1.

If NaCl is doped with 10^{-4} mol % of $SrCl_2$, the concentration of cation vacancies will be (N_A = 6.023 x 10^{23} mol^{-1})

(a) 6.023 x 10^{15} mol^{-1} (b) 6.023 x 10^{16} mol^{-1}

(c) 6.023 x 10^{17} mol^{-1} (d) 6.023 x 10^{14} mol^{-1}

2.

CsCl crystallises in body-centred cubic lattice. If 'a' is its edge length then which of the following expressions is correct?

(a) $r_{Cs+} + r_{Cl-} = 3a$

(b) $r_{Cs+} + r_{Cl-} = 3a/2$

(c) $r_{Cs+} + r_{Cl-} = (\sqrt{3}/2)*a$

(d) $r_{Cs+} + r_{Cl-} = \sqrt{3a}$

3.

The edge length of cube is 400pm. Its body diagonal would be-

(A) 500 pm
(B) 693 pm
(C) 600 pm
(D) 566 pm

4.

Total volume of atoms present in a face centred cubic unit cell of a metal is (r is atomic radius):

(A) $20/3\ \pi r^3$

(B) $24/3\ \pi r^3$

(C) $12/3\ \pi r^3$

(D) $16/3\ \pi r^3$

5.

A solid has a bcc structure. If the distance of closest approach between the two atoms is 1.73**Å .** The edge length of the cell is:

(a) 200pm

(b) $\sqrt{3}/\sqrt{2}$ pm

(c) 142.2 pm

(d) $\sqrt{2}$pm

6.

Which is covalent solid?

(a) Fe_2O_3

(b) Diamond

(c) Graphite

(d) All of these

7.

The anions (A) form hexagonal closest packing and atoms (C) occupy only 2/3 of octahedral voids in it. then the general formula of the compound is-

(A) CA

(B) A_2

(C) C_2A_3

(D) C_3A_2

8.

Graphite in an example of-

(A) Ionic solid

(B) Covalent solid

(C) Vander waal's crystal

(D) Metallic crystal

9.

Select the correct statement (s)-

(a) The C.N. of cation occupying a tetrahedral hole is 4.

(b) The C.N. of cation occupying a octahedral hole is 6.

(c) In schottky defects, density of the lattice decreases,

(A) a,b

(B) b,c

(C) a,b,c

(D) a,c

10.

Which arrangement of electrons leads to anti-ferromagnetism?
(a) ↑↑↑↑
(b) ↑↓↑↓
(c) Both (a) and (b)
(d) None of these

11.

Among the following types of voids. which one is

the largest void:-

(A) Triangular system
(B) Tetragonal system
(C) Monoclinic system
(D) Octahedral

12.

The ratio of cations to anion in a closed pack tetrahedral is:

(a) 0.414
(b) 0.225
(c) 0.02
(d) none of these

13.

The most efficient packing of similar spheres is obtained in

1. the simple cubic system and the body centered cubic system

2. the simple cubic system and the hexagonal close packed system

3. the face centered cubic system and the hexagonal close packed system

4. the body centered cubic system and the face centered cubic system

14.

Frenkel defect is noticed in:

(a) AgBr

(b) ZnS

(c) Agl

(d) all of these

15.

How many octahedral and tetrahedral holes are present per unit cell in a face centred cubic arrangement of atoms?

(A) 8,4

(B) 1.2

(C) 4.8

(D) 2.1

16.

Choose the correct matching sequence from the possibilities given

(a) Crystal defect	(1) AB AB AB. . . . type crystal
(b) hcp	(2) Covalent crystal
(c) CsCl	(3) Frenkel
(d) Diamond	(4) Face centered in cube
(e) NaCl	(5) Body centered in cube

	(a)	(b)	(c)	(d)	(e)
(A)	3	1	2	5	4
(B)	3	1	5	2	4
(C)	3	5	1	2	4
(D)	5	3	4	2	1

17.

Fraction of total volume occupied by atoms in a simple cube is-

(A) $\pi/2$

(B) $\sqrt{3}\pi/8$

(C) $\sqrt{2}\pi/6$

(D) $\pi/6$

18.

Copper metal has a face-centred cubic structure with the unit cell length equal to 0.361nm. Picturing copper ions in contact along the face diagonal. The apparent radius of a copper ion is-

1. 0.128

2. 1.42

3. 3.22

4. 4.22

19.

An element (atomic mass = 100 g mole)having BCC structure has unit cell edge 400 pm. The density of the element is (number of atom bcc(z)=2)

1. $2.144 g/cm^3$
2. $5.2 g/cm^3$
3. $7.289 g/cm^3$
4. $10.376 g/cm^3$

20.

The appearance of colour in solid alkali metal halides is generally due to :-

1. Frankel Defect
2. Interstitial Defect

3. F-Centres
4. Schottky Defect

21.

AB crystallizers 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

1. 250 pm

2. 200 pm

3. 300 pm

4. 335 pm

22.

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

1.AB_2

2.A_2B_3

3.A_2B_5

4.A_2B

23.

Packing fraction of simple cubic crystal lattice is

1. 38%

2. 74%

3. 68%

4. 52.4%

24.

Silver metal crystallises in a cubic closest – packed arrangement with the edge of the unit cell having a length a = 407 pm. What is the radius of silver atom.

(1) 143.9 *pm*

(2) 15.6 *pm*

(3) 11.59 *pm*

(4) 13.61 *pm*

25.

From the fact that the length of the side of a unit cell of lithium is 351 *pm*. Calculate its atomic radius. Lithium forms body centred cubic crystals.

(1) 152.69 *pm*

(2) 62.71 *pm*

(3) 151.98 *pm*

(4) 54.61 *pm*

26.

Lithium borohydride $(LiBH_4)$,crystallises in an orthorhombic system with 4 molecules per unit cell. The unit cell dimensions are : a = 6.81*Å*, b= 4.43*Å*, c=7.17*Å*. If the molar mass of $LiBH_4$ is 21.76 $g\ mol^{-1}$. The density of the crystal is –

(1) 0.668 $g\ cm^{-3}$

(2) 0.585 $g\ cm^{2}$

(3) 1.23 $g\ cm^{-3}$

(4) None

27.

CsBr has a (*bcc*) arrangement and its unit cell edge length is 400 *pm*. Calculate the interionic distance in *CsCl* **[CBSE 1993]**

(1) 346.4 *pm*

(2) 643 *pm*

(3) 66.31 *pm*

(4) 431.5 *pm*

28.

The diffraction of barium with *X*-radiation of wavelength 2.29*Å* gives a first – order reflection at 30°. What is the distance between the diffracted planes.

(1) 3.29 *Å*

(2) 4.39 *Å*

(3) 2.29 *Å*

(4) 6.29 *Å*

29.

The vacant space in bcc lattice cell is ;

(a) 26%

(b) 48%

(c) 23%

(d) 32%

30.

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

(a) 128
(b) 157
(c) 181
(d) 108

31.

Lithium metal crystallises 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) 240.8 pm

(b) 151.8 pm

(c) 75.5 pm

(d) 300.5 pm

32.

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

$\left(\mathrm{a}\right)\ \frac{1}{2}\mathrm{a}:\ \frac{\sqrt{3}}{4}\mathrm{a}:\ \frac{1}{2\sqrt{2}}\mathrm{a}$ $\left(\mathrm{b}\right)\ \frac{1}{2}\mathrm{a}:\sqrt{3}\mathrm{a}:\ \frac{1}{\sqrt{2}}\mathrm{a}$

$\left(\mathrm{c}\right)\ \frac{1}{2}\mathrm{a}:\ \frac{\sqrt{3}}{2}\mathrm{a}:\ \frac{\sqrt{2}}{2}\mathrm{a}$ $\left(\mathrm{d}\right)\ 1\mathrm{a}:\sqrt{3}\mathrm{a}:\sqrt{2}\mathrm{a}$

33.

Which of the following statements is not correct?

(a) The fraction of the total volume occupied by the atoms in a primitive cell is 0.48

(b) Molecular solids are generally volatile

(c) The number of carbon atoms in an unit cell of diamond is 4

(d) The number of Bravais lattices in which a crystal can be categorized is 14

34.

Iron has a body centred cubic unit cell with the cell dimension of 286.65 pm. Density of iron is 7.87 g cm^{-3}. Use this information to calculate Avogadro's number.

(Atomic mass of Fe = 56.0 u)

1. $6.04 \times 10^{23}\ \mathrm{mol}^{-1}$
2. $12.08 \times 10^{24}\ \mathrm{mol}^{-1}$
3. $6 \times 10^{22}\ \mathrm{mol}^{-1}$
4. $6 \times 10^{-23}\ \mathrm{mol}^{-1}$

35.

Sodium metal crystallizes in bcc lattice with cell edge $= 4.29\ \overset{0}{A}$. The radius of sodium atom will be-

(A) 1.50 $\overset{0}{A}$

(B) 1.86 $\overset{0}{A}$

(C) 2.80 $\overset{0}{A}$

(D) None of these

36.

A metallic element exists as cubic lattice. Each edge of the unit cell is 2.88 $\overset{0}{A}$. The density of the metal is 7.20 g cm^{-3}. How many unit cell will be present in 100 g of the metal -

(A) 6.85×10^{2}

(B) 5.82×10^{23}

(C) 4.37×10^{5}

(D) 2.12×10^{6}

37.

Fraction of total volume occupied by atoms in a simple cube is-

(A) $\frac{\pi}{2}$

(B) $\frac{\sqrt{3}\pi}{8}$

(C) $\frac{\sqrt{2}\pi}{6}$

(D) $\frac{\pi}{6}$

38.

Analysis shows that an oxide ore of nickel has formula $Ni_{0.98}O_{1.00}$. The percentage of nickel as Ni^{3+} ions is nearly

1. 2
2. 96
3. 4
4. 98

39.

Frenkel defect is not found in the halides of alkali metals because alkali metals have

1. high electropositivity
2. high ionic radii

3. high reactivity

4. ability to occupy interstitial sites

40.

A solid PQ have rock salt type structure in which Q atoms are at the corners of the unit cell. If the body centred atoms in all the unit cells are missing, the resulting stoichiometry will be-

(A) PQ

(B) PQ_2

(C) P_3Q_4

(D) P_4Q_3

41.

8 : 8 co-ordination of CsCl is found to change into 6 : 6 co-ordination on:

(a) applying pressure
(b) increasing temperature
(c) both (a) and (b)
(d) none of these

42.

At room temperature, sodium crystallises in a body centred cubic cell with a 4.24 $\overset{0}{A}$. The theoretical density of sodium is- (Atomic mass of sodium=23.0 g mol^{-1})

(A) $2.05\ g\ cm^{-3}$

(B) $3.45\ g\ cm^{-3}$

(C) $1.00\ g\ cm^{-3}$

(D) $3.55\ g\ cm^{-3}$

43.

The unit cell dimensions of a cubic lattice (edges a, b, c and the angles between them, $\alpha,\ \beta,\ \gamma$) are

(A) a=b=c, $\alpha = \beta = \gamma = 90^\circ$

(B) a=b≠c, $\alpha = \beta = \gamma = 90^\circ$

(C) a=b=c, $\alpha = \gamma = 90^\circ,\ \beta \neq 90^\circ$

(D) a≠b≠c, $\alpha = \beta = 90^\circ,\ \gamma \neq 90^\circ$

44.

Copper metal has a face-centred cubic structure with the unit cell length equal to 0.361 nm. Picturing copper ions in contact along the face diagonal. The apparent radius of a copper ion is-

(A) 0.128

(B) 1.42

(C) 3.22

(D) 4.22

45.

A compound alloy of gold and copper crystallizes in a cube lattice in which the gold atoms occupy the lattice points at the corners of a cube and the copper atoms occupy the centres of each of the cube faces. The formula of this compound is-

(A) AuCu

(B) $AuCu_2$

(C) $AuCu_3$

(D) None of these

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