

PHYSICAL CHEMISTRY

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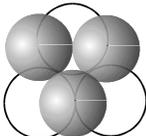
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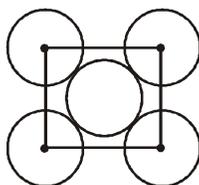
- Q.1 In a face centered cubic unit cell, the contribution from the atom at the corner and face centre of the cube are respectively :
- (1) $\frac{1}{4}, \frac{1}{2}$ (2) $\frac{1}{8}, \frac{1}{4}$ (3) $\frac{1}{4}, \frac{1}{2}$ (4) $\frac{1}{8}, \frac{1}{2}$
- Q.2 When molten form of crystalline solid is rapidly cooled, it changes into -
- (1) crystalline solid (2) amorphous solid (3) insulator (4) superconductor
- Q.3 Solid CO_2 is an example of
- (1) Ionic crystal (2) Covalent crystal (3) Metallic crystal (4) Molecular crystal.
- Q.4 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.5 Tetragonal crystal system has the following unit cell dimensions :
- (1) $a = b = c, \alpha = \beta = \gamma = 90^\circ$ (2) $a = b \neq c, \alpha = \beta = \gamma = 90^\circ$
 (3) $a \neq b \neq c, \alpha = \beta = \gamma = 90^\circ$ (4) $a = b \neq c, \alpha = \beta = 90^\circ, \gamma = 120^\circ$
- Q.6 If the radius of metal atom is 1.00 \AA and its crystal structure is simple cubic, then what is the volume of one unit cell ?
- (1) $8 \times 10^{-28} \text{ m}^3$ (2) $4 \times 10^{-30} \text{ cm}^3$ (3) $8 \times 10^{-30} \text{ m}^3$ (4) $2 \times 10^{-24} \text{ cm}^3$
- Q.7 The intermetallic compound LiAg crystallizes in cubic lattice in which both lithium and silver have coordination number of eight. The crystal class is :
- (1) Simple cubic (2) Body centred cubic (3) Face centred (4) None of these
- Q.8 The crystal system for which $a \neq b \neq c$ and $\alpha = \beta = \gamma = 90^\circ$ is said to be :
- (1) triclinic (2) tetragonal (3) cubic (4) orthorhombic
- Q.9 How many rectangular faces are in an orthorhombic unit cell ? (Given : $a \neq b \neq c$ & $\alpha = \beta = \gamma = 90^\circ$)
- (1) 4 (2) 2 (3) 6 (4) No faces rectangular
- Q.10 How many nearest neighbours are present in an atom forming bcc lattice?
- (1) 4 (2) 6 (3) 8 (4) 12
- Q.11 The arrangement of the first two layers, one above the other, in hcp and ccp arrangements is :
- (1) Exactly same in both cases (2) partly same and partly different
 (3) Different from each other (4) Nothing definite
- Q.12 The octahedral voids in a face-centred cubic (fcc or ccp) structure are located at
- (1) at edge centres and 8 along diagonals (2) 12 at edge centres and one at a body centre
 (3) 8 along body diagonal and 6 at edge centres (4) All the edge centres only
- Q.13 The maximum percentage of available volume that can be filled in a face centred cubic system by atoms is-
- (1) 74% (2) 68% (3) 34% (4) 26%
- Q.14 Fraction of empty space in ABAB type arrangement in 3D :
- (1) 0.74 (2) 0.26 (3) 0.68 (4) 0.32

- Q.15 The void present in simple cubic crystal is :
 (1) cubic (2) tetrahedral (3) octahedral (4) triangular
- Q.16 The empty space between the shaded balls and hollow balls as shown in the diagram is called
- 
- (1) hexagonal void (2) octahedral void (3) tetrahedral void (4) double triangular void
- Q.17 The coordination number of octahedral void is :
 (1) 8 (2) 6 (3) 4 (4) 12
- Q.18 If cations C form a hexagonal close packing & anion (a) occupy $\frac{2}{3}$ rd of octahedral holes, then the general formula of the compound is :
 (1) C_3A_4 (2) C_6A_5 (3) C_3A_2 (4) C_2A_3
- Q.19 In a spinel structure O^{2-} ions form an fcc array, 'A' cation occupy one-eighth of tetrahedral holes and 'B' cation occupy one-half of octahedral holes. What is the formula ?
 (1) A_2BO_4 (2) AB_2O_4 (3) $A_2B_2O_4$ (4) $A_2B_2O_4$
- Q.20 In a face centred lattice of X atoms, Y atoms occupy $\frac{1}{2}$ of tetrahedral holes and $\frac{1}{4}$ of octahedral holes. What is the possible formula of compound ?
 (1) X_4Y_6 (2) X_4Y_5 (3) X_4Y_8 (4) X_4Y_9
- Q.21 In a ccp structure of X atoms. Y atoms occupy half of octahedral holes. If one Y atom and X atom from each unit cell is replaced by Z, then the formula of compound will be -
 (1) $X_4Y_2Z_2$ (2) X_3YZ_2 (3) $X_3Y_2Z_2$ (4) X_3Y_3Z
- Q.22 In a face centered lattice of X and Y, X atoms are present at the corners while Y atoms are at face centers. Then the formula of the compound is :
 (1) XY_3 (2) X_2Y_3 (3) X_3Y (4) XY
- Q.23 In a closest packed lattice, the number of octahedral sites as compared to tetrahedral ones will be.
 (1) Equal (2) Half (3) Double (4) None of these
- Q.24 If the distance between Na^+ and Cl^- ions in NaCl crystal is 'a' pm, what is the length of the cell edge ?
 (1) $2a$ pm (2) $a/2$ pm (3) $4a$ pm (4) $a/4$ pm
- Q.25 Which of the following expressions is correct in the case of a sodium chloride unit cell (edge length = a)
 (1) $r_c + r_a = a/2$ (2) $r_c + r_a = a$ (3) $r_c + r_a = 2a$ (4) $r_c + r_a = 2^{1/2} a$
- Q.26 Potassium fluoride has $NaCl^-$ type structure. What is the distance between K^+ and F^- ions if cell edge is 'a' cm ?
 (1) $2a$ cm (2) $a/2$ cm (3) $4a$ cm (4) $a/4$ cm
- Q.27 In sodium chloride, Cl^- ions form ccp arrangement. Which site a Na^+ ions will occupy in this structure ?
 (1) Cubic (2) Tetragonal (3) Octahedral (4) Trigonal bipyramidal
- Q.28 In zinc blende structure the coordination number of Zn^{2+} ion is
 (1) 2 (2) 4 (3) 6 (4) 8

- Q.29 Which of the following statements are correct in context of point defects in a crystal ?
 (1) AgCl has anion Frenkel defect and CaF₂ has Schottky defects
 (2) AgCl has cation Frenkel defects and CaF₂ has anion Frenkel defects
 (3) AgCl as well as CaF₂ have anion Frenkel defects
 (4) AgCl as well as CaF₂ has Schottky defects
- Q.30 In the schottky defect
 (1) cations are missing from the lattice sites and occupy the interstitial sites
 (2) Cations and anions are missing
 (3) anions are missing and electrons are present their place
 (4) equal number of extra cations and electrons are present in the interstitial sites.
- Q.31 As a result of schottky defect,
 (1) there is no effect on the density
 (2) density of the crystal increases
 (3) density of the crystal decreases
 (4) any of the above three can happen.
- Q.32 F-centres in an ionic crystal are
 (1) lattice sites containing electrons
 (2) interstitial sites containing electrons
 (3) lattice sites that are vacant
 (4) interstitial sites containing cations
- Q.33 In a solid lattice the cation has left a lattice site and is located at an interstitial position, the lattice defect is
 (1) Interstitial defect (2) Vacancy defect (3) Frenkel defect (4) Schottky defect
- Q.34 What type of crystal defect is indicated in the diagram below?

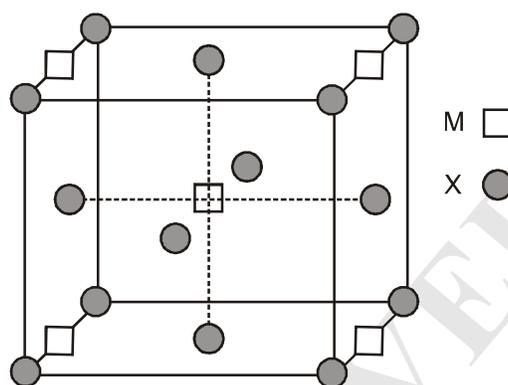
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Na ⁺	Cl ⁻	<input type="checkbox"/>	Cl ⁻	Na ⁺	Cl ⁻
Cl ⁻	Na ⁺	Cl ⁻	Na ⁺	<input type="checkbox"/>	Na ⁺

 (1) Frenkel defect (2) Schottky defect
 (3) interstitial defect (4) Frenkel and Schottky defects
- Q.35 Percentages of free space in cubic close packed structure and in body centered packed structure are respectively.
 (1) 30% and 26% (2) 26% and 32% (3) 32% and 48% (4) 48% and 26%
- Q.36 A substance A_xB_y crystallizes in a face centered cubic lattice in which atoms 'A' occupy each corner of the cube and atoms 'B' occupy the centers of each face of the cube . Identify the correct composition of the substance A_xB_y .
 (1) AB₃ (2) A₄B₃ (3) A₃B (4) composition cannot be specified
- Q.37 The packing efficiency of the two dimensional square unit cell shown below is :



- (1) 39.27% (2) 68.02% (3) 74.05% (4) 78.54%

- Q.38 A compound $M_p X_q$ has cubic close packing (ccp) arrangement of X. Its unit cell structure is shown below. The empirical formula of the compound is :



- (1) MX (2) MX_2 (3) M_2X (4) M_5X_{14}

ASSERTION & REASON

Directions : Each of these questions contains an Assertion followed by reason. Read them carefully and answer the question on the basis of following options. You have to select the one that best describes the two statements.

- (1) If both assertion and reason are true and reason is the correct explanation of assertion.
- (2) If both assertion and reason are true but reason is not the correct explanation of assertion.
- (3) If Assertion is true but reason is false.
- (4) If both assertion and reason are false.

- Q.39 **Assertion :** The edge length of NaCl = $2(r_{Na^+} + r_{Cl^-})$

Reason : In NaCl crystal, the nearest neighbour of Na^+ are 6 Cl^- ions and 12 Na^+ ions.

- Q.40 **Assertion :** ZnS crystals have Frenkel defects.

Reason : The size of Zn^{2+} is very small as compared to S^{2-} ion.

- Q.41 **Assertion :** Schottky defect is a vacancy defect in ionic solids.

Reason : Schottky defect is shown by ionic substances in which the cation and anion are of almost similar sizes.

- Q.42 **Assertion :** The crystals having Schottky defects are electrically neutral.

Reason : The charge of missing cations = the charge of missing anion.

- Q.43 **Assertion :** Frenkel defect creates a vacancy defect as well as interstitial defect.

Reason : Schottky defect is vacancy defect.

- Q.27 The number of carbon atoms per unit cell of diamond unit cell is : [AIPMT-2013]
 (1) 8 (2) 6 (3) 1 (4) 4
- Q.28 If a is the length of the side of a cube, the distance between the body centered atom and one corner atom in the cube will be [AIPMT 2014]
 (1) $\frac{\sqrt{3}}{4}a$ (2) $\frac{\sqrt{3}}{2}a$ (3) $\frac{2}{\sqrt{3}}a$ (4) $\frac{4}{\sqrt{3}}a$
- Q.29 A given metal crystallizes out with a cubic structure having edge length of 361 pm. If there are four metal atoms in one unit cell, what is the radius of one atom? [AIPMT 2015]
 (1) 127 pm (2) 80 pm (3) 108 pm (4) 40 pm
- Q.30 Lithium has bcc structure. Its density is 530 kg m^{-3} and its atomic mass is 6.94 g mol^{-1} . Calculate the edge length of a unit cell of Lithium metal. ($N_A = 6.02 \times 10^{23} \text{ mol}^{-1}$) [NEET-I 2016]
 (1) 264 pm (2) 154 pm (3) 352 pm (4) 527 pm
- Q.31 The ionic radii of A^+ and B^- ions are $0.98 \times 10^{-10} \text{ m}$ and $1.81 \times 10^{-10} \text{ m}$. The coordination number of each ion in AB is [NEET-I 2016]
 (1) 2 (2) 6 (3) 4 (4) 8
- Q.32 In calcium fluoride, having the fluorite structure, the coordination numbers for calcium ion (Ca^{2+}) and fluoride ion (F^-) are [NEET-II 2016]
 (1) 4 and 8 (2) 4 and 2 (3) 6 and 6 (4) 8 and 4
- Q.33 If an atom crystallizes in bcc lattice with $r = 4 \text{ \AA}$ then the edge length will be [AIIMS 2016]
 (1) 2 \AA (2) 8 \AA (3) 2.39 \AA (4) 9.23 \AA
- Q.34 Which of the incorrect statement? [NEET 2017]
 (1) $FeO_{0.98}$ has non stoichiometric metal deficiency defect.
 (2) Density decreases in case of crystals with Schottky's defect.
 (3) $NaCl(s)$ is insulator, silicon is semiconductor, silver is conductor, quartz is piezo electric crystal.
 (4) Frenkel defect is favoured in those ionic compounds in which sizes of cation and anions are almost equal.

ANSWER KEY

Q.1	4	Q.2	2	Q.3	4	Q.4	4	Q.5	2	Q.6	3	Q.7	2
Q.8	4	Q.9	3	Q.10	3	Q.11	1	Q.12	2	Q.13	1	Q.14	2
Q.15	1	Q.16	2	Q.17	2	Q.18	3	Q.19	2	Q.20	2	Q.21	2
Q.22	1	Q.23	2	Q.24	1	Q.25	1	Q.26	2	Q.27	3	Q.28	2
Q.29	2	Q.30	2	Q.31	3	Q.32	1	Q.33	3	Q.34	2	Q.35	2
Q.36	1	Q.37	4	Q.38	2	Q.39	2	Q.40	1	Q.41	2	Q.42	1
Q.43	2												