Q1: NTA Test 01 (Single Choice)

The radius ratio of KF is 0.98. The structure of KF is of the type

(A) NaCl

(B) ZnS

(C) CsCl

(D) Graphite

Q2: NTA Test 02 (Single Choice)

How many unit cells are present in a cube shaped ideal crystal of NaCl of mass 1.00 g?

(A) 2.57×10^{21}

(B) 5.14×10^{21}

(C) 1.28×10^{21}

(D) 1.71×10^{21}

Q3: NTA Test 03 (Single Choice)

A body centred cubic lattice is made up of hollow sphere of B. Sphere of solid A are present in hollow sphere of B. Radius of A is half of the radius of B. What is the ratio of total volume of sphere B unoccupied by A in unit cell and volume of unit cell?

(A) $\frac{29\pi\sqrt{3}}{64}$

(B) $\frac{7\pi\sqrt{3}}{64}$

(C) $\frac{19\pi\sqrt{3}}{64}$

(D) $\frac{2\pi\sqrt{3}}{64}$

Q4: NTA Test 04 (Single Choice)

A solid XY has NaCl structure. If radius of X^+ is 100 pm. What is the radius of Y^- ion:

(A) 120 pm

(B) 136.6 to 241.6 pm

(C) 136.6 pm

(D) 241.6 pm

Q5: NTA Test 05 (Single Choice)

In orthorhombic unit cell the value of a, b and c are respectively 4.2 Å, 8.6 Å and 8.3 Å . Given the molecular mass of the solute is 155 g mol^{-1} and density is 3.3 g/cc , the number of formula units per unit cell is (Report your answer by rounding up to nearest integer)

(A) 2

(B) 3

(C) 4

(D) 6

Q6: NTA Test 06 (Single Choice)

A crystal made up of particles X, Y, and Z. X forms fcc packing. Y occupies all octahedral voids of X and Z occupies all tetrahedral voids of X. It all particles along one body diagonal are removed, then the formula of the crystal is

(A) XYZ_2

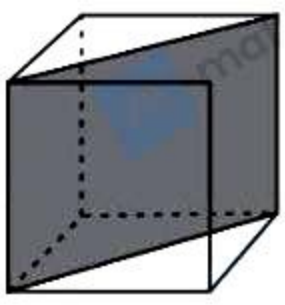
(B) X_2YZ_2

(C) $X_8Y_4Z_5$

(D) $X_5Y_4Z_8$

Q7: NTA Test 07 (Single Choice)

In a hypothetical solid, C atoms are found to form cubical close-packed lattice. A atoms occupy all tetrahedral voids and B atoms occupy all octahedral voids.



A and B atoms are of appropriate size, so that there is no distortion in the CCP lattice of C atoms. Now, if a plane as shown in the following figure is cut, then the cross section of this plane will look like

(A) 

(B) 

(C) 

(D) 

Q8: NTA Test 09 (Numerical)

Calculate the percentage of packing efficiency in simple cubic unit cell.

Q9: NTA Test 10 (Single Choice)

A body centre cubic lattice is made up of two different types of atoms A and B. Atom A occupies the body centre and B occupying the corner positions. One of the corners is left unoccupied per unit cell. Empirical formula of such a solid is

(A) AB

(B) A_2B_2

(C) A_5B_7

(D) A_8B_7

Q10: NTA Test 11 (Single Choice)

The radii of Na^+ and Cl^- ions are 95 pm and 181 pm respectively. The edge length of NaCl unit cell is

(A) 276 pm

(B) 138 pm

(C) 552 pm

(D) 415 pm

Q11: NTA Test 12 (Single Choice)

The number of unit cells present in 39 g of potassium if it crystallizes as body centred cube is (N = Avogadro number, At. Wt. of potassium = 39 g/mol)

(A) $\frac{N}{4}$

(B) $\frac{N}{2}$

(C) $\frac{N}{3}$

(D) N

Q12: NTA Test 13 (Single Choice)

$r_{Na^+} = 195$ pm and $r_{Cl^-} = 281$ pm in NaCl (rock salt) structure. What is the shortest distance between Na^+ ions?

(A) 778.3 pm

(B) 673.06 pm

(C) 195.7 pm

(D) 390.3 pm

Q13: NTA Test 14 (Single Choice)

A_2B has antifluorite structure (B forms FCC lattice and A occupies tetrahedral voids). If all ions along any one body diagonal are removed, then new formula of compound will be:

(A) A_4B_5

(B) A_8B_5

(C) A_7B_6

(D) A_8B_4

Q14: NTA Test 15 (Single Choice)

Strontium crystallizes in a fcc unit cell with edge length a. It contains 0.2% Frenkel defect and another crystal of Sr contains 0.1% Schottky defect. Density of solid with Frankel defect = d_f and density with Schottky defect = d_s, then

(A) $d_f = d_s$

(B) $d_f > d_s$

(C) $d_f < d_s$

(D) $d_f = 2d_s$

Q15: NTA Test 17 (Single Choice)

A metallic element exists in cubic lattice. Each edge of unit cell is 4Å The density of metal is 6.25 g /m^3. How many unit cells will be present in 100 g of metal?

(A) 1×10^{22}

(B) 2.5×10^{29}

(C) 5×10^{23}

(D) 2×10^{23}

Q16: NTA Test 18 (Single Choice)

The radius ratio of KF is 0.98. The structure of KF is the type.

(A) NaCl

(B) ZnS

(C) CsCl

(D) CaF_2

Q17: NTA Test 19 (Single Choice)

In a compound oxide ion have ccp arrangement, cations A are present in $\frac{1}{8}$ of the tetrahedral voids and cations B occupy $\frac{1}{2}$ of the octahedral voids. What are the formula of the compound?

(A) A_2BO_4

(B) AB_2O_4

(C) ABO_2

(D) A_2BO_2

Q18: NTA Test 20 (Single Choice)

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) $r_{Cs^+} + r_{Cl^-} = \frac{3a}{2}$

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

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

Q19: NTA Test 21 (Single Choice)

$TlAl(SO_4)_2 \cdot xH_2O$ is bcc with edge length 'a' = 1.22 nm. If the density of the solid is 2.32 g/cc, then the value of x is

(Given: $N_A = 6 \times 10^{23}$, atomtextc weight (in g/mol) Tl = 204, Al = 27, S = 32, O = 16, H = 1)

(A) 2

(B) 4

(C) 47

(D) 70

Q20: NTA Test 22 (Single Choice)

A metal crystallizes into two cubic systems-face centred cubic (fcc) and simple cubic (SC), whose unit cell lengths are 4.5 and 1.5 Å respectively. Calculate the ratio of densities of face centred cubic and Simple cubic.

(A) 0.15

(B) 1.44

(C) 2.25

(D) 3.25

Q21: NTA Test 23 (Numerical)

Number of crystal systems having only 2 types of bravais lattices = x , number of crystal system having at least two interfacial angles equal = y and number of crystal systems having all the three edge lengths equal = z . Then find the value of $x \times y \times z$.

Q22: NTA Test 28 (Numerical)

The metal M crystallizes in a body cantered lattice with cell edge 400 pm. The atomic radius of M is

Q23: NTA Test 30 (Single Choice)

One mole crystal of a metal halide of the type MX with molecular weight 119 g having face centered cubic structure with unit cell length 6.58 Å was recrystallized. The density of the recrystallized crystal was found to be $2.44 gcm^{-3}$. The type of defect introduced during the recrystalization may be

(A) additional M^+ and X^- ions at interstitial sites

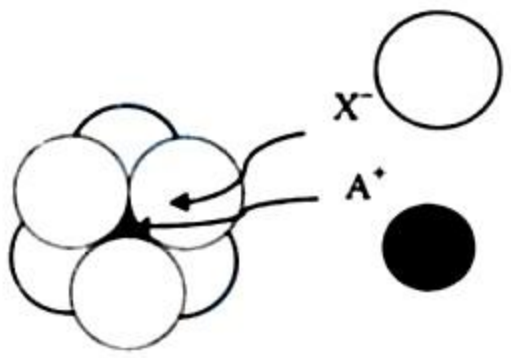
(B) Schottky defect

(C) F-centre

(D) Frenkel defect

Q24: NTA Test 31 (Single Choice)

The arrangement of X^- ions around A^+ ion in solid AX is given in the figure (not drawn to scale). If the radius of X^- is 250 pm, the radius of A^+ is



(A) 104 pm

(B) 125 pm

(C) 183 pm

(D) 57 pm

Q25: NTA Test 33 (Single Choice)

What is the simplest formula of a solid whose unit cell has the atom A at each corner, the atom B at each face centre and a C atom at the body centre?

(A) A_2BC

(B) AB_2C

(C) AB_3C

(D) ABC_2

Q26: NTA Test 35 (Single Choice)

In which of the following crystals alternate tetrahedral voids are occupied ?

(A) NaCl

(B) ZnS

(C) CaF_2

(D) Na_2O

Q27: NTA Test 36 (Single Choice)

For $[FeF_6]^{3-}$ and $[CoF_6]^{3-}$, the correct statement is

(A) both are coloured

(B) both are colourless

(C) $[FeF_6]^{3-}$ is coloured and $[CoF_6]^{3-}$ is colourless

(D) $[FeF_6]^{3-}$ is colourless and $[CoF_6]^{3-}$ is coloured

Q28: NTA Test 36 (Single Choice)

The shortest distance between two Na^+ ions in rock-salt arrangement having edge length equal to $a\sqrt{2}$ picometers is-

(A) $2a$

(B) $2a\sqrt{2}$

(C) $\frac{a}{\sqrt{2}}$

(D) a

Q29: NTA Test 37 (Single Choice)

The number of unit cells in 58.5 g of NaCl is approximately

(A) 6×10^{20}

(B) 1.5×10^{23}

(C) 6×10^{23}

(D) 0.5×10^{24}

Q30: NTA Test 41 (Single Choice)

The crystal system of a compound with unit cell dimensions $a = 0.387,\ b = 0.387$ and $c = 0.504$ nm and $\alpha = \beta = 90^{o}$ and $\gamma = 120^{o}$ is

(A) Hexagonal

(B) Cubic

(C) Rhombohedral

(D) Orthorhombic

Q31: NTA Test 42 (Single Choice)

A solid is formed and it has three types of atoms X, Y and Z. X forms a fcc lattice with Y atoms occupying all tetrahedral voids and Z atoms occupying half of octahedral voids. The formula of solid is

(A) X_4YZ_2

(B) X_4Y_2Z

(C) XY_2Z_4

(D) X_2Y_4Z

Q32: NTA Test 43 (Single Choice)

CsBr has bcc structure with edge length 4.3 Å . The shortest inter ionic distance in between Cs^{+} and Br^{-} is –

(A) 4.3 Å

(B) 7.44 Å

(C) 1.86 Å

(D) 3.72 Å

Q33: NTA Test 45 (Numerical)

What is the coordination number of Cs^{+} in CsCl?

Q34: NTA Test 46 (Single Choice)

If the unit cell of a mineral has cubic close packed (ccp) array of oxygen atoms with m fraction of octahedral holes occupied by aluminium ions and n fraction of tetrahedral holes occupied by magnesium ions, m and n, respectively, are

(A) $\frac{1}{2}, \frac{1}{8}$

(B) $1, \frac{1}{4}$

(C) $\frac{1}{2}, \frac{1}{2}$

(D) $\frac{1}{4}, \frac{1}{8}$

Q35: NTA Test 47 (Single Choice)

The density of KBr is $2.75\ g\ cm^{-3}$, length of the unit cell is 654 pm. K = 39, Br = 80, then what can be true about the predicted nature of the solid?

(Given: $N_A = 6.023 \times 10^{23}$)

(A) Solid has face centred cubic system with co-ordination number = 6

(B) Solid has simple cubic system with co-ordination number = 8

(C) Solid has face centred cubic system with co-ordination number =12

(D) None of the above

Q36: NTA Test 48 (Single Choice)

Which of the following compounds is metallic and ferromagnetic?

(A) MnO_2

(B) TiO_2

(C) CrO_2

(D) VO_2

Answer Keys

Q1: (C)

Q2: (A)

Q3: (B)

Q4: (B)

Q5: (C)

Q6: (D)

Q7: (C)

Q8: 52.40

Q9: (D)

Q10: (C)

Q11: (B)

Q12: (B)

Q13: (B)

Q14: (B)

Q15: (B)

Q16: (C)

Q17: (B)

Q18: (C)

Q19: (C)

Q20: (A)

Q21: 24

Q22: 173 **Q23:** (B) **Q24:** (A)

Q25: (C) **Q26:** (B) **Q27:** (D)

Q28: (D) **Q29:** (B) **Q30:** (A)

Q31: (D) **Q32:** (D) **Q33:** 8

Q34: (A) **Q35:** (A) **Q36:** (C)

Solutions

Q1: (C) CsCl

As $\frac{r_+}{r_-}$ lies in the range $0.732 - 1.000$. Hence the coordination number is 8 and crystal is of CsCl type.

Q2: (A) 2.57×10^{21}

$\therefore$ Mass of one unit cell $= V \times d$ (V is volume, d is density)

$= a^3 \times d$

Also, density $= \frac{z \times \text{at. wt.}}{a^3 \times \text{av. no.}}$

$\therefore$ Mass of one unit cell $= \frac{a^3 \times z \times \text{at. wt.}}{a^3 \times \text{av. no.}}$

$= \frac{z \times \text{at. wt.}}{\text{av. no.}}$

$= \frac{4 \times 58.5}{6.02 \times 10^{23}}$ (z = 4 for cubic shape)

$= 38.87 \times 10^{-23} \text{g}$

$\therefore$ No. of unit cell in 1 g $= \frac{1}{38.87 \times 10^{-23}}$

$= 2.57 \times 10^{21}$

Q3: (B) $\frac{7\pi\sqrt{3}}{64}$

Effective number of atoms of B present in a unit cell = 2

Total volume of B unoccupied by A in a unit cell

$= 2 \times \frac{4}{3}\left(R^3 - r^3\right) \times \pi$

$= \frac{7}{3}\pi R^3 \left(r = \frac{R}{2}\right)$

Volume of unit cell = a^3

$\left(\frac{4R}{\sqrt{3}}\right)^3 = \frac{64}{3\sqrt{3}} R^3 \left(\sqrt{3}a = 4R\right)$

Ratio of total volume of sphere B unoccupied by A in unit cell and volume of unit cell $= \frac{7/3\pi R^3}{\frac{64}{3\sqrt{3}} R^3} = \frac{7\pi\sqrt{3}}{64}$

Q4: (B) 136.6 **to** 241.6 pm

For NaCl like structure. The radius ratio should be 0.414 to 0.732

$$\frac{r^+}{r^-} = \frac{100}{r^-_{max}} = 0.414$$

$$\frac{100}{r_{min}} = 0.732$$

$$\therefore r^-_{max} = 241.6 \text{ pm}$$

$$\therefore r_{min} = 136.6 \text{ pm}$$

Q5: (C) 4

$$Z = \frac{V \times N_A \times \rho}{M}$$

V = Volume of unit cell = a × b × c

$$= \frac{4.2 \times 8.6 \times 8.3 \times 10^{-24} \times 6.023 \times 10^{23} \times 3.3}{155} = 3.84 \simeq 4$$

Q6: (D) $X_5Y_4Z_8$

For fcc, number of X atoms = 4/unit cell

Number of Tetrahedral Voids = Z = 8

Number of Octahedral Voids = Y = 4

Number of atoms removed along one body diagonal = 2X (corner) and 2Z (TVs) and 1 Y (OV at body centre)

$$\therefore \quad \text{Number of X atoms left} = 4 - \left(2 \times \frac{1}{8}\right) = \frac{15}{4}$$

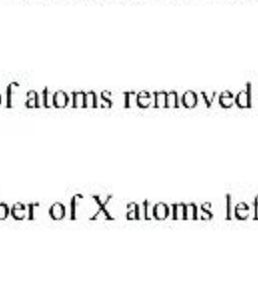
Number of Y atom left = 4 - (1 × 1) = 3

Number of Z atom left = 8 - (2 × 1) = 6

The simplest formula $= X_{\frac{15}{4}} Y_3 Z_6 \Rightarrow X_{15} Y_{12} Z_{24}$

$$\Rightarrow X_5 Y_4 Z_8$$

Q7: (C)



From figure, it is clear that 4 corners and 2 face centers lie on the shaded plane. Therefore, there will be six C atoms, and atoms (marked A) in TVs do not touch other.

Fig (i) is not possible; four atom marked C.

Fig. (ii) is not possible, atoms A in TVs are not shown in figure.

Fig. (iii) is possible, since atoms A in TVs are not touching each other. There are four atoms A on two body diagonals contained in shades plane.

Fig (iv) is not possible, since atoms A in TVs are touching each other.

Q8: 52.40

In simple cubic, packing efficiency

$$= \frac{\text{Volume of one atom} \times 100}{\text{Volume of unit cell}}$$

$$= \frac{\frac{4}{3}\pi r^3}{8r^3} \times 100 = \frac{\pi}{6} \times 100 = 52.4\%$$

where, r = radius of one sphere or atom.

Q9: (D) A_8B_7

There is one A per unit cell

Number of B per unit cell $= \frac{1}{8} \times 7 = \frac{7}{8}$

Empirical formula = $A_1B_{\frac{7}{8}}$

$= A_8B_7$

Q10: (C) 552 pm

NaCl has fcc structure.

In fcc lattice with ions in octahedral voids

$r^+ + r^- = \frac{a}{2}$

Where, a = edge length

$r^+ = 95$ pm, $r^- = 181$ pm

Edge length = $2r^+ + 2r^-$

$= (2 \times 95 + 2 \times 181)$ pm

$= 190 + 362 = 552$ pm

Q11: (B) $\frac{N}{2}$

Potassium has bcc system

Number of mole = 39/39 = 1 mole

1 mole of atoms = 6.022×10^{23} atoms = N

$\because$ In bcc system 2 atoms are present in 1 unit cell.

$\therefore$ N number of atoms are present in $\frac{N}{2}$ unit cells.

Q12: (B) 673.06 pm

The shortest distance between two Na^+ ion $= \frac{1}{2}$ face $-$ diagonal

$= \frac{1}{2} \times \sqrt{2}\{2(r_{Na^-} + r_{cr})\}$

$= \sqrt{2}(195 + 281)$ pm $= 673.06$ pm

Q13: (B) A_8B_5

On one body diagonal, 2 A-atoms(full contribution) 2 B-atoms $\left(\frac{1}{8}\text{contributions}\right)$ lie. So, new formula = $A_{8-2}B_{4-\frac{1}{4}} = A_8B_5$

Q14: (B) $d_f > d_s$

No effect on density due to Frenkel defect but due to Schottky defect density of solid decrease

Q15: (B) 2.5×10^{29}

$$d = \frac{\text{weight}}{\text{Total volume}}$$

$$6.25 = \frac{100}{n \times (4 \times 10^{-10})^3}$$

$$\frac{100}{6.25 \times 64 \times 10^{-30}}$$

$$n = 2.5 \times 10^{29}$$

Q16: (C) CsCl

As $\frac{r+}{r-}$ lies in the range 0.732 - 1.000. Hence co-ordination number is 8 and KF is of CsCl type.

Q17: (B) AB_2O_4

Oxide ions are forming the lattice

Effective number of oxide ions = 4 (ccp)

$\therefore$ Tetrahedral voids $= 2 \times 4 = 8$

And effective number of A atom $= \frac{1}{8} \times 8 = 1$

Number of octahedral voids $= 4$

Effective number of B atom $= \frac{1}{2} \times 4 = 2$

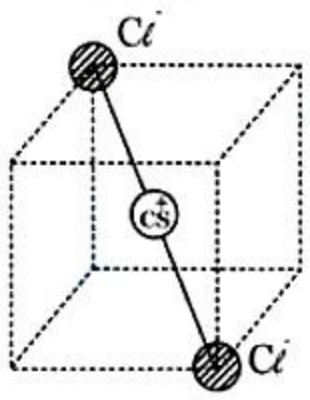
$\therefore$ Molecular formulae $= AB_2O_4$

Q18: (C) $r_{Cs^+} + r_{Cl^-} = \frac{\sqrt{3}}{2}a$

8 chloride ions at 8 corners Cs^- cation at body centre along body diagonal there will be one Cs^+ cation and 2 Cl^- ions at ends of body diagonal.

$2r_{Cs^+} + 2r_{Cl^-} = \sqrt{3}\,a$

a is edge length



Q19: (C) 47

For any unit cell

$d = \frac{2\,M}{a^3\,N_A}$ (for BCC, Z = 2)

$$2.32 = \frac{2 \times M}{6 \times 10^{23} \times (1.22)^3 \times 10^{-21}}$$

$\therefore$ M = 1264

So $423 + x\,(18) = 1264$

$x = 47$

Q20: (A) 0.15

face centred cubic unit cell length = 4.5 $\overset{o}{A}$

Simple cubic unit cell length = 1.5 $\overset{o}{A}$

Density in face centred cubic $= \frac{n_1 \times \text{atomic weight}}{V_1 \times \text{Avogadro number}}$

Density simple cubic (SC) $= \frac{n_2 \times \text{atomic mass}}{V_2 \times \text{Avogardro number}}$

$\frac{D_{fcc}}{D_{bcc}} = \frac{n_1}{n_2} \times \frac{V_2}{V_1}$

n_1 for face centred cubic = 4; Also $V_1 = a^3 = \left(4.5 \times 10^{-8}\right)^3$

n_2 for simple cubic = 1; Also $V_2 = a^3 = \left(1.5 \times 10^{-8}\right)^3$

$\frac{D_{fcc}}{D_{sc}} = \frac{4 \times \left(1.5 \times 10^{-8}\right)^3}{1 \times \left(4.5 \times 10^{-8}\right)^3} = 0.15$

Q21: 24

$x = 2$ (Tetragonal, Monoclinic)

$y = 6$ (except triclinic all the bravis lattices)

$z = 2$ (Cubic, Rhombohedral)

$xyz = (2)\,(6)\,(2) = 24.00$

Q22: 173

a = 400 pm

In body central lattice $\sqrt{3}a = 4r$

$r = \frac{\sqrt{3}a}{4}$

$r = \frac{\sqrt{3}}{4} \times 400$

$r = \sqrt{3} \times 100 = 173$ pm

Q23: (B) Schottky defect

Calculated density $d = Z \times \frac{\text{moler mass}}{N_a \times \text{volume}} = 2.78\ \text{gcm}^{-3}$

Is greater then actual density $2.44\ \text{gcm}^{-3}$ therefore density decreases and defect is Schottky defect

Q24: (A) 104 pm

$\frac{r_A}{r_x} = 0.414 = \frac{r_A}{250}$

$r_A^+ = 0.414 \times 250\ \text{pm} = 104\ \text{pm}$

Q25: (C) AB_3C

An atom at the corner of a cube is shared among 8 unit cells. As there are 8 corners in a cube, number of corner atom (A) per unit cell $8 \times \frac{1}{8} = 1$

Face-centred atom in a cube is shared by two unit cells.

As there are 6 faces in a cube, number of face-centred atom (B) per unit cell $6 \times \frac{1}{2} = 3$

An atom in the body of the cube is not shared by other cells.

$\therefore$ Number of atoms (C) at the body centre per unit cell = 1.

Hence, the formula of the solid is AB_3C .

Q26: (B) ZnS

In ZnS structure, sulphides occupy all the lattice points while Zn^{2+} ions are present in alternative tetrahedral voids.

NaCl has FCC structure and Na^+ atom occupied all octahedral hole.

CaF_2 has FCC structure and all T-holes will occupied by guest.

Na_2O has FCC sturcture and all T-holes will occupied by guest.

Q27: (D) $[FeF_6]^{3-}$ is colourless and $[CoF_6]^{3-}$ is coloured

In $[CoF_6]^{3-}$ it absorbs red colour light so it shows complementary colour green, while in the case of $[FeF_6]^{3-}$ there is very weak splitting so the light absorbed will be in infrared region so its complementary colour is not in visible region of light hence it appears colourless.

Q28: (D) a

Distance between two Na^+ is $\frac{1}{\sqrt{2}}$ times of edge length

Q29: (B) 1.5×10^{23}

58.5 g NaCl $= 6 \times 10^{23}$ molecule (atoms) of NaCl (as NaCl occupies FCC system)

1-unit cell have 4 molecules of NaCl

So, no. of unit cell $= \frac{6\times10^{23}}{4} = 1.5 \times 10^{23}$

Q30: (A) Hexagonal

For the given crystal,

$a = b \neq c, \alpha = \beta = 90^o, \gamma = 120^o$

These are the characteristic of a hexagonal system.

Q31: (D) X_2Y_4Z

X is in f.c.c. lattice

Number of atoms = atom at corner $\times \frac{1}{8}$ + atoms at faces $\times \frac{1}{2}$

$X = 8 \times \frac{1}{8} + 6 \times \frac{1}{2} = 4$

Total tetrahedral voids $= 8$

As y are at T.V.

So $Y = 8$

Number of Octahedra voids $= 4$

$Z = \frac{1}{2} \times 4 = 2$

So $X = 4, Y = 8, Z = 2$

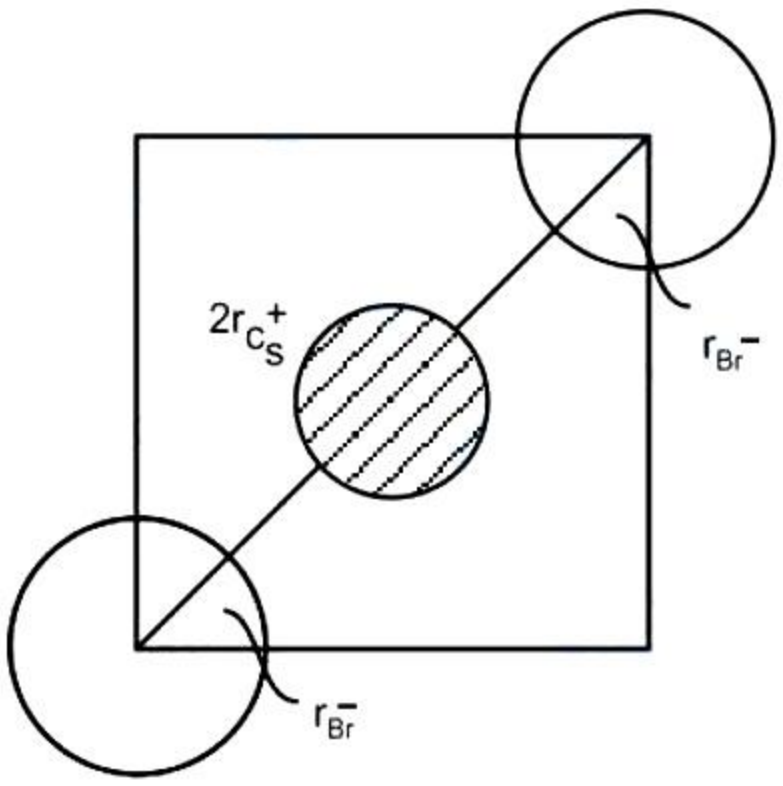
Hence the formula of solid is $X_4Y_8Z_2$ or X_2Y_4Z .

Q32: (D) 3.72 Å

In BCC structure the cations and anions touch along the body diagonal

$2\left(r_{cs^+} + r_{Br^-}\right) = \sqrt{3} \times 4 \cdot 3$ (Body Diagonal $= \sqrt{3}a$)

$$r_{cs^+} + r_{Br^-} = \frac{1 \cdot 732 \times 4 \cdot 3}{2} = 3 \cdot 72 \text{ Å}$$



Q33: 8

Coordination number is defined as the no. of nearest equidistant neighbours.
The coordination number of CsCl is 8..8

Q34: (A) $\frac{1}{2}, \frac{1}{8}$

No. of oxygen atoms per unit cell in ccp $= 4\left(O^{2-}\right)$

No. of octahedral voids per unit cell $= 4\left(Al^{3+}\right)$

No. of Tetrahedral voids per unit cell $= 8\left(Mg^{3+}\right)$

Total negative charge due to oxygen atoms $= 8$

Net charge must be zero.

$m4\,(3) + 2n\,(8) + 4\,(-2) = 0$

$3m + 4n = 2$

(A) $\frac{3}{2} + \frac{4}{8} = 2$ is correct.

(B) $3 \times 1 + 4 \times \frac{1}{4} = 4 \neq 2$ is incorrect.

(C) $3 \times \frac{1}{2} + 4 \times \frac{1}{2} = 4 \neq 2$ is incorrect

(D) $3 \times \frac{1}{4} + 4 \times \frac{1}{8} = \frac{3}{4} + \frac{2}{4} = \frac{5}{4} \neq 2$ is incorrect.

Q35: (A) Solid has face centred cubic system with co-ordination number = 6

Given that $\rho = 2.75 \text{ g cm}^{-3}$

we need to find type of unit cell

$$\therefore \quad \rho = \frac{Z \times M}{N_A a^3}$$

$$\because \quad Z = \frac{\rho \times N_A \times a^3}{M}$$

$$= \frac{2.75 \times 6.023 \times 10^{23} \times (654 \times 10^{-10})^3}{119}$$

$\therefore \quad Z \simeq 4$ So fcc unit cell

In FCC 1 atm surrounded by 6 atoms so coordination number is 6.

Q36: (C) CrO_2

Chromium Oxide (CrO_2) is metallic compound and it shows Ferromagnetic property. It is a black synthetic magnetic solid and was once widely used in magnetic tape emulsion.