



# CHEMISTRY

## BOOKS - MODERN PUBLICATION CHEMISTRY (KANNADA ENGLISH)

### THE SOLID STATE

#### Multiple Choice Questions Level I

1. Which of the following is an example of covalent solid ?

A. Silicon carbide

B.  $BaSO_4$

C. Solid  $CO_2$

D. Iodine.

**Answer: A**



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2. Which of the following is a molecular solid ?

A. MgO

B. AgCl

C.  $CO_2$

D. Pd

**Answer: C**



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**3. An example of an ionic crystalline solid is :**

A. Diamond

B. Silica

C. LiF

D. Iron

**Answer: C**



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4. In which of the following pairs both the solids belong to same type ?

A. Solid  $CO_2$ , ZnS

B.  $CaF_2$ , Ca

C. Graphite, ice

D. SiC, AlN

**Answer: D**



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5. The interparticle forces in solid hydrogen are :

A. van der Waals' forces

B. Covalent bonds

C. Hydrogen bonds

D. Coordinate bonds

**Answer: A**



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6. Which of the following is not the property of crystalline solids ?

A. definite geometry

B. sharp melting point

C. isotropy

D. anisotropy

**Answer: C**



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7. Which of the following is not crystalline solid ?

A. Zinc sulphide

B. Silver

C. Glass

D. Quartz

**Answer: C**



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**8.** Which of the following does not belong to same type of crystal?

A. Quartz

B. SiC



C. Iodine

D. Diamond

**Answer: C**



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**9.** The number of basic types of unit cells among the crystals is :

A. Eight

B. Fourteen

C. Seven

D. Ten

**Answer: C**



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**10.** If  $a, b$  and  $c$  and  $\alpha, \beta$  and  $\gamma$  are the edges and angles of a unit cell, then an orthorhombic unit cell is described as :

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

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

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

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

**Answer: B**



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**11.** Which of the following is not a crystal system ?

A. Triclinic

B. Rhombohedral

C. Tetragonal

D. Isomorphous

**Answer: D**



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**12.** The most unsymmetrical crystal system is :

A. cubic

B. hexagonal

C. triclinic

D. orthorhombic

**Answer: C**



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**13.** The unit cell with crystallographic dimensions :

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

A. Cubic

B. hexagonal

C. Tetragonal

D. Orthorhombic

**Answer: C**



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**14.** A crystal system has the following dimensions :

$a = 0.426\text{nm}$ ,  $b = 0.496\text{nm}$ ,  $c = 0.562\text{ nm}$  and

$\alpha = \gamma = 90^\circ$  and  $\beta \neq 90^\circ$ . This represents

A. monoclinic

B. triclinic

C. hexagonal

D. tetragonal

**Answer: A**



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**15.** The smallest repeating pattern which when repeated again and again results in the crystal of substance is called

A. space lattice

B. crystal system

C. unit cell

D. coordination number.

**Answer: A**



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**16.** Which of the following crystal system has only primitive Bravais lattice ?



A. Tetragonal

B. Orthorhombic

C. Monoclinic

D. Rhombohedral

**Answer: D**



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**17.** The co-ordination number in ccp and hcp arrangement of metal atoms are respectively

A. 6,6

B. 12,6

C. 12,12

D. 8,6

**Answer: C**



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**18.** The number of atoms per unit cell in a body centred cubic arrangement is :

A. 1

B. 3

C. 4

D. 6

**Answer: B**



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**19.** Which of the following type of cubic latic has maximum number of atoms per unit cell ?

- A. Simple cubic
- B. Body centred cubic
- C. Face centred cubic
- D. All have same.

**Answer: C**



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**20.** In a hcp arrangement, each atom at the corner contributes to the unit cell equal to

A.  $1/2$

B.  $1/8$

C.  $1/6$

D.  $1/4$

**Answer: C**



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**21. The efficiency of packing is 68% in**

A. hcp structure

B. simple cubic structure

C. fcc structure

D. bcc structure

**Answer: D**



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22. When atoms are placed at the corners of all 12 edges of a cube, the number of atoms present per unit cell is :

A. 1

B. 2

C. 4

D. 6

**Answer: A**



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**23.** Metallic gold crystallizes in body centred cubic lattice. The coordination number of gold is :

A. zero

B. 6

C. 8

D. 4

**Answer: C**



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**24.** Crystals can be described into .....  
basic crystal habits .



A. 7

B. 4

C. 14

D. 3

**Answer: A**



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**25.** An example of a body centred cube is :

A. Sodium

B. Magnesium

C. Zinc

D. Copper

**Answer: A**



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**26.** A metallic element crystallizes into a lattice containing a sequence of layers of ABABAB ..... Any packing of spheres leaves out

voids in the lattice. What percentage by volume of this lattice is empty space ?

A. 0.74

B. 0.26

C. 0.5

D. 0.2

**Answer: B**



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27. Close packing is maximum in the crystal which is

A. Simple cubic

B. bcc

C. fcc

D. All

**Answer: C**



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28. In a primitive cubic lattice, the percentage of void volume is

A. 52.36%

B. 25.95%

C. 74.05%

D. 47.64%

**Answer: D**



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29. The number of atoms present in a hexagonal close packed unit cell is

A. 4

B. 6

C. 8

D. 12

**Answer: B**



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30. The number of atoms per unit cell in a simple cubic arrangement is :

A. 1

B. 8

C. 4

D. 2

**Answer: A**



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31. The number of octahedral sites for a lattice consisting of  $N$ -atoms is :

A.  $N$

B.  $2N$

C.  $N/2$

D.  $6N$

**Answer: A**



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32. A metal crystallized in fcc lattice and edge of the unit cell is 620 pm. The radius of metal atom is

A. 265.5pm

B. 219.2pm

C. 310pm

D. 438.6pm

**Answer: B**



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33. The radius of  $A^+$  is  $0.95 \text{ \AA}$  and of  $B^-$  is  $1.81 \text{ \AA}$ . The coordination number of  $A^+$  is :

A. 4

B. 6

C. 8

D. 2

**Answer: B**



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**34.** If the radius of an octahedral void is  $r$  and the radius of atom in close packing is  $R$ , then the relation between  $r$  and  $R$  is :

A.  $R = 0.414r$

B.  $r = 0.732R$

C.  $r = 0.414R$

D.  $r = 0.532R$

**Answer: D**



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35. For tetrahedral coordination number , the radius ratio,  $r^+ / r^-$  is :

A. 0.225 – 0.414

B. 0.414 – 0.526

C. 0.414-0.732

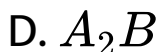
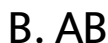
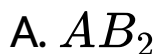
D. 0.732 – 1.0

**Answer: A**



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**36.** A solid is made up of two elements A and B. Atoms of B are in ccp arrangement, while atoms A occupy all the tetrahedral sites. The formula of the compound is :



**Answer: D**



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37.  $\text{TlCl}$  has  $\text{NaCl}$  structure, the coordination number of  $\text{Tl}^+$  in  $\text{TlCl}$  is :

A. 6

B. 4

C. 8

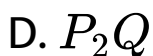
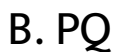
D. 3

**Answer: A**



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38. A solid is made up of two elements P and Q. P atoms are in ccp arrangement while atoms Q occupy all the octahedral voids and half of the tetrahedral voids. The formula of the compound is :

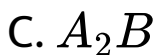
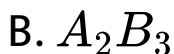


**Answer: B**



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**39.** A compound formed by elements A and B has a cubic structure in which A atoms are at the corners of the cube and B atoms are at the face centres. The formula of the compound is :







**Answer: A**



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**40.** One unit cell of NaCl contains



**Answer: C**

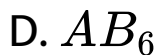
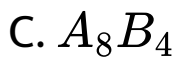


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**41.** A compound is formed by elements A and B. This crystallizes in the cubic structure where the A atoms are at the corners of the cube and B atoms are at the body centres. The simplest formula of the compound is :

A. AB

B.  $A_6B$

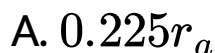


**Answer: A**



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**42.** In a close packing of atoms A of radius  $r_a$ , the radius of atom B that can be fitted in tetrahedral void is



B.  $0.155r_a$

C.  $0.414r_a$

D.  $0.732r_a$

**Answer: A**



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**43.** Body diagonal of a cube is 866 pm. Its edge length would be

A. 408pm

B. 612.4pm

C. 586pm

D. 500pm

**Answer: D**



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**44.** If  $a$  be the edge length of the unit cell and  $r$  be the radius of an atom, then for fcc arrangement, the correct relation is

A.  $4a = \sqrt{3}r$

B.  $4r = \sqrt{3} \cdot a$

C.  $4r = \sqrt{2}a$

D.  $4r = \frac{a}{\sqrt{2}}$

**Answer: C**



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**45.** In a face centred cubic lattice, a unit cell is shared equally by how many unit cells ?

A. 2

B. 4

C. 6

D. 8

**Answer: C**



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**46.** Lithium metal crystallized in a body centred cubic crystal. If the length of the side

of the unit cell of lithium is 351 pm, the atomic radius of the lithium will be :

A. 151.8 pm

B. 75.5pm

C. 300.5pm

D. 240.8pm

**Answer: A**



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47. Copper crystallizes in a face-centred cubic lattice with a unit cell length of 361pm. What is the radius of copper atom in pm ?

A. 157

B. 181

C. 108

D. 128

**Answer: D**



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48. A metal has face centred cubic arrangement . If length of the edge of the cell is  $x$  pm and  $M$  is its atomic mass, then density will be equally to ( $N_0$  is Avogadro number )

A.  $\frac{M \times 10^{30}}{x^3 \times N_0} gcm^{-3}$

B.  $\frac{M \times N_0}{x^3} gcm^{-3}$

C.  $\frac{4M}{x^3 \times N_0} \times 10^{30} gcm^{-3}$

D.  $\frac{M}{4x^3 \times N_0} gcm^{-3}$

**Answer: C**



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49. An element crystallized in fcc lattice and edge length of unit cell is 400 pm. If density of unit cell is  $11.2 \text{ gcm}^{-3}$ , then atomic mass of the element is

A.  $215.6 \text{ gmol}^{-1}$

B.  $431.2 \text{ gmol}^{-1}$

C.  $107.8 \text{ gmol}^{-1}$

D.  $98.6 \text{ gmol}^{-1}$

**Answer: C**



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**50.** A metallic element 'X' has cubic lattice. Each edge of the unit cell is  $2.0\text{\AA}$  and its density is  $2.5\text{ gcm}^{-3}$ . Number of atoms in 200g of the metal are :

A.  $1 \times 10^{20}$

B.  $1 \times 10^{22}$

C.  $1 \times 10^{24}$

D.  $1 \times 10^{25}$

**Answer: D**



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**51.** How many unit cells are present in a cube shaped ideal crystal of NaCl of mass 1.0 g ?

A.  $2.57 \times 10^{21}$

B.  $1.28 \times 10^{21}$

C.  $1.71 \times 10^{21}$

$$D. 5.14 \times 10^{21}$$

**Answer: A**



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**52.** A unit cell of sodium chloride has four formula units. The edge length of the unit cell is 0.564 nm. What is the density of sodium chloride ?

$$A. 1.2 \text{gcm}^{-3}$$

B.  $2.16\text{gcm}^{-3}$

C.  $3.64\text{gcm}^{-3}$

D.  $4.56\text{gcm}^{-3}$

**Answer: B**



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**53.** The cell edge of a fcc crystal is 100 pm and its density is  $10.0\text{gcm}^{-3}$ . The number of atoms in 100 g of this crystal is :

A.  $1 \times 10^{25}$

B.  $2 \times 10^{25}$

C.  $3 \times 10^{25}$

D.  $4 \times 10^{25}$

**Answer: D**



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**54.** The cubic unit cell of Al ( molar mass = 27 g  $mol^{-1}$ ) has an edge length of 405 pm. Its density is  $2.7gcm^{-3}$ . The cubic unit cell is :



A. body centred

B. primitive

C. edge centred

D. face centred

**Answer: D**



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

A. 2

B. 5

C. 3

D. 1

**Answer: B**



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**56.** In AgBr, there can occur

A. only Schottky defect

B. only Frenkel defect

C. both ( A) and ( B)

D. None of these

**Answer: C**



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**57.** Which of the following is not correct consequence of Schottky defects ?

A. electrical conductivity increases

B. density decreases

C. lattice energy of crystal increases

D. stability of crystal decreases.

**Answer: C**



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**58.** The appearance of colour in solid alkali halides is generally due to

A. Schottky defect

B. Frenkel defect

C. Interstitial position

D. F-centres

**Answer: D**



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**59.** A p-type material is electrically

A. positive

B. negative

C. neutral

D. depends upon the concentration of p-impurities

**Answer: C**



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**60.** The white ZnO turns yellow on heating because of

A. Frenkel defect

B. Metal excess defect

C. Metal deficiency defect

D. Schottky defect

**Answer: B**



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**61.** The crystal with metal deficiency defect is

A. NaCl

B. FeO

C. KCl

D. ZnO

**Answer: B**



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**62.** Some polar crystals produce small electric current on heating . This phenomenon is called

A. Piezo electricity



B. Pyro electricity

C. Ferro electricity

D. Anti ferroelectricity

**Answer: B**

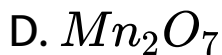
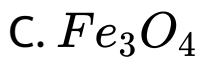


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**63.** An example of a ferromagnetic oxide is :

A.  $CrO_2$

B.  $TiO_2$



**Answer: A**



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**64.** If the alignment of magnetic moments in a substance is in a compensatory way so as to give zero net magnetic moment, then the substance is said to be

A. Ferromagnetic

B. Anti-ferromagnetic

C. Ferrimagnetic

D. Diamagnetic

**Answer: B**



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**65.**  $Fe_3O_4$  is ferrimagnetic at room temperature but at 850 K it becomes :

A. Diamagnetic

B. Ferromagnetic

C. Non-magnetic

D. Paramagnetic

**Answer: D**



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**66.** The phenomenon in which the crystals on  
subjecting to a pressure or mechanical stress  
produce electricity is called

A. pyroelectricity

B. piezoelectricity

C. ferroelectricity

D. ferrielectricity

**Answer: B**



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**67.** In which of the following structures, the cation has maximum coordination number ?

A.  $Na_2O$

B. Zinc blende

C.  $CaF_2$

D. NaCl

**Answer: C**



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**68.** In CsCl structure, the coordination numbers of  $Cs^+$  and  $Cl^-$  ions are respectively.

A. 8,8

B. 8,6

C. 6,8

D. 6,6

**Answer: B**



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**69.** In  $CaF_2$ , the coordination numbers of  $Ca^{2+}$  and  $F^-$  ions are respectively.

A. 8,4

B. 4,4

C. 6,4

D. 4,8

**Answer: A**



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**70.** Co-ordination number of cations in rock salt structure of NaCl is :



A. 4

B. 6

C. 8

D. 9

**Answer: B**



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**Multiple Choice Questions Level II**

1. KF has NaCl structure. The edge length of its unit cell has been found to be 537.6 pm. The distance between  $K^+$  and  $F^-$  in KF is :

A. 537.6pm

B. 268.8pm

C. 1075.2pm

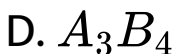
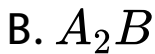
D. cannot be calculated

**Answer: B**



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2. In a solid 'AB' having NaCl structure, 'A' atoms occupy the corners of the cubic unit cell. If all the face-centred atoms along one of the axes are removed, then the resultant stoichiometry of the solid is

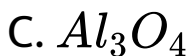
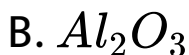
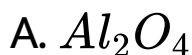


**Answer: D**



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3. In corundum, oxide ions are arranged in hcp arrangement and the aluminium ions occupy two-third of the octahedral holes. Its formula is :



**Answer: B**



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4. An element (atomic mass = 100 / mol) having bcc structure has unit cell edge 400 pm. The density of the element is :

A.  $10.376gcm^{-3}$

B.  $5.1888gcm^{-3}$

C.  $7.289gcm^{-3}$

D.  $2.144gcm^{-3}$

**Answer: B**



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5. A metal crystallizes in cubic close packed (ccp). The atomic radius of metal is 144 pm and its atomic mass is 197 a.m.u. Its density is

A.  $19.4 \text{ gcm}^{-3}$

B.  $1.94 \text{ gcm}^{-3}$

C.  $29.4 \text{ gcm}^{-3}$

D.  $2.94 \text{ gcm}^{-3}$

**Answer: A**



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6. A compound AB crystallized in bcc lattice with unit cell edge length of 480 pm. If the radius of  $B^-$  is 225pm, then the radius of  $A^+$  is

A. 225 pm

B. 190.7pm

C. 129.6pm

D. 132.8pm

**Answer: B**



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7. In a cubic crystal anions are arranged in fcc arrangement and the cations occupy all the octahedral voids and half the tetrahedral voids. The ratio of the cations and anions in the crystal is

A. 1:1



B. 2: 1

C. 1: 2

D. 3: 2

**Answer: B**



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**8.** Schottky defect in a crystal 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

**Answer: B**



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9. If NaCl is doped with  $10^{-4}$  mol % of  $SrCl_2$ , the concentration of cation vacancies will be ( $N_A = 6.022 \times 10^{23} mol^{-1}$ )

A.  $6.02 \times 10^{18} mol^{-1}$

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

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

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

**Answer: B**



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10. The fraction of total volume occupied by the atoms present in a simple cube is

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

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

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

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

**Answer: D**



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11. Three element A,B and C crystallise into a cubic solid lattice. Atoms A occupy the corners, B occupy the cube centres and C occupy the edges. The formula of the compound is :

A.  $ABC$

B.  $ABC_2$

C.  $ABC_3$

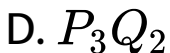
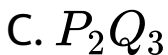
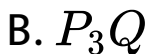
D.  $ABC_4$

**Answer: C**



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12. A solid is formed by two elements P and Q. The element Q forms cubic close packing and atoms of P occupy two-third of tetrahedral voids. The formula of the compound is



**Answer: C**



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13. A unit cell of sodium chloride has four formula units. The edge length of the unit cell is 0.564 nm. What is the density of sodium chloride ?

A.  $1.2gcm^{-3}$

B.  $2.16gcm^{-3}$

C.  $3.64gcm^{-3}$

D.  $4.56gcm^{-3}$

**Answer: B**



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**14.** Aluminium crystallizes in a ccp structure. Its metallic radius is 125pm. The number of unit cells in  $1.00 \text{ cm}^3$  of Al are

A.  $2.27 \times 10^{22}$

B.  $1.13 \times 10^{20}$

C.  $2.26 \times 10^{26}$

D.  $1.13 \times 10^{23}$



**Answer: A**



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**15.** An element crystallizes in a structure having fcc unit cell of an edge 200 pm. Calculate the density if 200 g of this element contains  $24 \times 10^{23}$  atoms.

A.  $4.16 \text{gcm}^{-3}$

B.  $41.6 \text{gcm}^{-3}$

C.  $20.8 \text{gcm}^{-3}$

$$D. 10.4gcm^{-3}$$

**Answer: B**



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**16.** Total volume of atoms present in face centred cubic unit cell of metal is (  $r$  is atomic radius )

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

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

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

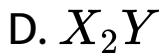
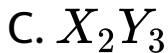
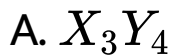
D.  $\frac{20}{3} \pi r^3$

**Answer: C**



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**17.** In a compound, atoms of element Y form ccp lattice and those of X occupy  $\frac{2}{3}$  rd of tetrahedral voids. The formula of the compound will be :



**Answer: B**



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**18.** For tetrahedral co-ordination, the radius ratio ( $r_+ / r_-$ ) should be :

A. 0.155-0.225

B. 0.225-0.414

C. 0.414-0.732

D. 0.732-1

**Answer: B**



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**19.** Which of the following is not an example of 3-15 compound ?

A. InSb

B. GaAs

C. CdSe

D. AlP

**Answer: C**



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**20.** Which of the following transition metal oxide is not an insulator ?

A. MnO

B. NiO

C. VO

D.  $Mn_2O_3$

**Answer: C**



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**21.** In a face centred cubic unit cell of close packed atoms, the radius of atom (  $r$  ) is

related to the edge length ( $a$ ) of the unit cell

by the expression

$$\text{A. } r = \frac{a}{\sqrt{2}}$$

$$\text{B. } r = \frac{a}{2}$$

$$\text{C. } r = \frac{a}{2\sqrt{2}}$$

$$\text{D. } r = \frac{\sqrt{3}a}{4}$$

**Answer: C**



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22. The most unsymmetrical and symmetrical systems are respectively.

- A. tetragonal, cubic
- B. triclinic, cubic
- C. rhombohedral, hexagonal
- D. orthorhombic, cubic

**Answer: B**



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23. The number of tetrahedral and octahedral holes in a hexagonal primitive unit cell are

A. 8,4

B. 6,12

C. 2,1

D. 12,6

**Answer: D**



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**24.** Gold crystallizes in a face centred unit cell. Its edge length is 0.410nm. The radius of gold atom is

A. 0.205 nm

B. 0.290 nm

C. 0.145 nm

D. 0.578 nm

**Answer: C**



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25. A metal X ( at. Mass = 60) has a body centred cubic crystal structure. The density of the metal is  $4.2 \text{ g cm}^{-3}$  . The volume of unit cell is

A.  $8.2 \times 10^{-23} \text{ cm}^3$

B.  $4.75 \times 10^{-23} \text{ cm}^3$

C.  $3.86 \times 10^{23} \text{ cm}^3$

D.  $3.86 \times 10^{-23} \text{ cm}^3$

**Answer: B**



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26. The empty space in hcp unit cell is

A. 0.74

B. 0.476

C. 0.32

D. 0.26

**Answer: D**



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

A. 4

B. 6

C. 8

D. 10

**Answer: C**



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28. Total volume of atoms present in face centred cubic unit cell of metal is (  $r$  is atomic radius )

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

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

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

D.  $\frac{20}{3} \pi r^3$

**Answer: C**



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29. If 'a' stands for the edge length of the cubic system : simple cubic , body centred cubic and face centred cubic, then the ration of the radii of the spheres in these systems will be respectively :

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

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

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

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

**Answer: A**





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30. If three interaxial angles defining the unit cell are all equal in magnitude, the crystal cannot belong to

- A. orthorhombic system
- B. tetragonal system
- C. rhombohedral system
- D. cubic system

**Answer: C**



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31. Total number of tetrahedral and octahedral voids in 0.5 mol of a compound forming hcp structure are :

A.  $6.022 \times 10^{23}$

B.  $3.011 \times 10^{23}$

C.  $9.033 \times 10^{23}$

D.  $4.516 \times 10^{23}$

**Answer: C**



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32. Sodium chloride, NaCl usually crystallizes in a face centred cubic lattice. How many ions are in contact with any single  $Na^+$  ion ?

A. 4

B. 6

C. 8

D. 1

**Answer: B**



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33. Which one of the following compound exhibits both Schottky and Frenkel defects ?

A. NaCl

B. AgCl

C. AgBr

D. AgI

**Answer: C**



34. Percentage of free space in cubic close packed structure and in body centred packed structure are respectively :

A. 32% and 48%

B. 48% and 26%

C. 30% and 26%

D. 26% and 32%

**Answer: D**



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

A. 200pm

B. 300pm

C. 335pm

D. 250pm

**Answer: C**



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**36.** A metal crystallises into a lattice containing a sequence of layers of atoms of AB AB AB ..... What is the percentage by volume of this lattice having empty space ?

A. 74

B. 26

C. 20

D. 16

**Answer: B**



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

A. 288 pm

B. 408pm



C. 144pm

D. 204pm

**Answer: A**



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**38.** A mineral having the formula  $AB_2$  crystallizes in the ccp lattice, with A atoms occupying the lattice points. The coordination number of A and B atoms in its structure are

A. 4,8

B. 4,4

C. 8,8

D. 8,4

**Answer: D**



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**39.** Which of the following statement is not true about the hexagonal close packing ?

- A. The coordination number is 12.
- B. It has 74% packing efficiency.
- C. Tetrahedral voids of the second layer are covered by the spheres of the third layer.
- D. In this arrangement spheres of the fourth layer are exactly aligned with those of the first layer.

**Answer: D**



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**40.** Which of the following statements is not true ?

A. Paramagnetic substances are weakly attracted by magnetic field.

B. Ferromagnetic substances cannot be magnetised permanently

C. The domains in antiferromagnetic substances are oppositely oriented with respect to each other.

D. Pairing of electrons cancels their magnetic moment in the diamagnetic substances.

**Answer: B**



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## Multiple Choice Questions Level Iii

1. Copper crystallizes in fcc with a unit cell length of 361 pm. What is the radius of copper

atom ?

A. 108 pm

B. 127 pm

C. 157 pm

D. 181pm

**Answer: B**



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2. The edge length of a face centred cubic cell of an ionic substance is 508pm. If the radius of the cation is 110pm, the radius of the anion is :

A. 618pm

B. 144 pm

C. 288 pm

D. 398 pm

**Answer: B**



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

A. 32% and 48%

B. 48% and 26%

C. 30% and 26%

D. 26% and 32%

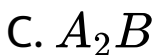
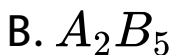
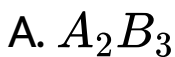
**Answer: D**







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



**Answer: B**



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5. Copper crystallises in fcc lattice with a unit cell edge of 361 pm. The radius of copper atom is :

- A. 108pm
- B. 128 pm
- C. 157 pm
- D. 181 pm

**Answer: B**



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**6.** Lithium metal crystallized in a body centred cubic crystal. If the length of the side of the unit cell of lithium is 351 pm, the atomic radius of the lithium will be :

A. 152pm

B. 75 pm

C. 300 pm

D. 240 pm

**Answer: A**



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

A. Iodine

B. Silicon

C. Sulphur

## D. Phosphorus

**Answer: B**



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

A. 7.01 %

B. 4.08%

C. 6.05%

D. 5.08%

**Answer: B**



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9. CsCl crystallises in body centred cubic lattice.

If 'a' is its edge length then which of the

following expression is correct ?

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

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

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

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

**Answer: C**



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**10.** Sodium metal crystallizes in a body centred cubic lattice with a unit cell edge of  $4.29\text{\AA}$ . The radius of sodium atom is approximately :

A.  $1.86\text{\AA}$

B.  $3.22\text{\AA}$

C.  $5.72\text{\AA}$

D.  $0.93\text{\AA}$

**Answer: A**



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**Recent Examination Questions**



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

A. 2

B. 5

C. 3

D. 1

**Answer: B**



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2. An ionic compound is expected to have tetrahedral structure if  $r_+ / r_-$  lies in the range of

A. 0.155 to 0.225

B. 0.732 to 1

C. 0.414 to 0.732

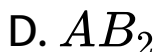
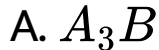
D. 0.225 to 0.414

**Answer: D**



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3. A compound formed by elements A and B has a cubic structure in which A atoms are at the corners of the cube and B atoms are at the face centres. The formula of the compound is :



**Answer: C**



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4. Which one of the following is a molecular crystal?

A. Rock salt

B. Quartz

C. Dry ice

D. Diamond

**Answer: C**



5. In a face centred cubic lattice, a unit cell is shared equally by how many unit cells ?

A. 6

B. 4

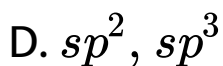
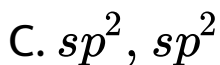
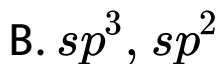
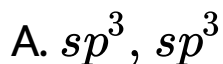
C. 2

D. 8

**Answer: A**



6. Hybridised states of carbon in graphite and diamond are respectively



**Answer: D**



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7. A crystalline solid  $XY_3$  has ccp arrangement for its element Y. X occupies

- A. 66% of tetrahedral voids
- B. 33% of tetrahedral voids
- C. 66% of octahedral voids
- D. 33% of octahedral voids

**Answer: D**



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8. Volume occupied by single CsCl ion pair in a crystal is  $7.014 \times 10^{-23} \text{c}^3$ . The smallest Cs-Cs internuclear distance is equal to length of the side of the cube corresponding to volume of one CsCl ion pair. The smallest Cs to Cs internuclear distance is nearly

A.  $4.4 \text{\AA}$

B.  $4.3 \text{\AA}$

C.  $4 \text{\AA}$

D.  $4.5 \text{\AA}$



**Answer: C**



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9. The unit cell with crystallographic dimensions,

$a \neq b \neq c, \alpha = \gamma = 90$  and  $\beta \neq 90$  is

A. Orthorhombic

B. Triclinic

C. Tetragonal

D. Monoclinic

**Answer: D**



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**10.** Sodium metal crystallizes in B.C.C. lattice with edge length of  $4.29 \text{ \AA}$ . The radius of sodium atom is

A.  $2.145 \text{ \AA}$

B.  $2.857 \text{ \AA}$

C.  $1.857 \text{ \AA}$

D.  $1.601 \text{ \AA}$

**Answer: C**



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**11.** If same type of atoms are packed in hexagonal close packing and cubic close packing separately, then

- A. Density of hcp will be greater than ccp
- B. Density of hcp will be smaller than ccp
- C. Density of hcp will be equal to ccp

D. Density of hcp and ccp will depend upon the temperature of the system.

**Answer: C**



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