TOPIC : SOLID STATE

1. Which of the following is a molecular solid ?
   (a) ZnS (b) MgO
   (c) Ice (d) Diamond
2. For a primitive cubic unit cell, the radius of atom (R) can be related to the side of the unit cell (a) as
   (a) R = 2a (b) R = a
   (c) R = $\frac{a}{4}$ (d) R = $\frac{a}{2}$
3. When electrons are trapped in the crystal lattice in place of anion vacancy, the defect in the crystal is known as
   (a) Frenkel defect (b) Schottky defect
   (c) F-centre (d) Dislocations
4. The number of octahedral and tetrahedral voids per sphere in a cubic close packed arrangement is respectively.
   (a) 1 and 3 (b) 6 and 4
   (c) 1 and 3 (d) 1 and 2
5. In a face centred cubic lattice the number of nearest neighbour for a given lattice point is
   (a) 6 (b) 4
   (c) 8 (d) 12
6. As crystal may have one or more places of symmetry as well as one or more than one axis of symmetry but it has only
   (a) two centres of symmetry
   (b) one centre of symmetry
   (c) four centres of symmetry
   (d) no centre of symmetry
7. Which of the following is not a property of crystalline solid ?
   (a) Isotropy (b) Anisotropy
   (c) Sharp melting point (d) Definite geometry
8. Which of the following is a ferromagnetic compound?
   (a) Fe_2O_3 (b) Fe_3O_4
   (c) Cr_2O_3 (d) CrO_2
9. Which of the following is a diamagnetic compound?
   (a) MnO_2 (b) V_2O_5
   (c) TiO (d) Fe_2O_3
10. A binary solid AB having radius ratio 0.52 is most likely to have
    (a) zinc blends structure
    (b) rock-salt-structure
    (c) fluorite structure
    (d) antifluorite structure
11. For a cubic void the radius ratio is equal to
    (a) 0.225 (b) 0.414
    (c) 0.732 (d) 0.155
12. Na_2O has antifluorite structure. In Na_2O, the coordination number of oxide ions is
    (a) 4 (b) 6
    (c) 8 (d) 12
13. Which of the following is known as spinel ?
    (a) $MgAl_2O_4$ (b) $K_4Fe(CN)_6$
    (c) CaO (d) $Na_2Fe_2O_4$
14. A match box represents an example of :
    (a) cubic geometry
    (b) rectangular geometry
    (c) orthorhombic geometry
    (d) monoclinic geometry
15. If the mix pentavalent impurity in a crystal lattice of germanium, the type of semi-conductor formed is
    (a) n-type
    (b) p-type
    (c) both n and p type
    (d) none of the two
16. A compound formed by elements A and B crystallizes in the cubic structure where B atoms are at the corners of the cube and A atoms are at the centre of alternate faces. The formula of the compound would be
    (a) A_2B (b) A_3B_2
    (c) AB (d) AB_2

17. The co-ordination number of metal crystallizing in hexagonal close packed structure is
(a) 12 (b) 4
(c) 8 (d) 6

18. A unit cell having dimensions $a \neq b \neq c$; $\alpha \neq \beta \neq \gamma = 90^{o}$ is known as
(a) Monoclinic
(b) Triclinic
(c) Rhombohedral
(d) Orthorhombic

19. The radius of Na^{+} is 95 pm and that of Cl^{-} is 181 pm. The edge length of unit cell in NaCl would be
(a) 181 pm (b) 95 pm
(c) 276 pm (d) 552 pm

20. A simple cubic lattice consists of eight identical spheres of Radius 'R' in contact, placed at the corners of the cube, what fraction of the total volume of cube is actually occupied by the cube ?
(a) 74% (b) 68%
(c) 52.4% (d) 66%

21. In a compound, oxide ions have fcc arrangement and the cations M occupy two-third octahedral voids. The formula of the compound is
(a) M_2O (b) M_3O_2
(c) M_2O_3 (d) M_3O_4

22. A compound alloy of gold and copper crystallizes in a cubic lattice in which gold atoms occupy the lattice points at the corner of the cube and copper atoms occupy centres of each of the cube faces. The probable empirical formula of the compound alloy is
(a) Au_3Cu (b) $AuCu_3$
(c) Au_2Cu_3 (d) $AuCu_2$

23. In a compound XY_2O_4, oxide ions are arranged in CCP and cations X are present in octahedral voids. Cations Y are equally distributed between octahedral and tetrahedral voids. What fraction of the total voids is occupied by X and Y?
(a) 1/2 (b) 1/4
(c) 1/6 (d) 1/8

24. Which of the following pairs of species are likely to show Schottky type defects ?
(a) NaCl, ZnS (b) CsCl, NaCl
(c) ZnS, AgBr (d) AgBr, NaCl

25. The number of atoms in 100 g of fcc crystal with density (d) = 10 g cm^{-3} and edge length 200 pm is equal to
(a) 3×10^{25} (b) 5×10^{24}
(c) 1×10^{25} (d) 2×10^{25}

26. The edge length of face centred cubic unit cell is 5-8 pm. If the radius of cation is 110 pm, the radius of anion is
(a) 110 pm (b) 144 pm
(c) 618 pm (d) 398 pm

27. The ionic radii of X^{+} and Y^{-} ions are 146 and 216 pm respectively. The probable type of structure exhibited by it is
(a) CsCl type (b) Rock salt type
(c) Zinc blends type (d) CaF_2 type

28. In a compound XY_2O_4, oxide ions are arranged in ccp and cations X are present in octahedral voids. Cations Y are equally distributed between octahedral and tetrahedral voids. The fraction of the octahedral voids occupied is
(a) 1/2 (b) 1/4
(c) 1/8 (d) 1/6

29. In a solid, oxide ions are arranged in CCP. Cations A occupy one-sixth of the tetrahedral voids and cation B occupy one-third of the octahedral voids. The formula of the compound is
(a) ABO_3 (b) AB_2O_3
(c) A_2BO_3 (d) $A_2B_2O_3$

30. An element A crystallizes by adopting AB AB AB… pattern of close packing, the number of atoms in the unit cell is
(a) 6 (b) 3
(c) 4 (d) 8

31. Potassium has a bcc structure with nearest neighbour distance 4.52 Å. If atomic mass of potassium is 39, its density is
(a) 454 kg m^{-3} (b) 804 kg m^{-3}

(c) 852 kg m^{-3} (d) 900 kg m^{-3}

32. A sample of wustite is $Fe_{0.93}$ O. This percentage of iron present in the form of Fe(III) is
(a) 15.05% (b) 25%
(c) 7% (d) 20%

33. In ccp arrangement of A and B atoms, A atoms are at the corners of unit cell while B atoms are at the face centres. In each unit cell, two atoms are missing from the two corners. The simples formula of the compound is
(a) A_3B (b) AB_4
(c) A_7B_{24} (d) A_6B_7

34. Certain metal crystallizes in bcc lattice. The distance between the nearest neighours is 433 pm. The distance between the next nearest neighbours is
(a) 400 pm (b) 500 pm
(c) 600 pm (d) 650 pm

35. A solid AB has rock salt type structure, if radius of cation A^+ is 100 pm, the radius of anion B^- is
(a) 414 pm (b) 224 pm
(c) 41.4 pm (d) 241.5 pm

36. In certain binary compound XY, the ionic radius of X^- and Y^- ions are respectively 88 pm and 200 pm. The co-ordination number of X^+ in the crystal is
(a) 4 (b) 3
(c) 6 (d) 8

37. A sample of crystalline Cu_2O is found to be non stoichiometric with Cu : O ratio less than 2 : 1. Pick up correct statement about the substance
(a) It is n-type semiconductor
(b) It is p-type of semiconductor
(c) Since Cu^+ ions are less than required the substance is not electrically neutral
(d) The crystal structure has metal-excess defect.

38. Calcium crystallizes in a face centred cubic lattice and is reported to have 0.2% Schottky defects. If edge length of the unit cell is 5.7×10^{-8} cm, the density of the crystal is
(a) 1.54 g cm^{-3} (b) 1.02 g cm^{-3}
(c) 0.92 g cm^{-3} (d) 1.432 g cm^3

39. The pyknometric density of sodium chloride crystal is 2.165×10^3 kg m^{-3} while X-ray density is 2.178×10^3 kg m^{-3}. The fraction of unoccupied sites in sodium chloride crystal is
(a) 5.96×10^{-3} (b) 5.96×10^{-1}
(c) 5.96 (d) 5.96×10^{-3}

40. The crystals of cryolite mineral were found consist of closed packed array of $(AlF_6)^{3-}$ units and sodium ions occupying all the octahedral and tetrahedral voids. The formula of mineral is
(a) $NaAlF_6$ (b) Na_3AlF_6
(c) Na_2AlF_6 (d) Na_4AlF_6.

ANSWERS KEY

1	C	**11**	C	**21**	C	**31**	D
2	D	**12**	C	**22**	B	**32**	A
3	B	**13**	A	**23**	B	**33**	B
4	D	**14**	C	**24**	B	**34**	B
5	D	**15**	A	**25**	B	**35**	D
6	B	**16**	C	**26**	C	**36**	C
7	A	**17**	A	**27**	A	**37**	B
8	D	**18**	B	**28**	A	**38**	D
9	C	**19**	D	**29**	A	**39**	A
10	B	**20**	C	**30**	A	**40**	B