

B.Sc. II SEM PHYSICAL CHEMISTRY
CHAPTER: SOLID STATE MCQ
(FROM VARIOUS UNIVERSITY AND COMPETITIVE EXAMS)
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DAY 4

Q1. The number of octahedral void(s) per atom present in a cubic close-packed structure is

A 2

B 4

C 1 CORRECT ANSWER

D 3

Question 2

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

A 144 pm

B 204 pm

C 288 pm CORRECT ANSWER

D 408 pm

Question 3

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 300 pm

B 335 pm CORRECT ANSWER

C 250 pm

D 200 pm

Question 4

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

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

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

Question 5

Percentage of free space in a body centred cubic unit cell is

A 32% CORRECT ANSWER

B 34%

C 28%

D 20%

Question 6

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 $\frac{\pi}{6}$ CORRECT ANSWER

Question 7

If NaCl is doped with 10^{-4} mol % of Sr Cl₂, the concentration of cation vacancies will be ($N_A = 6.02 \times 10^{23} \text{ mol}^{-1}$)

A $6.02 \times 10^{16} \text{ mol}^{-1}$

B $6.02 \times 10^{17} \text{ mol}^{-1}$ CORRECT ANSWER

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

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

Question 8

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

- A** Schottky defect
- B** Frenkel defect
- C** Interstitial position
- D** F-centres CORRECT ANSWER

Question 9

In a face-centered cubic lattice, a unit cell is shared equally by how many unit cells?

- A** 2
- B** 4
- C** 6 CORRECT ANSWER
- D** 8

Question 10

A compound formed by elements X and Y crystallizes in a cubic structure in which atoms X are at the corners of the cube and atoms Y are at the face-centers. The formula of the compound is

- A** X_3Y

B

XY

CXY₂**D**XY₃ CORRECT ANSWER**Question 11**

The pycnometric density of sodium chloride crystal is $2.165 \times 10^3 \text{ kg m}^{-3}$ while its X-ray density is $2.178 \times 10^3 \text{ kg m}^{-3}$. The fraction of the unoccupied sites in sodium chloride crystal is

A

5.96

B 5.96×10^{-2} **C** 5.96×10^{-1} **D** 5.96×10^{-3} CORRECT ANSWER**Question 12**

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

AX₃Y₄**B**X₄Y₃ CORRECT ANSWER**C**X₂Y₃**D**X₂Y

Question 13

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

A

B

C

D $\frac{24}{3} \pi r^3$

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

$\frac{16}{3} \pi r^3$ CORRECT ANSWER

Question 14

An ionic compound has a unit cell consisting of A ions at the corners of a cube and B ions on the centres of faces of the cube. The empirical formula of the compound would be

A AB

B A_2B

C AB_3 CORRECT ANSWER

D A_3B

Question 15

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

A 5.14×10^{21} unit cells

B 1.28×10^{21} unit cells

C 1.71×10^{21} unit cells

D 2.57×10^{21} unit cells CORRECT ANSWER

DAY 5

Question 1

Which of the following is a molecular crystal?

A Dry ice CORRECT ANSWER

B Quartz

C Rock salt

D Diamond

Question 2

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

A 288 pm

B 144 pm CORRECT ANSWER

C 618 pm

D 398 pm

Question 3

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

A 8

B 6 CORRECT ANSWER

C 4

D 1

Question 4

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

A 30% and 26%

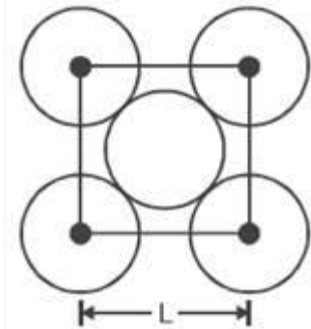
B 48% and 26%

C 32% and 48%

D 26% and 32% CORRECT ANSWER

Question 5

The packing efficiency of the two dimensional square unit cell shown is



A 39.27%

B 68.02%

C 74.05%

D 78.54% CORRECT ANSWER

Question 6

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 200 pm

B 300 pm

C 335 pm CORRECT ANSWER

D 250 pm

Question 7

A compound contains two types of atoms X and Y. It crystallizes in a cubic lattice with atoms X at the corners of the unit cell and atoms Y at the body centre. The simplest possible formula of this compound is:

A X_8Y

B X_2Y

C XY CORRECT ANSWER

D XY_8

Question 8

A compound of 'A' and 'B' crystallizes in a cubic lattice in which the 'A' atoms occupy the lattice points at the corners of the cube. The 'B' atoms occupy the centre of each face of the cube. The probable empirical formula of the compound is

A AB_3 CORRECT ANSWER

B AB

C A_3B

D AB_2

Question 9

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 300.5 pm

B 75.5 pm

C 151.8 pm CORRECT ANSWER

D 240.8 pm

Question 10

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 108

B 181

C 157

D 128 CORRECT ANSWER

Question 11

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

A 157 pm

B 127 pm CORRECT ANSWER

C 108 pm

D 181 pm

Question 12

A compound is formed by elements A and B. This crystallizes in the cubic structure where 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 CORRECT ANSWER

B AB_6

C A_6B

D A_8B_4

Question 13

An ionic compound is expected to have tetrahedral structure if r^+/r^- lies in the range of

A 0.414 to 0.732

B 0.732 to 1

C 0.155 to 0.225

D 0.225 to 0.414 CORRECT ANSWER

Question 14

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

A NaCl

B ZnS CORRECT ANSWER

C CaF₂

D Na₂O

Question 15

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

A AB₂

B A₂B

C A₄B₃

D A₃B₄ CORRECT ANSWER

DAY 6

Question 1

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 Avogadro's constant = $6.02 \times 10^{23} \text{ mol}^{-1}$)

A 40 g mol^{-1}

B 30 g mol^{-1}

C 27 g mol^{-1} CORRECT ANSWER

D 20 g mol^{-1}

Question 2

A compound formed by elements A and B crystallizes in the cubic structure where A atoms are at the corners of the cube and B atoms are at the face centres. The formula of the compound is

A AB_3 CORRECT ANSWER

B AB

C A_3B

D A_2B_2

Question 3

A metallic crystal having bcc type stacking pattern, what percentage of volume of this lattice is empty space?

A 68%

B 32% CORRECT ANSWER

C 26%

D 74%

Question 4

A p-type material is electrically

A positive

B negative

C Neutral CORRECT ANSWER

D depends upon the concentration of p-impurities

Question 5

A solid compound contains X, Y and Z atoms in a cubic lattice with X atoms occupying the corners, Y atoms in the body centred position and Z atoms at the centres of faces of the unit cell. What is the empirical formula of the compound?

A



B

XYZ_3 CORRECT ANSWER

C



D



Question 6

A substance A_xB_y crystallizes in a face centred cubic (fcc) lattice in which atoms 'a' occupy each corner of the cube and atoms 'B' occupy the centres of each face of the cube. Identify the correct composition of the substance A_xB_y :

A

AB_3 CORRECT ANSWER

B



C



D

Composition cannot be specified

Question 7

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 g/cm³

B 2.16 g/cm³ CORRECT ANSWER

C 3.64 g/cm³

D 4.56 g/cm³

Question 8

AB is an ionic solid. If the ratio of ionic radii of A⁺ and B⁻ is 0.52. What is the coordination number of B⁻?

A 6 CORRECT ANSWER

B 3

C 2

D 8

Question 9

For a crystal, the angle of diffraction (2θ) is 90° and the second order line has a d value of 2.28\AA . The wavelength (in \AA) of X-rays used for Bragg's diffraction is

A 2.28

B 2.00

C 1.613 CORRECT ANSWER

D 4.00

Question 10

If AgI crystallizes in zinc blende structure with I⁻ ions at lattice points, what fraction of tetrahedral voids is occupied by Ag⁺ ions?

A 25%

B 50% CORRECT ANSWER

C 100%

D 75%