 0.41 and 0.22
- D. Less than 0.22

**Answer: B**



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39. Which substance shows antiferromagnetism?



**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 ( $\text{ohm} - 1\text{cm} - 1$ ):

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  $Cl^-$  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 antifluorite 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 three 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. ↑↑↑ ↓↓↓ ↑↑↑ ↓↓↓

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 *NaF* is  $988^{\circ}C$ . The principal reason that melting point of NaF is much higher than that of RbBr is that:

A. The two crystals are not isomorphous

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

C. The intermolecular distance  $r_c+r_a$  is greater for RbBr than of NaF

D. The bond in 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.  $Fe_2O_3$



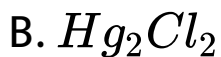
D. All

**Answer: D**



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**56. Which species is diamagnetic?**



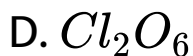
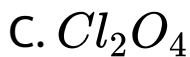
D. All

**Answer: D**



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**57. Which oxide of chlorine is paramagnetic?**



**Answer: B**



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58. Which crystal has the largest lattice energy?

A.  $KCl$

B.  $MgO$

C.  $LiBr$

D.  $NaF$

**Answer: B**



59. The structure of  $\text{MgO}$  is similar to  $\text{NaCl}$ .

The co-ordination number of  $\text{Mg}$  is:

A. 2

B. 6

C. 4

D. 8

**Answer: B**



60. 4 : 4 coordination is noticed in:

A.  $ZnS$

B.  $CuCl$

C.  $AgI$

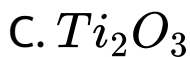
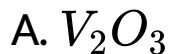
D. All

**Answer: D**



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



D. All

**Answer: D**



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62.8 : 8 coordination is noticed in:

A.  $MgO$

B.  $Al_2O_3$

C.  $CsCl$

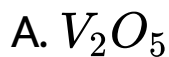
D. All

**Answer: C**



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63. The oxide that possesses electrical conductivity:



**Answer: B**



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

A.  $3\text{Na}^+$  ion

B.  $6\text{Na}^+$  ion

C.  $6\text{Cl}^-$  ion

D.  $4\text{NaCl}$  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 \_\_\_\_



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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.



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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.  $\text{Na}_2\text{O}$  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.



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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 \_\_\_\_\_



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**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 oppositely aligned, it is called \_\_\_\_\_ substance.



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**110.** Iron, cobalt, nickel and  $\text{CrO}_2$  are examples of \_\_\_\_\_ substances.



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**111.** Iodine is an ionic type solid.





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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?



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**124.** How does the presence of interstitial 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  $N_A$  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  $\text{ohm}^{-1}\text{m}^{-1}$ .



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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  $(ohm^{-1}cm^{-1})$ :



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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?



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**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.



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**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?



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



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**147.** What is a body centered cubic?







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**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(scpc)?



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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?



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**156.** What is the percentage 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 Schottky 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 its 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.** Crystalline 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 isotropy ?

(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 stoichiometric 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<sub>2</sub>*)`



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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.** In spite 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 ?



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**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?





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



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**201.** What are 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 ?



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**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  $200 \text{ pm}$ . Calculate its density if  $200 \text{ g}$  this element contains  $24 \times 10^{23}$  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  $8.55 \text{ g cm}^{-3}$ , 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 efficiency 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  $11.35 \text{ gcm}^{-3}$  and the metal crystallizes in *fcc* unit cell. Estimate the radius of lead atom (*at. mass of lead* = 207g 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  $286.65 \text{ pm}$ . The density of iron is  $7.874 \text{ gcm}^{-3}$ . Use this information to calculate avogadro's number. ( $AtmassofFe = 55.845u$ )



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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 of 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  $7.874 \text{ g cm}^{-3}$ . Use this information to

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



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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 = 23u  
)



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