Bravais Lattices

2. $a = b = c$, $\alpha = \beta = \gamma \neq 90^\circ$ represents which of the following crystal system? **[NCERT Pg. 10]**

(1) Rhombohedral (2) Orthorhombic

(3) Tetragonal (4) Cubic

Ans: 1

3. The lattice having AAA ... type pattern is **[NCERT Pg. 14]**

(1) Simple cubic

(2) Face-centred cubic

(3) Body-centred cubic

(4) End-centred

Ans: 1

8. The number of possible three dimensional lattices (Bravais lattices) is **[NCERT Pg. 11]**

(1) 7

(2) 4

(3) 14

(4) 5

Ans: 3

30. A Match box exhibits

(1) Cubic geometry

(2) Monoclinic geometry

(3) Orthorhombic geometry

(4) Hexagonal geometry

Ans: 3

16. B Which of the following crystal is represented by $a \neq b \neq c$ and $\alpha \neq \beta \neq \gamma \neq 90°$?

(1) Orthorhombic

(2) Monoclinic

(3) Triclinic

(4) Tetragonal

Ans: 3

2. The correct option for the number of body centred unit cells in all 14 types of Bravais lattice unit cells is : **[NEET-2021]**

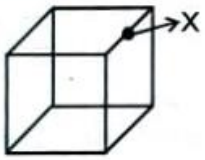
(1) 3 (2) 7

(3) 5 (4) 2

Ans: 1

Contribution

15. B The site labelled as 'X' in fcc arrangement is



(1) Face centre with $\frac{1}{4}$ contribution

(2) Edge centre with $\frac{1}{4}$ contribution

(3) Corner with $\frac{1}{4}$ contribution

(4) Tetrahedral void with $\frac{1}{8}$ contribution

Ans: 2

Finding Molecular Formula

4. The formula of crystalline solid having atoms 'B' in ccp arrangement, atoms 'A' occupying half of octahedral and half of tetrahedral voids is **[NCERT Pg. 18]**

(1) A_2B_3 (2) A_4B_3

(3) A_3B_2 (4) A_3B_4

Ans: 3

17. B In any ionic crystal A has formed cubical close packing and B atoms are present at every tetrahedral voids. If any sample of crystal contain 'N' number of B atoms then number of A atoms in that sample is

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

(3) 2 N (4) $\sqrt{2}$ N

Ans: 2

21. B A compound formed by element A and B crystallizes in the cubic structure, where A atoms are at the corners of a cube and B atoms are at the centre of the body. The formula of the compounds is

(1) AB

(2) AB_2

(3) A_2B_3

(4) AB_3

Ans: 1

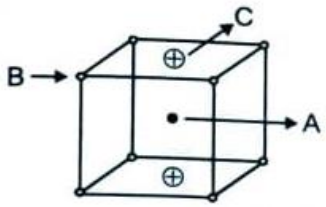
20. Structure of a mixed oxide is cubic close packed (ccp). The cubic unit cell of mixed oxide is composed of oxide ions. One fourth of the tetrahedral voids are occupied by divalent metal A and the octahedral voids are occupied by a monovalent metal B. The formula of the oxide is **[AIPMT (Mains)-2012]**

(1) ABO_2 (2) A_2BO_2

(3) $A_2B_3O_4$ (4) AB_2O_2

Ans: 2

23. In a solid A, B and C arranged as below. The formula of solid is



(1) ABC (2) AB_2C_2

(3) A_2BC (4) AB_8C_2

Ans: 1

24. In a cubic close packed structure of mixed oxides, the lattice is made up of oxide ions, one eighth of tetrahedral voids are occupied by divalent (X^{2+}) ions, while one-half of the octahedral voids are occupied by trivalent ions (Y^{3+}), then the formula of the oxide is

(1) XY_2O_4 (2) X_2YO_4

(3) $X_4Y_5O_{10}$ (4) $X_5Y_4O_{10}$

Ans: 1

25. In a face centred cubic arrangement of A and B atoms, atoms of A are at the corner of the unit cell and atoms of B are at the face centres. One of the A atom is missing from one corner in unit cell. The simplest formula of compound is

(1) A_7B_3 (2) AB_3

(3) A_7B_{24} (4) A_7B_8

Ans: 3

27. Number of unit cells in 0.1 g molecule NaCl is

(1) $0.1\ N_A$ (2) $0.025\ N_A$

(3) $0.5\ N_A$ (4) $0.25\ N_A$

Ans: 2

7. If one of the atoms is removed from simple cubic unit cell, then the effective number of atoms remained in a unit cell is **[NCERT Pg. 12]**

(1) 7 (2) 7/8

(3) 8/7 (4) 8

Ans: 2

6. A compound is formed by cation C and anion A. The anions form hexagonal close packed (hcp) lattice and the cations occupy 75% of octahedral voids. The formula of the compound is: **[NEET-2019]**

(1) C_2A_3 (2) C_3A_2

(3) C_3A_4 (4) C_4A_3

Ans: 3

Coordination Number

5. Number of moles of tetrahedral voids present in FCC type structure having 3 moles of atoms is **[NCERT Pg. 17]**

(1) 3 (2) 6

(3) 9 (4) 1/3

Ans: 4

8. In HCP arrangement, the co-ordination number is
B

(1) 6 (2) 12

(3) 8 (4) 10

Ans: 2

Voids

5. Number of moles of tetrahedral voids present in FCC type structure having 3 moles of atoms is **[NCERT Pg. 17]**

(1) 3 (2) 6

(3) 9 (4) 1/3

Ans: 2

3. The number of octahedral sites in a cubical close pack array of N spheres is
B

(1) N/2 (2) 2 N

(3) 4 N (4) N

Ans: 4

19. The number of octahedral void(s) per atom present in a cubic close-packed structure is **[AIPMT (Prelims)-2012]**

(1) 2 (2) 4

(3) 1 (4) 3

Ans: 3

Density

14. An element forms ccp lattice with a cell edge length of 400 pm. The density of the element is 10 g cm^{-3}. The atomic mass of the element will be [Take $N_A = 6.02 \times 10^{23}$] **[NCERT Pg. 22]**

(1) 65 u (2) 54.2 u

(3) 96.3 u (4) 205 u

Ans: 3

5. What is the volume of a face centred cubic unit cell, when its density is 2.0 g cm^{-3} and the molar mass of the substance is 60.22 g mol^{-1}?
B

(1) $4 \times 10^{-22}\ cm^3$ (2) $2 \times 10^{-22}\ cm^3$

(3) $44 \times 10^{-22}\ cm^3$ (4) $22 \times 10^{-22}\ cm^3$

Ans: 2

4. Lithium metal has a body centred cubic structure. Its density is 0.53 g cm^{-3} and its molar mass is 6.94 g mol^{-1}. Calculate the edge length of a unit cell of Lithium metal
B

(1) 153.6 pm (2) 351.6 pm

(3) 527.4 pm (4) 263.7 pm

Ans: 2

28. An element occurs in BCC structure with a edge length of 288 pm. The density of the element is 7.2 gm cm^{-3}. How many atoms of the element does 208 g of the element contain?

(1) 24.16×10^{22} (2) 24.16×10^{23}

(3) 24.16×10^{24} (4) 24.16×10^{25}

Ans: 2

7. Iron exhibits bcc structure at room temperature. Above 900°C, it transforms to fcc structure. The ratio of density of iron at room temperature to that at 900°C (assuming molar mass and atomic radii of iron remains constant with temperature) is

[NEET-2018]

(1) $\frac{\sqrt{3}}{\sqrt{2}}$ (2) $\frac{4\sqrt{3}}{3\sqrt{2}}$

(3) $\frac{1}{2}$ (4) $\frac{3\sqrt{3}}{4\sqrt{2}}$

Ans: 4

10. Lithium has a bcc structure. Its density is 530 kg m^{-3} and its atomic mass is 6.94 g mol^{-1}. Calculate the edge length of a unit cell of Lithium metal ($N_A = 6.02 \times 10^{23}$ mol^{-1}) **[NEET-2016]**

(1) 264 pm (2) 154 pm

(3) 352 pm (4) 527 pm

Ans: 3

13. B The gold crystallizes in a cubic closest packed structure. If its molar mass is M, number of spheres in one unit cell is Z and edge length of unit cell is x pm then its density in g/cm^3 will be

(1) $d = \frac{ZM}{xN_A}$ (2) $d = \frac{ZM}{x^3}$

(3) $d = \frac{ZM}{x^3 N_A}$ (4) $d = \frac{ZM}{x^3 10^{-30} N_A}$

Ans: 4

16. A metal has a fcc lattice. The edge length of the unit cell is 404 pm. The density of the metal is 2.72 g cm^{-3}.The molar mass of the metal is

(N_A is Avogadro's constant = 6.02×10^{23} mol^{-1})

[NEET-2013]

(1) 30 g mol^{-1} (2) 27 g mol^{-1}

(3) 20 g mol^{-1} (4) 40 g mol^{-1}

Ans: 2

Packing fraction

1. B Fraction of the total volume occupied by atoms in a simple cube is

(1) $\frac{\pi}{2}$ (2) $\frac{\sqrt{3}\pi}{8}$

(3) $\frac{\sqrt{2}\pi}{6}$ (4) $\frac{\pi}{6}$

Ans: 4

12. The vacant space in bcc lattice unit cell is

[Re-AIPMT-2015]

(1) 23% (2) 32%

(3) 26% (4) 48%

Ans: 2

27. Percentage of free space in a body centred cubic unit cell is **[AIPMT (Prelims)-2008]**

(1) 28% (2) 30%

(3) 32% (4) 34%

Ans:3

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

[AIPMT (Prelims)-2007]

(1) $\frac{\pi}{4}$ (2) $\frac{\pi}{6}$

(3) $\frac{\pi}{3\sqrt{2}}$ (4) $\frac{\pi}{4\sqrt{2}}$

Ans: 2

Relation b/w a & R

14. B For face centered cubic structure edge length 'a' can be related with radius 'r' as

(1) $a = r \times \sqrt{2}$ (2) $a = r$

(3) $a = 2\sqrt{2}r$ (4) $a = \frac{4}{\sqrt{3}}r$

Ans: 3

2. B If *a* is the length of unit cell, then which one is correct relationship?

(1) For simple cubic lattice,

Radius of metal atom = $\frac{a}{2}$

(2) For bcc lattice,

Radius of metal atom = $\frac{\sqrt{3}a}{4}$

(3) For fcc lattice,

Radius of metal atom = $\frac{a}{2\sqrt{2}}$

(4) All of these

Ans: 4

14. A given metal crystallizes out with a cubic structure having edge length of 361 pm. If there are four metal atoms in one unit cell, what is the radius of one atom? **[AIPMT-2015]**

(1) 108 pm (2) 40 pm

(3) 127 pm (4) 80 pm

Ans: 3

3. An element has a body centered cubic (bcc) structure with a cell edge of 288 pm. The atomic radius is **[NEET-2020 (Phase-1)]**

(1) $\frac{\sqrt{2}}{4}\times 288$ pm (2) $\frac{4}{\sqrt{3}}\times 288$ pm

(3) $\frac{4}{\sqrt{2}}\times 288$ pm (4) $\frac{\sqrt{3}}{4}\times 288$ pm

Ans: 4

15. If a is the length of the side of a cube, the distance between the body centered atom and one corner atom in the cube will be **[AIPMT-2014]**

(1) $\frac{2}{\sqrt{3}}a$ (2) $\frac{4}{\sqrt{3}}a$

(3) $\frac{\sqrt{3}}{4}a$ (4) $\frac{\sqrt{3}}{2}a$

Ans: 4

18. A metal crystallizes with a face-centered cubic lattice. The edge of the unit cell is 408 pm. The diameter of the metal atom is **[AIPMT (Prelims)-2012]**

(1) 144 pm (2) 204 pm

(3) 288 pm (4) 408 pm

Ans: 3

25. 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 ? **[AIPMT (Prelims)-2009]**

(1) 157 (2) 181

(3) 108 (4) 128

Ans: 4

24. 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 nearly be **[AIPMT (Prelims)-2009]**

(1) 152 pm (2) 75 pm

(3) 300 pm (4) 240 pm

Ans: 1

22. AB crystallizes in a body centred cubic lattice with edge length 'a' equal to 387 pm. The distance between two oppositively charged ions in the lattice is **[AIPMT (Prelims)-2010]**

(1) 335 pm (2) 250 pm

(3) 200 pm (4) 300 pm

Ans: 1

26. If 'a' stands for the edge length of the cubic systems : simple cubic, body centred cubic and face centred cubic, then the ratio of radii of the spheres in these systems will be respectively **[AIPMT (Prelims)-2008]**

(1) $1a : \sqrt{3}a : \sqrt{2}a$ (2) $\frac{1}{2}a : \frac{\sqrt{3}}{4}a : \frac{1}{2\sqrt{2}}a$

(3) $\frac{1}{2}a : \sqrt{3}a : \frac{1}{\sqrt{2}}a$ (4) $\frac{1}{2}a : \frac{\sqrt{3}}{2}a : \frac{\sqrt{2}}{2}a$

Ans: 2