CHEMISTRY

BOOKS - SURA CHEMISTRY (TAMIL ENGLISH)

SOLID STATE

Evaluation

1. Graphite and diamond are

A. Covalent and molecular crystals

B. ionic and covalent crystals

C. both covalent crystals

D. both molecular crystals

Answer: c

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2. An ionic compound A_xB_y crystallizes in fcc type crystal structure with B ions at the centre

of each face and A ion occupying centre of the cube. The correct formula of A_xB_y is

A. AB

B. AB_3

C. A_3B

D. A_8B_6

Answer: B

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3. The ration of close packed atoms to tetrahedral hole in cubic packing is

A. $1:1$

B. $1:2$

C. $2:1$

D. $1:4$

Answer: B

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4. Solid CO_2 is an example of

A. Covalent solid

B. metallic solid

C. molecular solid

D. ionic solid

Answer: c

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5. Write each of the following expressions in terms of $\alpha + \beta$ and $\alpha\beta$.

$$\frac{\alpha + 3}{\beta} + \frac{\beta + 3}{\alpha}$$

A. Both assertion and reason are true and reason is the correct explanation of assertion.

B. Both assertion and reason are true but reason is not the correct explanation of assertion.

C. Assertion is true but reason is false

D. Both assertion and reason are false.

Answer: a

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6. In calcium fluoride, having the fluorite structure the coordination number of Ca^{2+} on and F^{-} ion are

A. 4 and 2

B. 6 and 6

C. 8 and 4

D. 4 and 8

Answer: c

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7. The number of unit cells in 8 gm of an element X(atomic mass 40) which crystallizes in bcc pattern in (N_A is the Avogadro number)

A. 6.023×10^{23}

B. 6.023×10^{22}

C. 60.23×10^{23}

D. $\left(\frac{6.023 \times 10^{23}}{8 \times 40}\right)$

Answer: b

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8. The number of carbon atoms per unit cell of diamond is

A. 8

B. 6

C. 1

D. 4

Answer: a

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9. In a solid atom M occupies ccp lattice and $\left(\frac{1}{3}\right)$ of tetrahedral voids are occupied by atom N, find the formula of solid formed by M and N .

A. MN

B. M_3N

C. MN_3

D. M_3N_2

Answer: D

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10. The composition of a sample of wurtzite is $Fe_{0.93}O_{1.00}$ what % of Iron present in the form of Fe^{3+} ?

A. 0.1605

B. 0.1505

C. 0.1805

D. 0.1705

Answer: B

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11. The ionic radii of A^+ and B^- are 0.98×10^{-10}m and $1.81 \times 10^{-10}m$. The coordination number of each ion in AB is

A. 8

B. 2

C. 6

D. 4

Answer: c

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12. CsCl has bcc arrangement, its unit cell edge length is 400pm, its inter atomic distance is

A. 400pm

B. 800pm

C. $\sqrt{3} \times 100pm$

D. $\left(\frac{\sqrt{3}}{2}\right) \times 400$ pm

Answer: d

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13. A solid compound XY has NaCl structure,if the radius of the cation is 100pm, the radius of

the anion will be

A. $\left(\frac{100}{0.414}\right)$

B. $\left(\frac{0.732}{100}\right)$

C. 100×0.414

D. $\left(\frac{0.414}{100}0\right.$

Answer: a

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14. The vacant space in bcc lattic unit cell is

A. 0.48

B. 0.23

C. 0.32

D. 0.26

Answer: c

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15. The radius of an atom is 300pm, if it crystallized in a fcc centered cubic lattice, the length of the edge of the unit cell is

A. 488.5pm

B. 848.5pm

C. 884.5pm

D. 484.5pm

Answer: b

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16. The fraction of total volume occupied by the atoms in a simple cubic is

A. $\left(\frac{\pi}{4\sqrt{2}}\right)$

B. $\left(\frac{\pi}{6}\right)$

C. $\left(\frac{\pi}{4}\right)$

D. $\left(\frac{\pi}{3\sqrt{2}}\right)$

Answer: b

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17. The yellow coloured in NaCl crystal is due to

A. excitation of electron in F centers

B. reflection of light from Cl^- ion on the surface

C. refraction of light from Na^+ ion

D. all of the above

Answer: a

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18. If 'a' stands for the edge length of the cubic system, sc,bcc,and fcc. Then the ratio of radii of spheres in these system will be respectively.

A. $\left(\frac{1}{2}a : \frac{\sqrt{3}}{2}a : \frac{\sqrt{2}}{2}a\right)$

B. $\left(\sqrt{a} : \sqrt{3a} : \sqrt{2}a\right)$

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

D. $\left(\frac{1}{2}a : \sqrt{3}a : \frac{1}{\sqrt{2}}a\right)$

Answer: c

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19. If 'a' is the length of the side of the cube, the distance between the body centrerd atom and one corner atom in the cube will be

A. $\left(\frac{2}{\sqrt{3}}\right)a$

B. $\left(\frac{4}{\sqrt{3}}\right)a$

C. $\left(\frac{\sqrt{3}}{4}\right)a$

D. $\left(\frac{\sqrt{3}}{2}\right)a$

Answer: d

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20. Potassium has a bcc structure with nearest neighbour distance 4.52Å. Its atomic weight is 39,its density will be

A. $915kgm^{-3}$

B. $2142kgm^{-3}$

C. $452kgm^{-3}$

D. $390kgm^{-3}$

Answer: a

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21. Schottky defect in a crystal is observe when

A. unequal number of anions and anions are missing from the lattice

B. equal number of cations and anions are missing from the lattice.

C. an ion leaves its normalsite and occupies an interstitial site

D. no ion is mission from its lattice

Answer: b

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22. The cation leaves its normal position in the crystal and moves to some interstitial position, the defect in the crystal is known as

A. Schottky defect

B. F center

C. Frenkel defect

D. non-stoichiometric defect

Answer: c

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23. Assert : due to Frenkel defect, density of the crystalline solid decrases.

Reason : in Frenkel defect cation and anion leaves the crystal.

A. Both assertion and reason are true and reason is the correct explanation of assertion.

B. Both assertion and reason are true but reason is not the correct explanation of assertion.

C. Assertion is true but reason is false

D. Both assertion and reason are false.

Answer: d

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24. The crystal with a metal deficiency defect is

A. NaCl

B. FeO

C. ZnO

D. KCl

Answer: b

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Answer The Following Questions

1. Define unit cell.

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2. Give any three characteristics of ionic crystals.

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3. Differentiate crystaline solids and amorphous solids.

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4. Classify the following solids.

a. P_4 b. Brass

c. Diamond d. NaCl

e. Iodine

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5. Caluclation of number of atoms in different types of unit cells

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6. Distinguish tetrahedral and octahedral voids.

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7. Distinguish tetrahedral and octahedral voids.

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8. What are point defects?

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9. Explain Schottky defect.

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10. Write short note on metal excess and metal deficiency defect with an example .

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11. Calculate the number of atoms in a fcc unit cell.

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12. Explain AAAA and ABABA and ABCABC type of three dimensional packing with the help of neat diagram.

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13. Why ionic crystals are hard and brittle ?

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14. Calculate the percentage efficiency of packing in case of body centered cubic crystal.

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15. What is the two dimensional coordination number of a molecule in square close packed

layer ?

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16. Experiment shows that Nickel oxide has the formula $Ni_{0.96}O_{1.00}$.What fraction of Nickel exists as of Ni^{2+} and Ni^{3+} ions ?

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17. What is meant by the term "coordination number "? What is the coorrdination number

of atoms in a bcc structure ?

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18. An element has bcc structures with a cell edge of 288 pm. The density of the element is $7.2 gcm^{-3}$. How many atoms are present in 208 g of the element.

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19. Aluminium crystallizes in a cubic close packed structure .Its metallic radius is 125pm. Calculate the edge length of unit cell.

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20. If NaCl is doped with 10^{-2} mol percentage of strontium chloride , what is the concentration of cation vacancy ?

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21. KF crystallizes in fcc structure like sodium chloride. Calculate the distance between K^+ and F^- in KF. (Given : density of KF is $2.48 g cm^{-3}$)

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22. An atom crystallizes in fcc crystal lattice and has a density of$10 g cm^{-3}$ with unit cell edge length of100pm. Calculate the number of atoms present in 1g of crystal.

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23. Atoms X and Y form bcc crystalline structure, Atom X is present at the corners of the cube and Y is at the centre of the cube. What is the formula of the compound ?

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24. Sodium metal crystallizes in bcc structure with the edge length of the unit cell

$4.3 \times 10^{-8} cm$. Calculate the radius of sodium atom.

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25. Write a note on Frenkel defect.

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Evaluate Yourself

1. An element has a face centered cubic unit cell with a length of 353.4 pm along an edge. The density of the element is 8.9 gcm^{-3}. How many atoms are present in 100g of an element?

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2. Determine the density of CsCl which crystallizes in a bcc types structure with an edge length 412.1 pm.

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3. A face centered cubic solid of an element (atomic mass 60) has a cube edge of 4Å. Calculate its density.

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Aaditional Questions And Answers

1. Which of the following defects decreases the density of the crystal?

A. Interstitial defect

B. Vacancy defect

C. Frenkel defect

D. None of these above

Answer: B

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2. In which of the following arrangements, octahedral voids are formed ?

A. fcc

B. bcc

C. simple cubic

D. hcp

Answer: d

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3. Which of the following cannot be regarded as molecular solid ?

A. Silicon carbide

B. AIN

C. Diamond

D. all of the above

Answer: d

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4. Which of the following is characteristic of ionic solids ?

A. Very low value of electrical conductivity in the molten state

B. Brittle nature

C. Very strong forces of attractions

D. Anisotropic nature

Answer: B:C:D

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5. An example of metal deficiency defect

A. NaCl

B. AgCl

C. CsCl

D. FeS

Answer: d

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6. What is the relation between diamond and graphite ?

A. Polymorphous

B. Isomer

C. Isotope

D. Isomorphous

Answer: a

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7. A solid with formula ABC_3 would probably have,

A. A at body centre, B at face centres and C at corners of the cube

B. A at corner of cube, B at body centre , C at face centre

C. A at corners of hexagon, B at centres of the hexagon and C inside the hexagonal unit cell

D. A at corner, B at face centre, C at body centre

Answer: b

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8. A binary solid A^+B^- has a structure with B^- ions constituting the lattice and A^+ ions occupying 25% tetrahedral holes. Formula of the solid is

A. A_2B

B. AB

C. AB_2

D. AB_4

Answer: c

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9. Amorphous solids have

A. Orderly arrangement of atoms

B. Long range of melting point

C. Anisotropy

D. both (a) and (c)

Answer: d

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10. Which one of the following crystal has $8:8$ structure ?

A. MgF_2

B. CsCl

C. KCl

D. NaCl

Answer: b

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11. If 'a' is the length of unit cell, then which one is correct relationship ?

A. For simple cubic lattice, radius of metal atom $= \frac{a}{20}$

B. For bcc lattice , radius of metal atom $= \frac{\sqrt{3}a}{4}$

C. For fcc lattice, radius of metal atom $= \frac{a}{2\sqrt{2}}$

D. All of these

Answer: d

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12. Which of the following features is false regarding the structure of CsCl ?

A. It has bcc arrangements

B. Co-ordination number for each ionis 8

C. Number of atoms in a unit cell is 4.

D. The radius ratio (r_+ / r_-) is 0.93

Answer: c

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13. Which type of solids will have the highest melting point ?

A. Ionic crystals

B. Network covalent solid

C. Molecular solids

D. Metallic crystals

Answer: b

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14. Which of the following statement is correct?

A. On increasing temperature, the coordination number of solid remains unchanged.

B. On increasing pressure, the co-ordination number of solid increases.

C. On increasing pressure, the co-ordination number of solid decreases.

D. On increasing temperature ,the co-ordination numbr of solid increases.

Answer: B

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15. Which of the following is incorrect statement about the Bragg's equation $n\lambda = 2d\sin\theta$?

A. n, represents order of reflection

B. λ, represents wave length of uv-rays used

C. θ, represents angle of incidence

D. d, represents distance between two parallel planes

Answer: b

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16. Calculate the number of atoms in a cubic unit cell having one atom on each corner and one atom on each body diagonal

A. 2

B. 3

C. 4

D. 5

Answer: d

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17. Three atoms P,Q and R crystallize in a cubic solid lattic having P atom at corners, Q atom at body centre and R atom at the face centre. Identify formula of the compound.

A. PQR

B. PQR_2

C. PQR_3

D. P_3QR

Answer: C

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18. An element with atomic mass 60 having fcc structure has a density of $6.23g/cm^3$. What is the edge length of unit cell ?

A. 200Pm

B. 300 Pm

C. 400 Pm

D. 500 Pm

Answer: c

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

A. 8

B. 4

C. 2

D. 6

Answer: d

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20. Schottky defects conains

A. Cation vacancies only

B. Cation vacancies and interstitital cations

C. Equal number of cation and anion vacancies

D. Anion vacancies and interstitial anions

Answer: c

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21. What is wrong about a.b.c.c. unit cell ?

A. In addition to an atom at the centre of the body of the unit cell, there are 8

atoms at 8 different corners

B. $\frac{1}{8}$ atom at a corner of the unit cell

C. No. of atoms in the unit cells is 2

D. The no. of atoms in the unit cells is 4

Answer: d

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22. In a body centred cubic unit cell, a metal atom at the centre of the cell is surrounded by how many other metal atoms ?

A. 12

B. 4

C. 6

D. 8

Answer: d

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23. Which one of the following does not belong to AB type ?

A. Cu_2O

B. $CsCl$

C. FeS

D. ZnS

Answer: A

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24. A regular three dimensional arrangement of identical points in space is called

A. Unit cell

B. Space lattice

C. Primitive

D. Crystallography

Answer: B

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25. The smallest repeating unit in space lattice which when repeated over and again results in the crystal of the given substance is called

A. Space lattice

B. Crystal lattice

C. Unit cell

D. Isomorphism

Answer: c

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26. In the Bragg's equation for diffraction of X-rays, 'n' represents

A. The number of moles

B. Avogadro number

C. A quantum number

D. Order of reflection

Answer: d

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27. The number of close neighbours in a body centred cubic lattice of identifical spheres is

A. 6

B. 4

C. 12

D. 8

Answer: d

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28. In a simple cubic cell, each point on a corner is shared by

A. One unit cell

B. Two unit cell

C. 8 unit cell

D. 4 unit cell

Answer: c

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29. Pick out the example for covalent and molecular crystal.

A. Ice, Diamond

B. Diamond, Ice

C. NaCl, FeS

D. FeS,Ice

Answer: b

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30. The wavelength of X-rays is in the order of

A. $10^{-8}cm$

B. $10^{-10}cm$

C. $10^{-8}m$

D. $10^{-10}nm$

Answer: a

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31. The diffraction of crystal of Ba with X-ray of wavelength 2.29Å gives a first order reflection at $27^{\circ}8'$. What is the distance between the diffracted patterns ?

A. 5.02Å

B. 0.398Å

C. 2.51Å

D. 10.04Å

Answer: b

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32. Crystalline solids are also called as

A. supercooled liquids

B. true solids

C. pseudo solids

D. all the above

Answer: B

33. Which one of the following statements is not true

A. The heat of vaporisation of ionic crystals are high

B. Ionic crystals are soluble in non-polar solvent

C. Ionic crystals are hard and brittle

D. Ionic crystals are conductors in solution state

Answer: b

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34. The cation leaves its normal position in the crystal and moves to some interstitial position, the defect in the crystal is known as

A. Schottky defect

B. Metal excess defect

C. Frenkel defect

D. Metal deficiency defect

Answer: c

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35. Which type of defect is founding transition metals that have variable valency ?

A. Frenkel defect

B. Schottky defect

C. Line defect

D. Metal deficiency defect

Answer: d

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36. Which one of the following statement is wrong about Frenkel defect ?

A. An ion occupies an interstitial position

B. Anion is much larger in size than the cation

C. The crystal remains neutral

D. Non-stoichiometric compound is formed

Answer: d

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37. Element 'A' and 'B' form a compound with cubic structure in which 'A' atoms are at the corners of the cube and 'B' atoms at the face centres. What is the formula of the compound ?

A. AB

B. AB_2

C. AB_3

D. AB_6

Answer: C

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38. In an hexagonal crystal

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

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

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

D.

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

Answer: D

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

A. phosphorus

B. sulphur

C. chlorine

D. silicon

Answer: d

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40. Which among the following is an amorphous solid ?

A. Graphite

B. SiO_2

C. Sic

D. Diamond

Answer: a

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41. Which one of the following is a network solid ?

A. diamond

B. silicon carbide

C. naphthalene

D. both (a) and (b)

Answer: d

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42. Example of hydrogen bonded molecular solids

A. H_2O

B. glucose

C. urea

D. all the above

Answer: d

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43. An excess of potassium ion makes KCl crystals appear violet since

A. Some of anionic sites are occupied by unpaired electron

B. Anionic sites are occupied by pair of electrons

C. both (a) and (b)

D. neither (a) nor (b)

Answer: a

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44. The number of chloride ions present per unit of CsCl are

A. 6

B. 8

C. 1

D. 4

Answer: c

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Fill In The Blanks

1. Frankel defect is also known as _____

A. stoichiometric defect

B. dislocation defect

C. both (a) & b

D. non-stoichiometri defect

Answer: C

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2. Amorphous solids can also be called _____

A. pseudo solids

B. true solids

C. super cooled liquids

D. both(a) & (c)

Answer: d

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3. Graphite is a good conductor of electricity due to the presence of _____

A. Lone pair of electrons

B. Free valence electrons

C. Cations

D. Anions

Answer: b

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4. The number of carbon atoms per unit of diamond unit cell is _____

A. 8

B. 6

C. 1

D. 4

Answer: a

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5. The mass of unit cell of Na_2O is _____

A. Twice the formula mass of Na_2O

B. Four times the formula mass of Na_2O

C. Six times the formula mass of Na_2O

D. Thrice the formula mass of Na_2O

Answer: B

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6. The C-C and Si-C inter atomic distances are 154 pm and 188 pm . The atomic radius of Si is _____

A. 77Pm

B. 94Pm

C. 114Pm

D. 111Pm

Answer: d

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7. The total number of elements of symmetry in a cubic crystal is _____

A. 9

B. 23

C. 10

D. 14

Answer: b

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

A. 1

B. 2

C. 3

D. 4

Answer: a

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9. Co-ordination number in ABAB..... Type arrangement is _____

A. 6

B. 8

C. 12

D. 6

Answer: c

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10. The coordination number of Zn in ZnO and Zn is ZnS are respectively _____

A. 4 and 6

B. 4 and 4

C. 2 and 4

D. 4 and 3

Answer: b

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11. The point defects shown by FeO and FeS respectively _____

A. Metal deficiency defect

B. Metal excess defect

C. Schottky defect

D. Frenkel defect

Answer: a

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12. The coordination number of a metal crystallising in a hexagonal close packed structure is _____

A. 6

B. 4

C. 8

D. 12

Answer: d

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13. An example of covalent crystalline solid is _____

A. NaI

B. Al

C. Si

D. Ar

Answer: c

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14. Iodine crystals are _____

A. covalent

B. ionic

C. metallic

D. molecular

Answer: d

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15. Ionic solids are characterised by _____

A. solubility in polar solvents

B. high vapour pressure

C. low melting point

D. good conductivity in solid state

Answer: a

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16. The number of atoms present in a unit cell of a mono atomic substance of a simple cubic lattic , body centered cubic and face centred cubic respectively are _____

A. 4,5 and 6

B. 8,9 and 14

C. 2,3 and 5

D. 1,2 and 4

Answer: d

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17. In a face centred cubic cell, an atom at the face contributes to the unit cell _____

A. $\frac{1}{4}$ part

B. 1 part

C. $\frac{1}{2}$ part

D. $\frac{1}{8}$ part

Answer: c

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18. Potassium crystallizes in bcc lattice, hence the coordination number of potasium in potassium metal is _____

A. 0

B. 8

C. 6

D. 4

Answer: b

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19. The number of chloride ions that surrounds the central Na^+ ion in NaCl crystal is _____

A. 12

B. 8

C. 6

D. 4

Answer: c

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20. An example for Frenkel defect is _____

A. NaCl

B. AgBr

C. CsCl

D. FeS

Answer: b

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21. The Bragg's equation is _____

A. $\lambda = 2d \sin\theta$

B. $nd = 2\lambda \sin\theta$

C. $2\lambda = nd \sin\theta$

D. $n\lambda = 2d \sin\theta$

Answer: d

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22. The crystal structure of CsCl is _____

A. Simple cubic

B. Face-centred cubic

C. Tetragonal

D. Body centred cubic

Answer: d

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23. The total number of atoms per unit cell is bcc is _____

A. 1

B. 2

C. 3

D. 4

Answer: b

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24. A cubic crystal has _____ faces.

A. 2

B. 4

C. 6

D. 8

Answer: c

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25. Bragg's equation gives the essential condition for _____ to occur

A. deflection

B. diffraction

C. reflection

D. refraction

Answer: b

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26. The force that binds a metal on to a number of electrons within its sphere of influence is known as _____ bond.

A. covalent

B. ionic

C. metallic

D. co-ordinate

Answer: c

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27. The number of cesium ion per unit cell in CsCl crystal system is _____

A. 4

B. 8

C. 6

D. 1

Answer: d

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28. In edge centred lattice , an atom in the edge is shared by _____

A. 4 unit cell

B. 12 unit cell

C. 2 unit cell

D. 8 unit cell

Answer: b

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29. Calculate the number of atoms in a fcc unit cell.

A. 4

B. 8

C. 12

D. 2

Answer: a

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30. An example of covalent crystal is _____

A. CsCl

B. NaCl

C. ice

D. Diamond

Answer: d

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31. A crystal which has the same unit cell and contains the same lattice points throughout the crystal is _____

A. perfect

B. imperfect

C. distorted

D. both (b) and (c)

Answer: a

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32. The size of the anion in Frenkel defect crystal is _____

A. larger than the cation

B. smaller than the cation

C. equal in size with cation

D. both are large in size

Answer: a

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33. The seven primitive crystal systems differe in the _____ arrangement.

A. crystallographic axes

B. angles

C. both (a) and (b)

D. neither (a) nor (b)

Answer: c

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34. The cation leaves its normal position in the crystal and moves to some interstitial position, the defect in the crystal is known as

A. metal excess

B. p type

C. Schottky defect

D. Frenkel

Answer: d

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35. If electrical conductivity is found to be same in all directions through a solid the substance is _____ solid and the property is called _____

A. crystalline, isotropy

B. amorphous, isotropy

C. crystalline, anisotropy

D. amorphous,isotropy

Answer: b

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36. ABAB type of packing is called _____

A. hexagonal close packing

B. cubic close packing

C. tetragonal close packing

D. none of the above

Answer: a

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37. Coordination number of tetrahedral and octahedral voids respectively are _____

A. 2,4

B. 4,2

C. 4,6

D. 6,4

Answer: c

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38. The coordiantion number of each sphere in body centred cubic packing is _____

A. 2

B. 4

C. 6

D. 8

Answer: d

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39. Crystal of NaCl has yellow colour due the presence of _____

A. cation vacancy

B. Fcentres

C. both (a) and (b)

D. neither (a) nor (b)

Answer: b

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40. The structure of ionic compound depends upon _____ of the ions

A. stoichiometry

B. size

C. both (a) and (b)

D. neither (a) nor (b)

Answer: c

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41. Structure of B_2O_3 is _____

A. trigonal planar

B. tetrahedral

C. octahedral

D. cubic

Answer: a

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42. The coordination number of ZnS is _____

A. 3

B. 4

C. 6

D. 8

Answer: b

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43. The correct order of packing efficiency in different types of unit cells is _____

A. fcc $>$ bcc $>$ sc

B. sc $<$ fcc $<$ bcc

C. fcc $<$ bcc $>$ sc

D. bcc $<$ fcc $<$ sc

Answer: a

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Assertion Reason

1. Assertion (A) : The packing efficiency is maximum for the fcc structure.

Reason (R) : The co-ordination number is 12 in fcc structure.

A. Both assertion and reason are true and reason is the correct explanation of assertion.

B. Both assertion and reason are true but reason is not the correct explanation of

assertion.

C. Assertion is true but reason is false

D. Both assertion and reason are false.

Answer: B

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2. Assertion (A) : Total number of octahedral voids present in unit cell of cubic close packing including the one that is present at the body centre is four.

Reason (R) : Besides the body centre there is one octahedral void present at the centre of each of the six faced of the unit cell and each of which is shared between the adjacent unit cells.

A. Both assertion and reason are true and reason is the correct explanation of assertion.

B. Both assertion and reason are true but reason is not the correct explanation of assertion.

C. Assertion is true but reason is false

D. Both assertion and reason are false.

Answer: c

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3. Assertion (A) : Graphite is a good conductor of electricity. However diamond belongs to the category of insulators.

Reason (R) : Graphite is soft in nature on the other hand diamond is very hard and brittle.

A. Both assertion and reason are true and reason is the correct explanation of assertion.

B. Both assertion and reason are true but reason is not the correct explanation of assertion.

C. Assertion is true but reason is false

D. Both assertion and reason are false.

Answer: b

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4. Assertion (A) : The total number of atoms present in a simple cubic unit cell is one .

Reason (R) : Simple cubic unit cell has atoms at incorners each of which is shared between eight adjacent unit cells .

A. Both assertion and reason are true and reason is the correct explanation of assertion.

B. Both assertion and reason are true but reason is not the correct explanation of assertion.

C. Assertion is true but reason is false

D. Both assertion and reason are false.

Answer: a

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5. Assertion : In NaCl structure, the inter ionic distance is $a/2$.

(a Unit cell edge length).

Reason : NaCl forms face centered cubic unit cell.

A. Both assertion and reason are true and reason is the correct explanation of assertion.

B. Both assertion and reason are true but reason is not the correct explanation of

assertion.

C. Assertion is true but reason is false

D. Both assertion and reason are false.

Answer: b

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6. Assertion : The number of spheres are eual to the number of octahedral voids as well as tetrahedral voids.

Reason : octahedral void and tetrahedral void has equal size.

A. Both assertion and reason are true and reason is the correct explanation of assertion.

B. Both assertion and reason are true but reason is not the correct explanation of assertion.

C. Assertion is true but reason is false

D. Both assertion and reason are false.

Answer: d

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7. Assertion : In Schottky defect, density of crystal decreases.

Reason : Number of cations and anions are missing in Schottky defect are equal.

A. Both assertion and reason are true and reason is the correct explanation of assertion.

B. Both assertion and reason are true but reason is not the correct explanation of assertion.

C. Assertion is true but reason is false

D. Both assertion and reason are false.

Answer: a

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8. Assertion : Covalent crystals have the highest melting point

Reason : Covalent bonds are stronger than ionic bonds

A. Both assertion and reason are true and reason is the correct explanation of assertion.

B. Both assertion and reason are true but reason is not the correct explanation of assertion.

C. Assertion is true but reason is false

D. Both assertion and reason are false.

Answer: c

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9. Assertion : A crystal with schottky defect is electrically neutraly

Reason : Equal number of cation and anion vacanies are present

A. Both assertion and reason are true and reason is the correct explanation of assertion.

B. Both assertion and reason are true but reason is not the correct explanation of assertion.

C. Assertion is true but reason is false

D. Both assertion and reason are false.

Answer: a

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10. Assertion : CsCl is a body centred cubic arrangement

Reason : CsCl has one Cs^+ ion and SCl^- ions in its unit cell

A. Both assertion and reason are true and reason is the correct explanation of assertion.

B. Both assertion and reason are true but reason is not the correct explanation of

assertion.

C. Assertion is true but reason is false

D. Both assertion and reason are false.

Answer: c

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11. Assertion : Frenkel defects is exhibited by alkali halides

Reason : Alkali ions have small size.

A. Both assertion and reason are true and reason is the correct explanation of assertion.

B. Both assertion and reason are true but reason is not the correct explanation of assertion.

C. Assertion is true but reason is false

D. Both assertion and reason are false.

Answer: d

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12. Assertion (A) : The packing efficiency is maximum for the fcc structure.

Reason (R) : The co-ordination number is 12 in fcc structure.

A. Both assertion and reason are true and reason is the correct explanation of assertion.

B. Both assertion and reason are true but reason is not the correct explanation of

assertion.

C. Assertion is true but reason is false

D. Both assertion and reason are false.

Answer: b

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Correct Statement S

1. I. Anisotropy is the property which depends on the direction of measurement.

II. Structural units of an ionic crystals are cations and anions.

III. Amorphous solids are anisotropic in nature.

IV. Crystalline solids have an orderly arrangements.

A. Only I

B. Only II

C. III & IV

D. I,II& IV

Answer: d

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2. I. Gas molecules move randomly without exerting reasonable forces on one another.

II. Covalent solids are held together by weak vander waals forces.

III. Molecules are held together by strong force of attraction.

IV. Covalent solids are good thermal and electrical conductors.

A. Only I

B. Only II

C. I,II & IV

D. I & III

Answer: D

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3. I. Ionic solids conduct electricity, because the ions are fixed in their lattice positions.

II. Hydrogen bonded molecular solids are soft solids under room temperature.

III. Dipole-dipole interactions are found in polar molecular solids

IV. X-ray diffraction analysis is used for the determination of crystal structure.

A. II,III, & IV

B. Only II

C. Only I

D. III & IV

Answer: A

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4. The correct statement regarding defects in crystalline solid is _____

A. Frenkel defect is a dislocation defect

B. Frenkel defect is found in halids of alkaline metals

C. Schottky defects have no effect on the density of crystalline solids

D. Frenkel defects decrese the density of crystalline solids

Answer: a

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Incorrect Statement S

1. Odd one out

A. Each sphere is in contact with 6 of its neighbouring spheres in ABAB types

B. Each sphere isin contact with 4 neighbouring spheres in AAAA types.

C. Polonium is the only metal with the simple cubic pattern

D. The number voids depends on the number of close packed spheres.

Answer: b

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2. Odd one out

A. Co-ordination number of each sphere is 12 in hcp arrangements.

B. Co-ordination number of each sphere is 8 in ccp arrangements.

C. The cubic close packing is based on the face centered cubic unit cell.

D. The structure of an ionic compound depends upon the stoichiometry

Answer: b

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3. Odd one out

A. Schottky defect change the stoichiometry of the crystal

B. Large number of Shottky defects in a crystal lowers its density

C. Schottky defect arises due to missing of equal number of cations and anions

D. Metal excess defect due to the presence of more number of metal ions

Answer: a

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4. Odd one out

A. Metal deficienty defect due to less number of anions than cations

B. Piczo electricity means electricity resulting from pressure and latent heat.

C. Constituents are randomly arranged in amorphous solids

D. Piezoelectric effect caused by mechanical stress on material.

Answer: a

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5. Which one of the following statement is wrong about Frenkel defect ?

A. An ion occupies an interstitial position

B. Anion is much larger in size than the cation

C. The crystal remains neutral

D. Non-stoichiometric compound is formed

Answer: d

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Very Short Answer

1. Why do solids have a definite volume ?

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2. Classify the following as amorphous or crystalline solids.

Polyurethane, Naphthalene, Benzoic acid,

Teflon, Potassium nitrate Cellophane, Polyvinyl chloride , Fiber glass, Copper.

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3. What type of stoichiometric defect is shown by ZnS.

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4. Ionic solids conduct electricity in mollten state but not in solid state. Explain.

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5. Distinguish between.

Face-centred and body-centred unit cells.

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6. What type of defect can arise when a solid is heated ? Which physical property is affected by it and in what way ?

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7. Calculate the number of atoms in a fcc unit cell.

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8. Name an element with which silicon can be doped to give an n-type semi conductor.

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9. Which point effect in crystal doesn't alter the density of the relevant solid ?

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10. Define the term amorphous.

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11. Define void.

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12. What is point defect in crystals ?

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13. Diamond and solid rhombic sulphur are covalent solids but the latter has very low melting point than the former. Explain why ?

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14. Aluminium crystallizes in a cubic close packed structure .Its metallic radius is 125pm. Calculate the edge length of unit cell.

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15. Define the term : space lattice.

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16. What is coordination number ?

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17. How many atoms can be present in a simple cubic lattice ?

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18. Write a note on the assignment of atoms per unit cell in body centred cubic lattic or CsCl.

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19. A compound made up of two atoms X and Y has a face centred cubic arrangement. X is present in the corners and Y at the centre of each face. If one atom is missing from corner. What is the simplest formula of the compound.

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20. What are primitive unit cells ?

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21. Name the seven primitive crystal system.

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22. NaCl has a sharp melting point but glass does not -Justify.

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23. In CaF_2 crystal, Ca^{2+} ions are present in arrangement . Calculate the number of F^- ions in the unit cell.

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24. Define packing efficiency.

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25. Distinguish between cubic and hexagonal unit cells.

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26. Why is FeS not formed in stoichometric composition ?

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27. What is F centre ?

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28. Frenkel defect is not show by alkali metal halides but silver halides do. Give reason.

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Short Answer

1. Why are solids rigid ?

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2. Silver crystallines in fcc lattice. If edge length of the cell is $4.07 \times 10^{-8} cm$ and density is 10.5 gcm^{-3} . Calculate the atomic mass of silver.

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3. If NaCl is doped with 10^{-3} mol % of $SrCl_2$, What is the concentration of cation valencies ?

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4. Why are solids incompressible ?

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5. Classify the following solids in different categories based on the nature of intermolecular force operating in them :

Potassium sulphate, tin, benzene, urea, ammonia, water, zinc sulphide, graphite, rabidium , argon,silicon carbide.

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6. What is the formula ofa compound in which the element Y form ccp lattice and atoms of X occupy $\frac{2}{3}rd$ of tetrahedral voids ?

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7. Calculate the number of unit cells in 8.1 g of aluminium, if it crystallises in a face centered cubic structure. (Atomic mass of $Al = 27gmol^{-1}$)

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8. Inspite of long range order in the arrangement of particles, why are the crystals usually not perfect?

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9. Examine the given defective crystal :

Answer the following questions.

Is the above defect stoichiometric or non-stoichiometric ?

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10. Examine the given defective crystal :

Answer the following questions.

What are such defects called ? Give an example of the compound which shows this type of defect.

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11. ZnO turns yellow on heating . Why ?

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12. What change occurs when AgCl is doped with $CdCl_2$?

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13. What type of semiconductor is produced when silicon is doped with boron ?

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14. How do the spacings of the three planes (100), (101) and (111) of simple cubic lattice vary ?

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15. Diffraction angle 2θ equal to 14.8° for a crystal having interplanar distance in the crystal is 0.400 nm when second order diffraction was observed. Calculate the wavelength of X-ray used.

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16. A metallic element exists as a cubic lattice. Each edge of the unit cell is 2.88Å. The density

of the metal is $7.20 gcm^{-3}$. How many unit cells there will be in 100g of the metal ?

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17. Sketch the Simple cubic

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18. Sketch the face-centered cubic

Watch Video Solution

19. Sketch the body centred cubic lattices.

Watch Video Solution

20. Calculate the number of atoms in a fcc unit cell.

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21. State Bragg's law.

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22. Write the properties of ionic crystals.

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23. Answer the following :

Name the intermolecular force present in ice.

Watch Video Solution

24. Answer the following :

What type of bond is present in network solid

?

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25. Distinguish the following.

Crystal lattice and unit cell

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26. Classify the following solids.

a. P_4 b. Brass

c. Diamond d. NaCl

e. Iodine

A. `

B.

C.

D.

Answer:

Watch Video Solution

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27. Explain the equivalent resistance of a series and parallel resistor network.

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Long Answer

1. Ionic solids, which have anionic vacancies due to metal excess defect, develop colour. Explain with the help of a suitable example

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2. A cubic solid is made of two elements P and Q. Atoms of Q are at the corners of the cube and P at the body - centre. What is the formula of the compound ? What is the coordination numbers of P and Q ?

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3. What are the general characteristics of solids ?

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4. What are molecular solids ? Explain the types of molecular solids.

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5. An element with molar mass 2.7×10^{-2} kg mol^{-1} forms a cubic unit cell with edge length 405 pm .If its density is $2.7 \times 10^{3} kgm^{-3}$. What is the nature of the cubic unit cell ?

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6. How can you determine the atomic mass of an unknonw metal if you know its density and the dimension of its unit cell ? Explain.

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7. Explain the following :

Similarities and differences between metallic and ionic crystals.

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8. How are crystals defects classified ?

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9. What are stoichiometric defects in ionic solids ? Explain.

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10. Write note on impurity defect ?

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11. KF crystallizes in fcc structure like sodium chloride, calculate the distance between K^+

and F^- in KF. (Given : density of KF is $2.48 g cm^{-3}$)

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12. Explain the following :

Similarities and differences between metallic and ionic crystals.

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Hots

1. A compound forms hexagonal closed packed structure. What is the total number of voids in 0.5 mol of it ? How many of these are tetrahedral voids ?

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2. Sodium crystallizes in a bcc unit cell. Calculate the approximate number of unit cells in 9.2 g of sodium. (Atomic mass Na 23 u) .

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3. The energy requried to vapourize one mole of coper is smaller than that of energy required to vapourise 1 mole of diamond why ?

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Unit Test

1. The ratio of close packed atoms to tetrahedral hole in cubic packing is

A. $1:1$

B. $1:2$

C. $2:1$

D. $1:4$

Answer: B

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2. Crystal of NaCl has yellow colour due the presence of _____

A. excitation of electron in F centers

B. reflection of light from Cl^- ion on the surface

C. refraction of light from Na^+ ion

D. all of the above

Answer: a

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3. potassium has a bcc structure with nearest neighbour distance 4.52Å. Its atomic weight is 39,its density will be

A. $910kgm^{-3}$

B. $2142kgm^{-3}$

C. $452kgm^{-3}$

D. $390kgm^{-3}$

Answer: a

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4. The vacant space in bcc lattic unit cell is

A. $48\ \%$

B. $23\ \%$

C. 0.32

D. 0.26

Answer: c

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5. Assertion : monoclinic sulphur is an example of monclinic crystal system

Reason : For a monoclinic system , $\neq b \neq c$ an $\alpha = \gamma = 90^\circ$, $\beta \neq 90^\circ$

A. Both assertion and reason are true and reason is the correct explanation of assertion.

B. Both assertion and reason are true but reason is not the correct explanation of assertion.

C. Assertion is true but reason is false

D. Both assertion and reason are false.

Answer: a

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Answer In Paragraph

1. Distinguish between hexagonal close packing and cubic packing.

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2. Why ionic crystals are hard and brittle ?

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