Solved Example

Ex.1 Calculate the distance between 111 planes in a crystal of Ca. Repeat the calculation for the 222 planes. (a = 0.556nm)

Sol. We have,

$$d = \frac{a}{\sqrt{h^2 + k^2 + \ell^2}}$$

$$d_{111} = \frac{0.556}{\sqrt{1^2 + 1^2 + 1^2}} = 0.321 \text{ nm}$$

and $$d_{222} = \frac{0.556}{\sqrt{2^2 + 2^2 + 2^2}} = 0.161 \text{ nm}$$

The separation of the 111 planes is twice as great as that of the 222 planes.

Ex.2 Fraction of total volume occupied by atoms in a simple cube is -

[1] $\frac{\pi}{2}$ [2] $\frac{\sqrt{3}\pi}{2}$ [3] $\frac{\sqrt{2}\pi}{6}$ [4] $\frac{\pi}{6}$

Sol. In a simple cubic system, number of atoms

a = 2r

$\therefore$ Packing fraction = $\frac{\text{Volume occupied by one atom}}{\text{Volume of unit cell}}$

$$= \frac{\frac{4}{3}\pi r^3}{a^3} = \frac{\frac{4}{3}\pi r^3}{(2r)^3} = \frac{\pi}{6}$$

Ex.3 In a crystal both ions are missing from normal sites in equal number. This is an example of -

[1] F-centres [2] Interstitial defect

[3] Frenkel defect [4] Schottky defect

Sol. Schottky defects are arised when one positive ion and one negative ion are missing from their respective position leaving behind a pair of holes. These are more common in ionic compounds with high coordination number and having almost similar size of cations and anions.

Ex.4 Xenon crystallizes in face centre cubic lattice and the edge of the unit cell is 620 PM, then the radius of Xenon atom is -

[1] 219.20 PM [2] 438.5 PM [3] 265.5 PM [4] 536.94 PM

Sol. For fcc lattice

$4r = \sqrt{2}\, a$ where a = 620 PM

or $r = \frac{1}{2\sqrt{2}} \times a = \frac{1}{2\sqrt{2}} \times 620 \text{ PM} = 219.20 \text{ PM}.$

Ex.5 The edge length of cube is 400 PM. Its body diagonal would be -

[1] 500 PM [2] 693 PM [3] 600 PM [4] 566 PM

Sol. Since in body centre cubic, the body diagonal

$= \sqrt{3}\, a$

$= \sqrt{3} \times 400 \text{ PM}$

= 692.82 PM or say 693 PM

Ex.6 What is the simplest forkuma of a solid whose cubic unit cell has the atom A at each corner, the atom B at each face centre and C atom at the body centre

[1] AB_2C [2] A_2BC [3] AB_3C [4] ABC_3

Sol. An atom at the corner of a cube is shared among 8 unit cells. As there are 8 corners in a cube, number of corner atom [1] per unit cell = $8 \times \frac{1}{8} = 1$.

A face-centred atom in a cube is shared by two unit cellls. As there are 6 faces in a cube, number of face-centred atoms [2] per unit cell = $6 \times \frac{1}{2} = 3$.

An atom in the body of the cube is not shared by other cells.

$\therefore$ Number of atoms [3] at the body centre per unit cell = 1

Hence, the formula of the solid is AB_3C.

Ex.7 A compound alloy of glod and copper crystallizes in a cube lattice in which the gold atoms occupy the lattice points at the coruers of cube and copper atoms occupy the centres of each of the cube faces. The formula of this compound is -

[1] AuCu [2] $AuCu_2$ [3] $AuCu_3$ [4] None

Sol. One-eighth of each corner atom (Au) and one half of each face centered atom (Cu) are contained with in the unit cell of the compound.

Thus, the number of Au atoms per unit cell = $8 \times \frac{1}{8} = 1$ and

the number of Cu atoms per unit cell = $6 \times \frac{1}{2} = 3$. The formula of the compound is $AuCu_3$.

Ex.8 Lithium borohydride ($LiBH_4$), crystallises in a orthorhombic system with 4 molecules per unit cell. The unit cell dimensions are : a = 6.81 Å, b = 4.43 Å, c = 717Å. If the molar mass of $LiBH_4$ is 21.76 g mol^{-1}. The density of the crystal is -

[1] .668 g cm^{-3} [2] .585 g cm^2 [3] 1.23 g cm^{-3} [4] None

Sol. We know that,

$$\rho = \frac{ZM}{NV} = \frac{4\times(21.76 g mol^{-1})}{(6.023\times10^{23} mol^{-1})(6.81\times4.43\times7.17\times10^{-24} cm^3)}$$

$= 0.668 g\ cm^{-3}$

Ex.9 The unit cell of a metallic element of atomic mass 10^8 and density 10.5 g/cm^2 is a cube with edge length of 409 PM. The structure of the crystal lattice is -

[1] fcc [2] bcc [3] hcp [4] None

Sol. $\rho = \frac{Z\times M}{N\times a^3}$

Here, M = 108, $N_A = 6.023 \times 10^{23}$

Put on these values and solving we get -

$a = 409\ PM = 4.09 \times 10^{-8} cm$, $\rho = 10.5\ g/cm^2$

n = 4 = number of atoms per unit cell

So, The structure of the crystal lattice is fcc.

Ex.10 Copper metal has a face-centred cubic structure with the unit cell length equal 0.361 nm. Picturing copper ions in contact along the face diagonal. The apparent radius of a copper ion is -

[1] 0.128 [2] 1.42 [3] 3.22 [4] 4.22

Sol. For a face-centred cube, we have

$$\text{Radius} = \frac{\sqrt{2}a}{4} = \frac{\sqrt{2}\times 0.361}{4} nm = 0.128.$$

Exercise # 1

Q.1 How many number of atoms are there in a cube based unit cell having one atom on each corner and two atoms on each body diagonal of cube

[1] 8 [2] 6 [3] 4 [4] 9

Q.2 Each unit cell of NaCI consists of 13 chlorine atoms and

[1] 13 Na atoms [2] 14 Na atoms [3] 6 Na atoms [4] 8 Na atoms

Q.3 A crystal may have one or more planes and one or more axes of symmetry but it has

[1] Two centre of symmetry [2] One centre of symmetry

[3] No centre of symmetry [4] None ofthese

Q.4 An alloy of copper, silver and gold is found to have copper constituting the C.C.P. lattice. If silver atoms occupy the edge centres and gold is present at body centre, the alloy has a formula

[1] Cu_4Ag_2Au [2] Cu_4Ag_4Au [3] Cu_4Ag_3Au [4] CuAgAu

Q.5 Ice belongs to which of the following structures -

[1] Cubic [2] Hexagonal [3] Orthorhombic [4] Tetragonal

Q.6 A crystal plane intercepts the three crystallographic axes at the multiples of the unit distances 3/2, 2 and 1. The miller indices are

[1] 123 [2] 321 [3] 436 [4] 643

Q.7 The density of KBr is 2.75 gm cm^{-3}. Length of the unit cell is 654 pm. K = 39, Br = 80. Then what is true about the predicted nature of the solid

[1] Solid has face centred cubic system with Z = 4.

[2] Solid has simple cubic system with Z = 4.

[3] Solid has face centred cubic system with Z = 1

[4] Solid has body centred cubic system with Z = 2

Q.8 The number of atoms/molecules contained in one face centred cubic unit cell of a mono atomic substance is -

[1] 1 [2] 2 [3] 4 [4] 6

Q.9 The structure of sodium chloride crystal is

[1] Body centred cubic lattice [2] Face centred cubic lattice

[3] Octahedral [4] Square planar

Q.10 A binary solid ($A^+ B^-$) has a zinc blende structure with B^- ions constituting the lattice and A^+ ions occupying 25% tetrahedral holes. The formula of solid is

[1] AB [2] A_2B [3] AB_2 [4] AB_4

Q.11 The available space occupied by spheres of equal size in three dimensions in both hcp and ccp arrangements is :

[1] 74% [2] 70% [3] 60.4% [4] 52.4%

Q.12 In cubic close packing (ccp) arrangement, the pattern of the successive layers will be designed as :

[1] AB, AB, AB... etc [2] AB, ABC, AB... etc

[3] ABC, ABC, ABC... etc [4] None of these

Q.13 Cubic close packing arrangement is called :

[1] Hexagonal close packing [2] Face centred cubic

[3] Body centred cubic [4] None

Q.14 In a body centred cubic cell, the atom in the body is shared with :

[1] One unit cell [2] Two unit cell [3] Three unit cell [4] Four unit cell

Q.15 In a solid lattice a cation has left a lattice site and is located at an intertitial position. The lattice defect is :

[1] Interstitial defect [2] Vacancy defect

[3] Frenkel defect [4] Schottky defect

Q.16 Potassium crystallizes in a bcc lattice, hence the co-ordination number of potassium in potassium metal is :

[1] 0 [2] 4 [3] 6 [4] 8

Q.17 A packing of 8 : 8 co-ordination crystal is present in the compound :

[1] NaCl [2] KCl [3] CsCl [4] MgF_2

Q.18 The number of atoms in 100 gm of an FCC crystal with density d= 10 gm cm^{-3} and cell edge as 200 pm is equal to:

[1] 3×10^{25} [2] 5×10^{24} [3] 1×10^{25} [4] 2×10^{25}

Q.19 An element has bcc structure having unit cells 12.08×10^{23}. The number of atoms in these cell is :

[1] 12.08×10^{23} [2] 24.16×10^{23} [3] 48.38×10^{23} [4] 12.08×10^{22}

Q.20 The percentage of the volume occupied in three dimensional space for the simpcubic, bcc and fcc lattices respectively will be :

[1] 52%, 68%, 74% [2] 74%, 68%, 52% [3] 68%, 52%, 74% [4] 52%, 74%, 68%

Q.21 A certain metal crystallises in a simple cubic structure. At a certain temperature, it arranges to give a body centred structure. In this transition, the density of the metal

[1] Decreases [2] Increases

[3] Remain unchanged [4] Changes without a definite pattern

Q.22 In a face centred cubic arrangement of A & B atoms whose A atoms are at the corner of the unit cell & B atoms 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] $A_{7/8}\ B_3$

Q.23 Which of the following ,is not the property of solids

[1] Solids are always crystalline in nature [2] Solids have good density and less compressibility

[3] Solids diffuse very slowly [4] The volume of solids is fixed

Q.24 Crystals have vacant sites or defects in them. When light strikes a photographic AgBr paper, silver atoms move in through these defects to -

[1] Form -ve images [2] Form tiny clumps of silver atoms

[3] Form a colour image [4] None ofthese .

Q.25 A solid has a B. C. C. structure. If the distance of closest approach between the two atoms is 1.73 Å. The edge length of the cell is

[1] 200 pm [2] $\frac{\sqrt{3}}{\sqrt{2}}$ pm [3] 142.2 pm [4] $\sqrt{2}$ pm

Q.26 In a close packed array of N spheres, the number of tetrahedral holes are

[1] $\frac{N}{2}$ [2] 4N [3] 2N [4] N

Q.27 In a face centred cubic cell, an atom at the face centre is shared by

[1] 4 unit cells [2] 2 unit cells [3] 1 unit cell [4] 6 unit cells

Q.28 A solid XY has NaCl structure. If radius of X^+ is 100 pm. What is the radius. of Y^- ion

[1] 120pm [2] 136.6 to 241.6pm [3] 280pm [4] Unpredictable

Q.29 Of the five ΔH values required to calculate a lattice energy using the Born - Haber cycle, the one that is most difficult to measure is

[1] The electron affinity of the non - metal

[2] The heat of formation of gaseous atoms of the non-metal

[3] The ionisation energy of the metal

[4] The heat of sublimation of metal

Q.30 How many atoms are there in a unit cell of Mg which forms hexagonal crystals, there being a facecentred atom in each end of the unit cell and 3 completely enclosed atoms within the unit cell

[1] 4 [2] 6 [3] 12 [4] 8

Q.31 Na_2SeO_4 and Na_2SO_4 are

[1] Isomorphous [2] Polymorphs [3] Alloys [4] Ferromagnetic

Q.32 Most crystals show good cleavage because their atoms, ions or molecules are

[1] Weakly bonded together [2] Strongly bonded together

[3] Spherically symmetrical [4] Arranged in planes

Q.33 A solid is made of two elements X and Z. The atoms Z are in C.C.P. arrangement while atoms X occupy all the tetrahedral sites. What is the formula of the compound

[1] XZ [2] XZ_2 [3] X_2Z [4] Unpredictable

Q.34 Close packing is maximum in the crystal

[1] Simple cubic [2] Face centred [3] Body centred [4] None ofthese

Q.35 The vacant space in B.C.C. unit cell is

[1] 32% [2] 10% [3] 23% [4]46%

Q.36 ZnS is

[1] Ionic crystal [2] Covalent crystal [3] Metallic crystal [4] Vander Waals' crystal

Q.37 LiF is a/an

[1] Ionic crystal [2] Metallic crystal [3] Covalent crystal [4] Molecular crystal

Q.38 A compound CuCI has face centred cubic structure. Its density is 3.4 g cm^{-3}. The length of unit cell is.

[1] 5.783 Aº [2] 6.783 Aº [3] 7.783 Aº [4] 8.783 Aº

Q.39 A crystal of Fe_3O_4 is

[1] Paramagnetic [2] Diamagnetic [3] Ferromagnetic [4] None

Q.40 A cubic crystal possesses in all ..... elements of symmetry

[1] 9 [2] 13 [3] 1 [4] 23

Q.41 The density of KCI is 1.9893 g cm^{-3} and the length of a side unit cell is 6.29082 A as determined by X-Rays diffraction. The value of avogadro's-number calculated from these data is

[1] 6.017×10^{23} [2] 6.023×10^{23} [3] 6.03×10^{23} [4] 6.017×10^{19}

Q.42 The structure of sodium chloride crystal is

[1] Body centred cubic lattice [2] Face centred cubic lattice

[3] Octahedral [4] Square planar

Q.43 A solid having no definite shape is called

[1] Amorphous solid [2] Crystalline solid

[3] Anisotropic solid [4] None

Q.44 The unit cell cube length for LiCI (just like NaCI structure) is 5.14 A. Assuming anion-anion contact, the ionic radius for chloride ion is

[1] 1.815Aº [2] 2.8Aº [3] 3.8Aº [4] 4.815Aº

Q.45 Frenkel defect is noticed in

[1] AgBr [2] ZnS [3] AgI [4] All

Q.46 Extremely pure samples of Ge and Si are non-conductors, but their conductivity increases suddenly on introducing .....in their crystal lattice

[1] As [2] B [3] Both [1] and [2] [4] None

Q.47 At room temperature, 'sodium crystallizes in a body centred cubic lattice with a = 4.24 A. The theoretical density of sodium (At wt. of Na = 23) is

[1] 1.002 g cm^{-3} [2] 2.002 g cm^{-3} [3] 3.002 g cm^{-3} [4] None

Q.48 Schottky defect is noticed in

[1] NaCl [2] KCl [3] CsCl [4] All

Q.49 The resistance of mercury becomes almost zero at

[1] 4K [2] 10K [3] 20K [4] 25 K

Q.50 In a body centred cubic cell an atom at the body of centre is shared by

[1] 1 unit cell [2] 4 unit cells [3] 3 unit cells [4] 2 unit cells

Q.51 High thermal conductivity of metals is due to transfer of heat through

[1] Molecular collisions [2] Electronic collisions

[3] Atomic collisions [4] All

Q.52 In a simple cubic cell, each atom on a corner is shared by

[1] 2 unit cells [2] One unit cell [3] 8 unit cells [4] 4 unit cells

Q.53 The mass of a unit cell of CsCl corresponds to

[1] $8Cs^+$ and ICl^- [2] ICs^+ and $6Cl^-$ [3] ICs^+ and ICl^- [4] $4Cs^+$ and $4Cl^-$

Q.54 Maximum ferromagnetism is found in

[1] Fe [2] Ni [3] Co [4] None

Q.55 The co-ordination number of a body centred atom is

[1] 4 [2] 6 [3] 8 [4] 12

Q.56 Which is ferromagnetic

[1] Ni [2] Co [3] CrO_3 [4] All

Q.57 In a face centred cubic lattice the number of nearest neighbour for a given lattice point are

[1] 6 [2] 8 [3] 12 [4] 14

Q.58 The substance which possesses zero resistance as 0 K

[1] Conductor [2] Super conductor [3] Insulator [4] Semiconductor

Q.59 Close packing is maximum in the crystal lattice of

[1] Simple cubic [2] Face centred [3] Body centred [4] None

Q.60 The oxide which shows transition from metal to insulation, i.e. semiconductor are

[1] V_2O_3 [2] VO_2 [3] Ti_2O_3 [4] All

Q.61 Which is/are amorphous solids-

[1] Rubber [2] Plastics [3] Glass [4] All

Q.62 The structure of MgO is similar to NaCl: The co-ordination number of Mg is

[1] 2 [2] 6 [3] 4 [4] 8

Q.63 In bcc structure the space occupied by hard sphere is :

[1] 50% [2] 68% [3] 74% [4] 56%

Q.64 An ionic solid A^+B^- has structure similar to Na^+Cl^-. If the radius of A^+ is 100 pm. what will be the radius of B^-

[1] 120 pm [2] 136.6–241.6 pm [3] 280 pm [4] Indefinite

Q.65 The atomic mass of an element having bcc structure is 100 gm/mol. The length of the edge of unit cell is 400 pm. The density of the element is :

[1] 10.38 gm/cm^3 [2] 5.19 gm/cm^3 [3] 7.29 gm/cm^3 [4] 2.14 gm/cm^3

Q.66 Which will have the highest lattice energy :

[1] LiBr [2] LiCl [3] LiI [4] LiF

Q.67 X^+Y^- ionic compound keeps bcc structure. The distance between two nearest ions is 1.73 Å. What would be edge length of the unit cell ?

[1] 200 pm [2] $\frac{\sqrt{3}}{\sqrt{2}}$ pm [3] 142.2 pm [4] $\sqrt{2}$ pm

Q.68 The structure of ionic compound A^+B^- is identical to NaCl. If the edge length is 400 pm and the cation radius is 75 pm. Then evalute the radius of anion :

[1] 100 pm [2] 125 pm [3] 250 pm [4] 325 pm

Q.69 CsBr possesses bcc structure. The ege length of the unit cell is 400 pm. Find out the interionic distance :

[1] 346.4 pm [2] 200 pm [3] 300 pm [4] 100 pm

Q.70 For bcc structure, packing fraction and co-ordination number would be respectively :

[1] $8, \frac{\pi\sqrt{3}}{8}$ [2] $6, \frac{\pi\sqrt{2}}{6}$ [3] $8, \frac{\pi\sqrt{2}}{6}$ [4] None

Q.71 d_{111} plane of a unit cell makes intercepts on the axes :

[1] Only x axis [2] Only y axis [3] Only z axis [4] All the three axes

Q.72 A compound formed by elements A and B crystallizes in cubic structure where A atoms are at the corners of a cube and B atoms are at the face centre. The formula of the compound is :

[1] AB_3 [2] AB_4 [3] AB_2 [4] A_2B_3

Q.73 The internal resistance to the flow of the liquid is called its

[1] Viscosity [2] Surface tension [3] Parachore value [4] Refractive index

Q.74 A solid X melts slightly above 273K and is a poor conductor of heat and electricity. To which of the following categories does it belong -

[1] Ionic solid [2] Covalent solid [3] Metallic [4] Molecular

Q.75 A drop of liquid acquires spherical shape

[1] Because of its viscous nature

[2] Because of capillary action

[3] Because surface tension tends to minimise the surface area

[4] Because of all the aforesaid reasons

Q.76 In a crystal, the atoms are located at the position of -

[1] Zero P.E. [2] Infinite P.E. [3] Minimum P.E. [4] Maximum P.E.

Q.77 Which one is called pseudo solid

[1] CaF_2 [2] Glass [3] NaCl [4] All

Q.78 Graphite is an example of

[1] Ionic solid [2] Covalent solid [3] Vanderwaal's crystal [4] Metallic crystal

Q.79 The oxide that is insulator is

[1] VO [2] CoO [3] ReO_3 [4] Ti_2O_3

Q.80 Amorphous solids - .

[1] Possess sharp melting points

[2] Undergo clean cleavage when cut withknife

[3] Do not undergo clean cleavage when cut with knife

[4] Possess orderly arrangement over long distances

Answer Key - 1

Qus.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Ans.	4	2	2	3	1	3	1	3	2	3	1	3	2	1	3	4	3	2	2	1	2	3	1	2	1
Qus.	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
Ans.	3	2	2	1	2	1	4	3	2	1	1	1	1	3	4	1	2	1	1	3	4	1	4	1	1
Qus.	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75
Ans.	2	3	3	1	3	4	3	2	2	4	4	2	2	2	2	4	1	2	1	1	4	1	1	4	3
Qus.	76	77	78	79	80																				
Ans.	3	2	2	2	3																				

Exercise # 2

Q.1 Capillary action of the liquid can be explained on the basis of its

[1] Resistance to flow [2] Surface tension

[3] Heat ofvaporisation [4] Refractive index

Q.2 Wax is an example of

[1] Ionic crystal [2] Covalent crystal [3] Molecular crystal [4] Metallic crystal

Q.3 Crystals which are good conductor of electricity and heat are known as

[1] Ionic crystals [2] Covalence crystals [3] Metallic crystals [4] Molecular crystals

Q.4 Iodine crystals are

[1] Metallic solid [2] Ionic solid [3] Molecular solid [4] Covalent solid

Q.5 The amount of heat required to change one gram of a liquid to into its vapours at the boiling point is called

[1] Enthalpy of vaporization [2] Heat of vaporization

[3] Latent heat of vaporization [4] All the above

Q.6 During evaporation of liquid

[1] The temperature of the liquid rises

[2] The temperature of the liquid falls

[3] The temperature ofthe liquid remains unaffected

[4] None ofthe above is correct

Q.7 Out of the four liquids given below, the one having lowest vapour pressure at 25° C is

[1] Carbon tetrachloride [2] Benzene

[3] Chloroform [4] Water

Q.8 Which among the following will show an isotropy

[1] Glass [2] Barium chloride [3] Wood [4] Paper

Q.9 Ionic salts on dissolution in a solvent shows

[1] A decrease in the viscosity of the liquid [2] An increase in the viscosity of the liquid

[3] No affect on the viscosity of the liquid [4] None

Q.10 The elements of symmetry in a crystal are

[1] Plane of symmetry [2] Axis of symmetry

[3] Centre of symmetry [4] All

Q.11 A crystal may have one or more planes and one or more axes of symmetry but it possesses

[1] Two centres of symmetry [2] One centre of symmetry

[3] No centre of symmetry [4] None

Q.12 For tetrahedral co-ordination the radius ratio (r^+ r^-) should be

[1]. 0.414 - 0.732 [2] > 0.732

[3] 0.156 - 0.225 [4] 0.225 - 0.414

Q.13 TiO_2 is well known exa,mple of

[1] Triclinic system [2] Tetragonal system

[3] Monoclinic system [4] None

Q.14 The ratio of cations to anion in a closed pack tetrahedral is

[1] 0.414 [2] 0.225 [3] 0.02 [4] None

Q.15 The arrangement ABC ABC .....is referred to as

[1] Octahedral close packing [2] Hexagonal close packing

[3] Tetrahedral close packing [4] Cubic close packing

Q.16 The melting point of RbBr is 682°C, while that of NaF is 988°C. The principal reason that melting point of NaF is much higher than that of RbBr is that

[1] The two crystals are not isomorphous

[2] The molar mass of NaF is smaller than that of RbBr

[3]' The internuclear distance, $r_c + r_a$ is greater for RbBr than for NaF

[4] The bond in RbBr has more covalent character than the bond in NaF

Q.17 A binary solid ($A^+ B^-$) has a rock salt structure. If the edge length is 400 pm and radius of cation is 75 pm the radius of anion is

[1] 100pm [2] 125pm [3] 250 pm [4] 325 pm

Q.18 One among the following is an example of ferroelectric compound

[1] Quartz [2] Lead chromate [3] Barium titanate [4] Tourmaline

Q.19 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

Q.20 The most malleable metals (Cu, Ag, Au) have close - packing of the type

[1] Hexagonal close - packing [2] Cubic close - packing

[3] Body - centred cubic packing [4] Malleability is not related to type of packing

Q.21 The number of atoms present in a simple cubic unit cell are

[1] 4 [2] 3 [3] 2 [4] 1

Q.22 The radius of Ag^+ is 126 pm while that of I^- ion is 216 pm. The co-ordination number of Ag in AgI is :

[1] 2 [2] 8 [3] 6 [4] 4

Q.23 The number of octahedral sites in a cubical close pack array of S-spheres :

[1] $\frac{S}{2}$ [2] 2S [3] 4S [4] S

Q.24 The type of crystal latice associated with CsCl is :

[1] ccp [2] fcc [3] bcc [4] hcp

Q.25 The crystal structure of TICl is similar to that of CsCl what is the co-ordination number of $Tl^{+1:}$

[1] 4 [2] 6 [3] 8 [4]12

Q.26 If edge of a bcc crystal of an element is a cm, M is the atomic mass and N_0 is Avogadro's number, then density of the crystal is :

[1] $\frac{4M}{a^3N_0}$ [2] $\frac{2N_0}{Ma^3}$ [3] $\frac{2M}{N_0a^3}$ [4] $\frac{Ma^3}{2N_0}$

Q.27 In which case unit cell is not possible :

[1] One dimensional lattice [2] Two dimensional lattice

[3] Three dimensional lattice [4] None

Q.28 An atom situated at the corner of a simple cubic unit cell has its contribution towards the unit cell is :

[1] $\frac{1}{2}$ [2] $\frac{1}{4}$ [3] $\frac{1}{8}$ [4] 1

Q.29 Cell diagonal = $\sqrt{3}$ edge shows that the unit cell is :

[1] Simple cubic [2] Face centred cubic [3] Body centred cubic [4] None of these

Q.30 The percentage of vacant space of bcc unit cell is :

[1] 32% [2] 68% [3] 52% [4] 74%

Q.31 The number of nearest neighbours to each sphere in fcc lattice will be :

[1] 6 [2] 8 [3] 12 [4] 14

Q.32 Which of the following planes will be absent in a simple cubic system

[1] 100 [2] 110 [3] 111 [4] 200

Q.33 The number of atoms/molecules contained in one face centred cubic unit cell of a monoatomic substance is

[1] 4 [2] 6 [3] 8 [4] 12

Q.34 In a face centred cubic arrangement, the number of atoms per unit cell is

[1] 8 [2] 2 [3] 1 [4] 4

Q.35 The maximum percentage of available volume that can be filled in a face centred cubic system by an atom is-

[1] 74% [2] 68% [3] 34% [4] 26%

Q.36 Each unit cell of NaCl consists of 4 chloride ions and

[1] 13 Na atoms [2] 4 Na ions [3] 6 Na atoms [4] 8 Na atoms

Q.37 In the unit cell of NaCl lattice there are

[1] $3Na^+$ ions [2] $6Na^+$ ions [3] 6 Cl^- ions [4] 4 NaCl units

Q.38 The radius of the Na^+ is 95 pm and that of Cl^- ion is 181 pm, Predict the co-ordination number of Na+

[1] 4 [2] 6 [3] 8 [4] Unpredictable

Q.39 The ionic radii of Rb^+ and I^- are 1.46 and 2.16 A. The most probable type of structure exhibited by it is

[1] CsCl type [2] NaCltype [3] ZnStype [4] CaF_2 type

Q.40 The rank of a cubic unit cell is 4. The type of cell as

[1] Body centred [2] Face centred [3] Primitive [4] None

Q.41 An element occurring in the BCCstructure has 12.08×10^{23} unit cells. The total number of atoms of the element in these cell will be

[1] 24.16×10^{23} [2] 36.18×10^{23} [3] 6.04×10^{23} [4] 12.08×10^{23}

Q.42 The space occupied by B.C.C. arrangement is approx

[1] 50% [2] 68% [3] 74% [4] 56%

Q.43 Which is covalent solid

[1] Fe_2O_3 [2] Diamond [3] Graphite [4] All

Q.44 TiCl has structure similar to CsCl, the co-ordination number of Tl^+ is

[1] 4 [2] 6 [3] 10 [4] 8

Q.45 A certain metal fluoride crystallises in such a way that F atoms occupy simple cubic lattice sites, while metal atoms occupy the body centres of half the cubes. The formula of metal fluoride is

[1] M_2F [2] MF [3] MF_2 [4] MF_8

Q.46 Which substance shows antiferromagnetism

[1] ZrO_2 [2] CdO [3] CrO_2 [4] Mn_2O_3

Q.47 Certain crystals produce electric signals on application of pressure. This phenomenon is called

[1] Pyro electricity [2] Ferroelectricity

[3] Piezoelectricity [4] Ferrielectricity

Q.48 Which of the following defect, if present, lowers the density of the crystal

[1] Frenkel [2] Schottky [3] Edge dislocation [4] Constitution of F-centres.

Q.49 Transition metals, when they form interstitial compounds, the non-metals (H, B, C, N) are accomodated in- .

[1] Voids or holes in cubic - packed structure [2] Tetrahedral voids

[3] Octahedral voids [4] All of these

Q.50 A silicon solar battery makes. use of

[1] n- Type semiconductor [2] p- Type semicondl,lctor

[3] Combination of Si doped with As and B [4] p - n junction

Q.51 In a close pack array of N spheres, the number of tetrahedral holes are

[1] 4N [2] N/2 [3] 2N [4] N

Q.52 The yellow colour of ZnO and conducting nature produced in heating is due to

[1] Metal excess defects due to interstitial cation

[2] Extra positive ions present in an interstitial site

[3] Trapped electrons

[4] All of these

Answer Key - 2

Qus.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Ans.	2	3	3	3	3	3	4	2	1	4	2	4	2	2	4	3	2	3	4	2	4	3	4	3	3
Qus.	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
Ans.	3	1	3	3	1	3	4	1	4	1	2	4	2	2	2	1	2	4	4	3	4	3	2	4	3
Qus.	51	52																							
Ans.	3	4																							

Exercise # 3

Q.1 The coordination number of a metal crystallizing in a hexagonal close packed structure is **[NCERT 1978; DT 1999]**

[1] 4 [2] 12 [3] 8 [4] 6

Q.2 How many chloride ions are there around sodium ion in sodium chloride crystal **[NCERT 1979, 80; CPMT 1988; SHU 1982, 87; MP PET 1995, 99]**

[1] 3 [2] 8 [3] 4 [4] 6

Q.3 Most crystals show good cleavage because their atoms. ions or molecules are **[CSSE 1991]**

[1] Weakly bonded together [2] Strongly bonded together

[3] Spherically symmetrical [4] Arranged in planes

Q.4 The low solubility of $BaSO_4$ in water Can be attributed to **[CSSE 1991]**

[1] High lattice energy [2] Dissociation energy

[3] Low lattice energy [4] Ionic bond

Q.5 In a solid lattice the cation has left a lattice site and is located at an interstitial position. the lattice defect is **[AUMS 1982, 1991]**

[1] Interstitial defect [2] Valency defect

[3] Frenkel defect [4] Schottky defect

Q.6 Potassium has a bcc structure with nearest neighbour distance 4.52 A. Its atomic weight is 39. Its density (in kg m^{-3}) will be **[AIIMS 1991]**

[1] 454 [2] 804 [3] 852 [4] 908

Q.7 The number of atoms/molecules contained in one face centred cubic unit cell of a monoatomic substance is **[CPMT 1989,94; CBSE 1989, 96; NCERT 1990, MP PET 1993; Karnataka CET 1999]**

[1] 1 [2] 2 [3] 4 [4] 6

Q.8 The characteristic features of solids are **[AMU 1994]**

[1] Definite shape [2] Definite size

[3] Definite shape and size [4] Definite shape, size and rigidity

Q.9 In cubic closest packing (ccp) structure of NaCl, the coordination number of Na^+ ion is **[PM PET 1996]**

[1] 2 [2] 4 [3] 6 [4] 8

Q.10 Which one of the following is the biggest ion **[MP PET 1993]**

[1] Al^{+3} [2] Ba^{+2} [3] Mg^{+2} [4] Na^+

Q.11 A match box exhibits **[MP PET 1993. 95]**

[1] Cubic geometry [2] Monoclinic geometry

[3] Orthorhombic geometry [4] Tetragonal geometry

Q.12 In the crystal of CsCl. the nearest neighbours of each Cs ion are **[MP PET 1993]**

[1] Six chloride ions [2] Eight chloride ions

[3] Six Cs ions [4] Eight Cs ions

Q.13 Tetragonal crystal system has the following unit cell dimensions **[MP PMT 1993]**

[1] $a = b = c$ and $\alpha = \beta = \gamma = 90^o$ [2] $a = b \neq c$ and $\alpha = \beta = \gamma = 90^o$

[3] $a \neq b \neq c$ and $\alpha = \beta = \gamma = 90^o$ [4] $a = b \neq c$ and $\alpha = \beta = 90^o$, $\gamma = 120$

Q.14 Space lattice of CaF_2 is **[PM PMT 1993]**

[1] Face centred cubic [2] Body centred cubic

[3] Simple cubic [4] Hexagonal closed packing

Q.15 The existence of a substance in more than one solid modifications is known as or Any compound having more than two crystal structures is called **[MP PMT 1993; MP PET 1999]**

[1] Polymorphism [2] Isomorphism [3] Allotropy [4] Enantiomorphism

Q.16 A compound is formed by elements A and B. This crystallizes in the cubic structure when atoms A are the comers of the cube and atoms B are at the centre of the body. The simplest formula of the compounds is **[Karnataka CEE 1993: CBSE 2000; Kerala PMT 2002]**

[1] AB [2] AB_2 [3] A_2B [4] AB_4

Q.17 Frenkel defect Is caused due to **[MP PET 1994]**

[1] An ion missing from the normal lattice site creating a vacancy

[2] An extra positive ion occupying an interstitial position in the lattice

[3] An extra negative ion occupying an interstitial position in the lattice

[4] The shift of a positive ion from its normallattice site to an interstitial site

Q.18 Crystals can be classified into ..... basic crystal habits **[MP PMT 1994]**

[1] 3 [2] 7 [3] 14 [4] 4

Q.19 The radius of hydrogen atom in the ground state is 0.53 A. The radius of Li^{2+} ion (atomic number = 3) in the similar state is **[CBSE 1995]**

[1] 1.06 A [2] 0.265 A [3] 0.17 A [4] 0.53 A

Q.20 CsBr crystal has bcc structure. It has an edge length of 4.3Å. The shortest interionic distance between Cs^+ and Br^- ions is **[IIT 1995)**

[1] 1.86 Å [2] 3.72 Å [3] 4.3 Å [4] 7.44 Å

Q.21 The following is not a function of an impurity present in a crystal **[MP PET 1995]**

[1] Establishing thermal equilibrium [2] Having tendency to diffuse

[3] Contributing to scattering [4] Introducing new electronic energy levels

Q.22 Which is not a property of solids **[MP PET 1995]**

[1] Solids are always crystalline in nature [2] Solids have high density and low compressibility

[3] The diffusion of solids is very slow [4] Solids have definite volume

Q.23 Which of the following statements is correct for $CsBr_3$ **[IIT 1996]**

[1] It is a covalent compound [2] It contains Cs^{3+} and Br^- ions

[3] It contains Cs^+ and Br_3^- ions [4] It contains Cs^+ Br^- and lattice Br_2 molecule

Q.24 Due to Frenkel defect. the density of ionic solids **[MP PET 1996; MP PMT 2002]**

[1] Increases. [2] Decreases [3] Does not change [4] Changes

Q.25 How many space lattices are obtainable from the different crystal systems **[MP PMT 1996; MP PET/PMT 1998]**

[1] 7 [2] 14 [3] 32 [4] 230

Q.26 What type of lattice is found in potassium chloride crystal **[MP PMT 1996]**

[1] Face centred cubic [2] Body centred cubic

[3] Simple cubic [4] Simple tetragonal

Q.27 How many molecules are there in the unit cell of sodium chloride **[MP PMT 1996; MP PET 1997]**

[1] 2 [2] 4 [3] 6 [4] 8

Q.28 Potassium crystallizes with a **[MP PET/PMT 1998]**

[1] Face-centred cubic lattice [2] Body-centred cubic lattice

[3] Simple cubic lattice [4] Orthorhombic lattice

Q.29 An example of a body cube is **[AIIMS 1996]**

[1] Sodium [2] Magnesium [3] Zinc [4] Copper

Q.30 Body centered cubic lattice has a coordination number of **[AIIMS 1996; MP PMT 2002]**

[1] 4 [2] 8 [3] 12 [4] 6

Q.31 **Assertion:** In crystal lattice, the size of the cation is larger in .a tetrahedral hole than in an octahedral hole
Reason: The cations occupy more space than anions in crystal packing **[AIIMS 1996]**
[1] Both assertion and reason are true state ments and reason is the correct explanation of assertion
[2] Both assertion and reason are true statements and reason is not the correct explanation of assertion
[3] Assertion is true but reason is a false statement
[4] Both assertion and reason are false statements

Q.32 Which of the following statement(s) is(are) correct **[IIT 1998]**
(a) The coordination number of each type of ion in CsCl crystal is 8
(b) A metal that crystallizes in bcc structure has a coordination number of 12
(c) A unit cell of an ionic crystal shares some of its ions with other unit cells
(d) The length of the unit cell in NaCl is 552 pm (r_{Na+} = 95 pm r_{Cl-} = 181 pm)
Correct answer is
[1] a,b,c [2] b,c,d [3] a,c,d [4] a,b,d

Q.33 The number of atoms in 100 g of an fcc crystal with density d = 10 g / cm^3 and cell edge equal to 100 pm. is equal to **[CBSE 1994; Karnataka CET 2002]**
[1] 4 x 10^{25} [2] 3 x 10^{25} [3] 2 X 10^{25} [4] 1 x 10^{25}

Q.34 Ionic solids, with Schottky defects: contain in their structure **[CBSE 1994]**
[1] Equal number of cation and anion vacancies [2] Anion vacancies and interstitial anions
[3] Cation vacancies only [4] Cation vacancies and interstitial cations

Q.35 In the crystals of which of the following ionic compounds would you expect maximum distance between centres of cations and anions **[CBSE 1998]**
[1] LiF [2] CsF [3] CsI [4] LiI

Q.36 The ratio of close-packed atoms to tetrahedral U holes in cubic close packing is **[Punjab PMT 1998]**
[1] 1 : 1 [2] 1 : 2 [3] 1: 3 [4] 2 : 1

Q.37 The intermetallic compound LiAg crystallizes in cubic lattice in which both lithium and silver have coordination number of eight. The crystal class is **[CBSE 1997]**
[1] Simple cube [2] Body-centred cube
[3] Face-centred cube [4] None of these

Q.38 The edge length of body centred unit cubic cell is 508 pm. If the radius of the cation is 110 pm. the radius of the anion is **[CBSE 1998]**
[1] 285 pm [2] 398 pm [3] 144 pm [4] 618 pm

Q.39 Which of the following is ferroelectric compound **[AFMC 1997]**
[1] $BaTiO_3$ [2] $K_4[Fe(CN)_6]$ [3] Pb_2O_3 [4] $PbZrO_3$

Q.40 Example of unit cell with crystallographic dimensions $a \neq b \neq c$, $\alpha = \gamma = 90°$, $\beta \neq 90°$ is **[AFMC 1998]**
[1] Calcite [2] Graphite [3] Rhombic sulphur [4] Monoclinic sulphur

Q.41 An element (atomic mass = 100 g/mol) having bcc structure has unit cell edge 400 pm. Then density of the element is . **[CBSE 1996; AIIMS 2002]**
[1] 10.376 g/cm^3 [2] 5.188 g/cm^3 [3] 7.289 g/cm^3 [4] 2.144 g/cm^3

Q.42 Which of the folloWing is true for diamond **[AFMC 1997]**
[1] Diamond is a good conductor of electricity [2] Diamond is soft
[3] Diamond is a bad conductor of heat [4] Diamond is made up of C, H and O

Q.43 The lustre of a metal is due to **[AFMC 1998]**

[1] Its high density [2] Its high polishing

[3] Its chemical inertness [4] Presence of free electrons

Q.44 Sodium metal crystallizes as a' body centred cubic lattice with the cell edge 4.29 Aº. What is the radius of sodium atom **[AIIMS 1999]**

[1] 1.857×10^{-8}cm [2] 2.371×10^{-7}cm

[3] 3.817×10^{-8}cm [4] 9.312×10^{-7}cm

Q.45 **Assertion (A) :** Crystalline solids have short range order.

Reason (R) : Amorphous solids have long range order. **[AIIMS 1999]**

[1] Both A and R are true and the R is a correct explanation of the A

[2] Both A and R are true but the R is not a correct explanation of the A

[3] A is true but the R is false [4] Both A and R are false

Q.46 If the pressure on a NaCl structure is increased, then its coordination number will **[AFMC 2000]**

[1] Increase [2] Decrease [3] Remain the same [4] Either [2] or [3]

Q.47 A pure crystalline substance, on being heated gradually, first forms a turbid looking liquid and then the turbidity completely disappears. This behaviour is the characteristic of substances forming **[BHU 2000]**

[1] Isomeric crystals [2] Liquid crystals

[3] Isomorphous' crystals [4] Allotropic crystals

Q.48 In a cubic structure of compound which is made from X and Y, where X atoms are at the corners of the cube and Yat the face centres of the cube. The molecular formula of the compound is **[AIIMS 2000]**

[1] X_2Y [2] X_3Y [3] XY_2 [4] XY_3

Q.49 Which type of solid crystals will conduct heat and electricity **[Rajasthan PET 2000]**

[1] Ionic [2] Covalent [3] Metallic [4] Molecular

Q.50 Ferrous oxide has a cubic structure and each edge of the unit cell is 5.0 A. Assuming density of the oxide as 4.0g cm $^{-3}$, then the number of Fe^{2+} and O^{2-} ions present in each unit cell will be **[MP PET 2000]**

[1] Four Fe^{2+} and four O^{2-} [2] Two Fe^{2+} and four $^{2-}$

[3] Four Fe^{2+} and two O^{2-} [4] Three Fe^{2+} and three $^{2-}$

Q.51 In the Bragg's equation for diffraction of X-rays, n represents for **[MP PMT 2000]**

[1] Quantum number [2] An integer

[3] Avogadro's numbers [4] Moles

Q.52 The number of atoms in. a face-centred cubic unit cell are **[AMU 2000]**

[1] 4 [2] 5 [3] 6 [4] 2

Q.53 The number of unit cells in 58.5 g of NaCl is nearly **[MP PMT 2000, 01]**

[1] 6×10^{20} [2] 3×10^{22} [3] 1.5×10^{23} [4] 0.5×10^{24}

Q.54 The number of octahedral sites per sphere in a fcc structure is **[MP PMT 2000,01]**

[1] 8 (b} 4 [3] 2 [4] 1

Q.55 Which of the following statements is not true about NaCl structure **[DCE 2001]**

[1] Cl^- ions are in fcc arrangement [2] Na^+ ions has coordination number 4

[3] Cl^- ions has coordination number 6 [4] Each unit cell contains 4NaCl molecules

Q.56 If a non-metal is added to the interstitial sites of a metal then the metal becomes **[DCE 2001]**

[1] Softer [2] Less tensile [3] Less malleable [4] More ductile

Q.57 The number of close neighbour in a bodycentred cubic lattice of identical sphere is **[MP PET 2001]**

[1] 8 [2] 6 [3] 4 [4] 2

Q.58 The number of equidistant oppositely charged ions in a sodium chloride crystal is **[MP PET 2001]**

[1] 8 [2] 6 [3] 4 [4] 2

Q.59 The arrangement ABC ABC ABC ..... is referred as **[MP PET 2001]**

[1] Octahedral close packing [2] Hexagonal close packing

[3] Tetragonal close packing [4] Cubic close packing

Q.60 In CsCl structure, the coordination number of Cs^+ is **[MP PMT 2001]**

[1] Equal to that of Cl^-, that is 6 [2] Equal to that of Cl^-, that is 8

[3] Not equal to that of Cl^- that is 6 [4] Not equal to that of Cl^- that is 8

Q.61 In a solid 'AB having the NaCl structure. 'A' atoms occupy the corners of the cubic unit cell. If all the face-centered atoms along one of the axes are removed. then the resultant stoichiometry of the solid is **[IIT Screening 2001]**

[1] AB_2 [2] A_2B [4] A_4B_3 [3] A_3B_4

Q.62 **Assertion [1] :** In any ionic solid (MX) with Schottky defects, the number of positive and negative ions are same.

Reason (R) : Equal number of cation and anion vacancies are present **[IIT Screening 2001]**

[1] Both A and R are true and the R is a correct explanation of the A

[2] Both A and R are true but the R is not a correct explanation of the A

[3] A is true but the R is false [4] Both A and R are false

[5] A is false but the R is true

Q.63 An AB_2 type structure is found in **[AIIMS 2002]**

[1] NaCl [2] Al_2O_3 [3] CaF_2 [4] N_2O

Q.64 Schottky defect defines imperfection in the lattice structure of a **[AIIMS 2002]**

[1] Solid [2] Liquid [3] Gas [4] Plasma

Q.65 Na and Mg crystallize in BCC and FCC type crystals respectively. then the number of atoms of Na and Mg present in the unit cell of their respective crystal is **[AIEEE 2002]**

[1] 4 and 2 [2] 9 and 14 [3] 14 and 9 [4] 2 and 4

Q.66 Which one of the following metal oxides is antiferromagnetic in nature **[MP PET 2002]**

[1] MnO_2 [2] TiO_2 [3] VO_2 [4] CrO_2

Q.67 Which one of the following crystals does not exhibit Frenkel defect **[MP PET 2002]**

[1] AgBr [2] AgCl [3] KBr [4] ZnS

Q.68 The interionic distance for cesium chloride crystal will be **[MP PET 2002]**

[1] a [2] a/2 [3] $\frac{\sqrt{3}a}{2}$ [4] $\frac{2a}{\sqrt{3}}$

Q.69 In graphite. carbon atoms are joined together due to **[AFMC 2002]**

[1] Ionic bonding [2] Vander Waal'& forces

[3] Metallic bonding [4] Covalent bonding

Q.70 Which of the following shows electrical conduction **[AFMC 2002]**

[1] Sodium [2] Potassium [3] Diamond [4] Graphite

Q.71 How many unit cells are present in a cube- shaped ideal crystal of NaCl of mass 1.00 g

[Atomic masses: Na = 23. Cl = 35.5] **[AIEEE 2003]**

[1] 2.57×10^{21} unit cells [2] 5.14×10^{21} unit cells

[3] 1.28×10^{21} unit cells [4] 1.71×10^{21} unit cells

Q.72 The pyknometric density of sodium chloride crystal is 2.165×10^3 kg m^{-3} while its X-rays density is 2.178×10^3 kg m^{-3}. The fraction of unoccupied sites in sodium chloride crystal is **[CBSE PMT 2003]**

[1] 5.96×10^{-3} [2] 5.96 [3] 5.96×10^{-2} [4] 5.96×10^{-1}

Q.73 What is the coordination number of sodium in Na_2O **[AIIMS 2003]**

[1] 6 [2] 4 [3] 8 [4] 2

Q.74 Frenkel and Schottky defects are **[BHU 2003]**

[1] Nucleus defects [2] Non-crystal defects [3] Crystal defects [4] None of these

Q.75 In solid CsCl each Cl is closely packed withhow many Cs **[MP PET 2003]**

[1] 8 [2] 6 [3] 10 [4] 2

Q.76 An ionic comoiund has a unit cell consisting of A ions at the corners of a cube and B ions on the centres of the faces of the cube. The empirical formula for this compound would be **[AIEEE 2005]**

[1] A_2B [2] AB [3] A_3B [4] AB_3

Q.77 In which of the following FCC arrangement, the cations occupy the alternate tetrahedral voids **[JEE 2005]**

[1] NaCl [2] ZnS [3] Na_2O [4] CaF_2

Q.78 Total volume of atoms present in a face-centred cubic unit cell of a metal is (r is atomic radius) **[AIEEE 2006]**

[1] $\frac{24}{3}\pi^3$ [2] $\frac{12}{3}\pi r^3$ [3] $\frac{16}{3}\pi r^3$ [4] $\frac{20}{3}\pi r^3$

Answer Key - 3

Qus.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Ans.	2	4	4	1	3	4	3	4	3	2	3	2	2	1	1	1	4	2	3	2	1	1	3	3	2
Qus.	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
Ans.	1	2	2	1	2	4	2	1	1	3	2	2	3	1	4	2	3	4	1	4	1	2	4	3	1
Qus.	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75
Ans.	2	1	3	4	2	2	3	2	4	2	4	1	3	1	4	1	3	3	4	4	1	1	2	3	1
Qus.	76	77	78																						
Ans.	4	2	3																						