CHEMISTRY

JEE MAIN AND ADVANCED

MOCK TEST 15

Example

1. Which of the following is non-polar molecular solid?

A. SiC

B. Naphthlene

C. HCl

D. AIN

Answer: B

2. Solids for which physical properties like electric resistance or refractive index show different values when measured along different directions are called

A. Pseudo solids

B. Isotropic solids

C. Polymorphic solids

D. Anisotropic solids

Answer: D

3. Which of the following given list has molecular solids only?

A. Carborundum, dry ice, diamond, solid H_2, benzene

B. Naphthalene, Na_2SO_4 copper, corundum, CCl_4

C. Corundum, camphor, silicon carbide, ice, solid CS_2

D. Solid H_2, camphor, dry ice, $solid CS_2$, naphthalene

Answer: D

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4. If all the three interaxial angles defining the unit ceil are equal in magnitude, the crystal cannot be!ong to

(I) Orthorhombic system

(II) Monoclinic system

(III) Hexagonal system

(IV) Tetragonal system

A. II, III

B. I, IV

C. III, IV

D. I, II

Answer: A

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5. Which of the following sets of axial angles and axial lengths represent maximum number in Bravais lattices?

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

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

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

D. $\alpha = \beta = \gamma = 90^\circ$ and $a = b = c$

Answer: B

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6. Which of the following given crystal system is the most symmetrical and the most unsymmetrical system respectively?

A. Cubic, Hexagonal

B. Orthorhombic, Monoclinic

C. Cubic, Tridinic

D. Rhombohedral, Tetragonal

Answer: C

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7. Sodium crystallizes in a face centred cubic lattice. The approximate number of unit cells in 5.0 g of sodium is (Atomic mass of sodium = 23 amu)

A. 32.7×10^{22}

B. $3.27X10^{22}$

C. 6.54×10^{22}

D. 65.4×10^{22}

Answer: B

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8. Three atoms A, B and C crystallize in a cubic solid lattice where A atoms are present at the body centre, B atoms are present at the edge centre as well as at the corners of the cube and C atoms are present at the face centres of the cube. Now if all the atoms are removed from the two 4-fold axis and the one 2-fold axis passing through the cube, then the formula of the compound is

A. B_7C_2

B. AB_2C_7

C. ABC_2

D. A_5C_2

Answer: A

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9. Three atoms P, Q and R crystallize in a cubic solid lattice where P atoms are at the altemate faces, R atoms are at the centre of edges and Q atoms are

at the 2/3 rd of the total corners present, hence the fomula of the compound is

A. $P_2Q_9R_2$

B. $P_3Q_2R_9$

C. $P_3Q_4R_1$

D. $P_2Q_3R_4$

Answer: B

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10. A compound formed by elements X, Y and Z has a cubic structure in which X atoms are at the corner of the cube and also at alternate face centres. Y atoms are present at the body centre and Z atoms are present at the alternate edge centre. Then the molecular formula of the compound is

A. XYZ

B. XY_2Z

C. XYZ_3

D. X_2YZ

Answer: D

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11. An ionic compound is made up of A & B only. Ions A occupy all the corners and alternate edge centers while atoms B occupy all the face centers. The formula of compound will be

A. AB_2

B. A_2B_3

C. A_2B

D. AB_3

Answer: B

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12. An ionic compound is made up of A & B only. Ions of A occupy all the corners and alternate face centers while that of B occupy body center and edge centers. If B contains -1 charge then charge on atom A will be

A. 1

B. 2

C. 3

D. 4

Answer: B

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13. Which one of the following schemes of ordering closed packed sheets of equal sized spheres do not generate close packed lattice?

A. ABCABC

B. ABACABAC

C. ABBAABBA

D. ABCBCABCBC

Answer: C

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14. If the anions (X) form hexagonal closed packing and cations (Y) occupy only 3/8th of octahedral voids in it, then the general formula of the compound is

A. XY

B. YX_2

C. X_8Y_3

D. X_3Y_4

Answer: C

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15. A solid is formed and it has three types of atoms X, Y, Z. X forms an FCC lattice with Y atoms occupying one-fourth of tetrahedral voids and Z atoms occupying half of the octahedral voids. The formula of the solid is

A. $X_4Y_4Z_2$

B. X_2YZ_2

C. X_4YZ

D. X_2YZ

Answer: D

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16. The two ions A^+ and B^- have radii 40 pm and 120 pm respectively. In the closed packed crystal of compound AB, the coordination number of A^+ would be

A. 6

B. 8

C. 4

D. 12

Answer: C

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17. A crystal is made up of particles A. B and C. A forms fcc packing, B occupies all octahedral voids and C occupies all tetrahedral voids. If all the

particles along one body diagonal are removed, then the formula of the crystal would be

A. ABC_2

B. A_2BC_2

C. $A_8B_4C_5$

D. $A_5B_4C_8$

Answer: D

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18. The number of nearest neighbours of each atom in cubic close packing (ccp) and body-centred cubic arrangement (bcc) is respectively

A. 12, 12

B. 12, 8

C. 8, 6

D. 8, 8

Answer: B

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19. Minimum distance between two tetrahedral voids if a is the edge length of the cube is

A. $\frac{a}{4}$

B. $\frac{a}{2\sqrt{2}}$

C. $\frac{a}{2}$

D. $\frac{\sqrt{3a}}{4}$

Answer: C

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20. The minimum distance between an octahedral and a tetrahedral void in fcc lattice is

A. $a\sqrt{3}$

B. $\frac{a\sqrt{3}}{2}$

C. $\frac{a\sqrt{3}}{3}$

D. $\frac{a\sqrt{3}}{4}$

Answer: D

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21. You are given 6 identical balls . The maximum number of square voids and triangular voids (in separate arrangements) that can be created respectively are

A. $2, 4$

B. $4, 2$

C. $4, 3$

D. $3, 4$

Answer: A

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22. The number of octahedral voids in case of hcp unit cell is

A. 6

B. 12

C. 4

D. 8

Answer: A

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23. The number of nearest neighbours of each sphere in hexagonal closed packing pattern in its own layer will be

A. 4

B. 6

C. 12

D. 8

Answer: B

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24. In an arrangement of type ABABA .... identical atoms of first layer (A) and third layer (A) are joined by a line passing through their centers . Identify the correct statement .

A. No void is found on the line

B. Only tetrahedral voids are found on the line

C. Only octahedral voids are found on the line

D. Equal number of tetrahedral and octahedral voids are found on the line

Answer: B

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25. Given an alloy of Cu, Ag and Au in which Cu atoms constitute the ccp arrangement . If the hypothetical formula of the alloy is Cu_4Ag_3Au , the probable locations of Ag and Au atoms are

A. Ag- all tetrahedral voids , Au - all octahedral voids

B. Ag- (3th)/8 tetrahedral voicks , Au - (1th)/4 octahedral voids

C. Ag- 1/2 octahedral voicks , Au - 1/2 tetrahedral voids

D. Ag- all octahedral voicks , Au - all tetrahedral voids

Answer: B

26. Which of the following statement is false ?

A. Two tetrahedral voids are formed on each of the four body diagonals of the cube

B. When body centre of the cube is surrounded by six atoms of face centres , an octahedral

voids is formed .

C. Tetrahedral void is present at the centre of each of the 12 edges

D. The shortest distance between two octahedral a voids is $\frac{a}{\sqrt{2}}$ (a is the edge length of the unit cell).

Answer: C

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27. In fcc , a tetrahedral void is formed by atoms at

A. 3 corners and 1 face centre

B. 3 face centres and 1 corner

C. 2 face centres and 2 corners

D. 2 face centres , 1 corner and 1 body centre

Answer: B

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28. The relation between atomic radius (r) and edge length (a) a face - centred cubic cell is

A. $r = \frac{a}{2}$

B. $r = \frac{a}{2\sqrt{2}}$

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

D. $\frac{\sqrt{2}a}{2}$

Answer: B

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

A. $\frac{\pi}{2}$

B. $\frac{\sqrt{3}\pi}{8}$

C. $\left(\sqrt{2}\pi\right)6$

D. $\frac{\pi}{6}$

Answer: D

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30. In a close packed structure of mixed oxides , the lattice is composed of oxide ions , one eighth of the tetrahedrai voids are occupied by divalent cations (A) while half of the octahedral voids are occupied by trivalent cations (B) . What is the formula of the oxide ?

A. A_2B_3O

B. $A_4B_2O_3$

C. AB_2O_4

D. $A_3B_2O_2$

Answer: C

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31. An ionic solid AB crystallizes as a bcc structure . The distance between cation and anion in the lattice is 338 pm . Calculate the edge length of the unit cell .

A. 195.15 pm

B. 97.58 pm

C. 390.3 pm

D. 780.6 pm

Answer: C

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32. In a metal M having bcc arrangement edge length of the unit cell is 400 pm . The atomic radius of the metal is

A. 173 pm

B. 100 pm

C. 141 pm

D. 200 pm

Answer: A

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33. A compound XY crystallizes in BCC lattice with unit cell - edge length of 480 pm , if the radius of Y = is 225 pm , then the radius of X is

A. 95.34 pm

B. 225 pm

C. 127.5 pm

D. 190.7 pm

Answer: D

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34. What are the number of atoms per unit cell and the number of nearest neighbours in a bcc structure ?

A. $2, 12$

B. $4, 12$

C. $2, 8$

D. $2, 6$

Answer: C

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35. An element crystallizes in a fcc lattice and the edge length of the unit cell is 0.559 nm . The density of crystal is 3.19 g / cm^3 . Find atomic weight of the element .

A. 100.6

B. 75.9

C. 95.8

D. 83.9

Answer: D

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36. An element X (molar mass = 80 g / mol) having fcc structure , calculate number of unit cells in 8 g of X.

A. $0.4 \cdot N_A$

B. $0.1 \cdot N_A$

C. $4 \cdot N_A$

D. $0.025 \cdot N_A$

Answer: D

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37. Molybdenum (molar mass 96 $gcrystallizesasbcrystal. If densityofcrystalis 10.3 \frac{g}{}$ cm^3, $thenradiusofMoa \rightarrow mis$(N_A = 6 X 10^23)$(Takeroot(3)(31) = 3.2$)`

A. 111 pm

B. 314 pm

C. 138.56 pm

D. 314 pm

Answer: C

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38. The coordination number of a metal crystallising a hcp structure is

A. 12

B. 8

C. 6

D. 4

Answer: A

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39. The unit cell present in ABCABC closed packing of atoms is

A. Hexagonal

B. Tetragonal

C. Face centred cube

D. Simple cube

Answer: C

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40. The atomic radius of strontium (Sr) is 215 pm and it crystallizes in FCC . Edge length of the cube is

A. 430 pm

B. 608.2 pm

C. 496.53 pm

D. 304.1 pm

Answer: B

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41. If the density of crystalline CsCl is 3.988 gcm^{-3}, calculate the volume effectively occupied by a single CsCl ion pair in the crystal (CsCl = 168.4)`

A. $7.01 \cdot 10^{-23} cm^3$

B. $6.02 \cdot 10^{-24} cm^3$

C. $1cm^3$

D. $3.5 \cdot 10^{-23} cm^3$

Answer: A

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42. A binary solid (AB) has a rock salt structure . If the edge length is 500 pm , and radius of cation is 80 pm , find the radius of anion

A. 100 pm

B. 120 pm

C. 250 pm

D. 170 pm

Answer: D

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