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NEET SOLID STATE — PYQS

Max. Marks: 192 **Questions:** 48

Section A (MCQ) — 48 questions

Q.1 A compound is formed by two elements A and B. The element B forms cubic close packed structure and atoms of A occupy 1/3 of tetrahedral voids. If the formula of the compound is A_xB_y, then the value of x + y is in option [NEET (UG) 2023]

(1) 4 (2) 3 (3) 2 (4) 5

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Q.2 What fraction of one edge centred octahedral void lies in one unit cell of fcc? [NEET (UG) 2023]

(1) $\frac{1}{3}$ (2) $\frac{1}{4}$ (3) $\frac{1}{12}$ (4) $\frac{1}{2}$

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Q.3 Given below are two statements : one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.

Assertion (A): In a particular point defect, an ionic solid is electrically neutral, even if few of its cations are missing from its unit cells.

Reason (R): In an ionic solid, Frenkel defect arises due to dislocation of cation from its lattice site to interstitial site, maintaining overall electrical neutrality.

In the light of the above statements, choose the most appropriate answer from the options given below : [NEET (UG) 2022]

(1) Both (A) and (R) are correct and (R) is the correct explanation of (A)

(2) Both (A) and (R) are correct but (R) is not the correct explanation of (A)

(3) (A) is correct but (R) is not correct

(4) (A) is not correct but (R) is correct

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Q.4 Copper crystallises in fcc unit cell with cell edge length of 3.608×10^{-8} cm. The density of copper is 8.92 g cm^{-3}. Calculate the atomic mass of copper. [NEET (UG) 2022]

(1) 63.1 u (2) 31.55 u (3) 60 u (4) 65 u

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Q.5 Match **List-I** with **List-II** :

List-I (Defects)		List-II (Shown by)	
a.	Frenkel defect	i.	Non-ionic solids and density of the solid decreases
b.	Schottky defect	ii.	Non-ionic solids and density of the solid increases
c.	Vacancy defect	iii.	Ionic solids and density of the solid decreases
d.	Interstitial defect	iv.	Ionic solids and density of the solid remains constant

Choose the correct answer from the options given below : [NEET (UG) 2022 (Phase 2)]

(1) (a)-(iv), (b)-(iii), (c)-(i), (d)-(ii)

(2) (a)-(i), (b)-(ii), (c)-(iii), (d)-(iv)

(3) (a)-(i), (b)-(iii), (c)-(ii), (d)-(iv)

(4) (a)-(iv), (b)-(iii), (c)-(ii), (d)-(i)

Solution

Q.6 What fraction of Fe exists as Fe(III) in $Fe_{0.96}O$? (Consider $Fe_{0.96}O$ to be made up of Fe(II) and Fe(III) only) [NEET (UG) 2022 (Phase 2)]

(1) $\frac{1}{20}$ (2) $\frac{1}{12}$ (3) 0.08 (4) $\frac{1}{16}$

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Q.7 The correct option for the number of body centred unit cells in all 14 types of Bravais lattice unit cells is : [NEET (UG) 2021]

(1) 3 (2) 7 (3) 5 (4) 2

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Q.8 Right option for the number of tetrahedral and octahedral voids in hexagonal primitive unit cell are : [NEET (UG) 2021]

(1) 12, 6 (2) 8, 4 (3) 6, 12 (4) 2, 1

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Q.9 An element has a body centered cubic (bcc) structure with a cell edge of 288 pm. The atomic radius is : [NEET (UG) 2020]

(1) $\frac{\sqrt{2}}{4} \times 288$ pm (2) $\frac{4}{\sqrt{3}} \times 288$ pm

(3) $\frac{4}{\sqrt{2}} \times 288$ pm (4) $\frac{\sqrt{3}}{4} \times 288$ pm

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Q.10 A compound is formed by cation C and anion A. The anions form hexagonal close packed (hcp) lattice and the cations occupy 75% of octahedral voids. The formula of the compound is : [NEET (UG) 2019]

(1) C_3A_4 (2) C_4A_3 (3) C_2A_3 (4) C_3A

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Q.11 Iron exhibits bcc structure at room temperature. Above 900°C, it transforms to fcc structure. The ratio of density of iron at room temperature to that at 900°C (assuming molar mass and atomic radii of iron remains constant with temperature) is [NEET 2018]

(1) $\frac{\sqrt{3}}{\sqrt{2}}$ (2) $\frac{4\sqrt{3}}{3\sqrt{2}}$ (3) $\frac{3\sqrt{3}}{4\sqrt{2}}$ (4) $\frac{1}{2}$

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Q.12 Which is the incorrect statement? [NEET 2017]

(1) Density decreases in case of crystals with Schottky defect.

(2) $NaCl_{(s)}$ is insulator, silicon is semi conductor, silver is conductor, quartz is piezoelectric crystal.

(3) Frenkel defect is favoured in those ionic compounds in which sizes of cation and anions are almost equal

(4) $FeO_{0.98}$ has non-stoichiometric metal deficiency defect.

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Q.13 Lithium has a 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. ($N_A = 6.02 \times 10^{23}$ mol^{-1}) [NEET 2016 (Phase 1)]

(1) 527 pm (2) 264 pm (3) 154 pm (4) 352 pm

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Q.14 The vacant space in bcc lattice unit cell is [AIPMT 2015]

(1) 48% (2) 23% (3) 32% (4) 26%

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Q.15 The ionic radii of A^+ and B^- ions are 0.98×10^{-10} m and 1.81×10^{-10} m. The coordination number of each ion in AB is [NEET 2016 (Phase 1)]

(1) 8 (2) 2 (3) 6 (4) 4

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Q.16 In calcium fluoride, having the fluorite structure, the coordination numbers for calcium ion (Ca^{2+}) and fluoride ion (F^-) are [NEET 2016 (Phase 2)]

(1) 4 and 2 (2) 6 and 6 (3) 8 and 4 (4) 4 and 8

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Q.17 The correct statement regarding defects in crystalline solids is [AIPMT 2015]

(1) Frenkel defects decrease the density of crystalline solids

(2) Frenkel defect is a dislocation defect

(3) Frenkel defect is found in halides of alkali metals

(4) Schottky defects have no effect on the density of crystalline solids

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Q.18 A given metal crystallises 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 (Cancelled)]

(1) 80 pm (2) 108 pm (3) 40 pm (4) 127 pm

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Q.19 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) $\frac{2}{\sqrt{3}}a$ (2) $\frac{4}{\sqrt{3}}a$ (3) $\frac{\sqrt{3}}{4}a$ (4) $\frac{\sqrt{3}}{2}a$

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Q.20 A metal has a fcc lattice. The edge length of the unit cell is 404 pm. The density of the metal is 2.72 g cm^{-3}. The molar mass of the metal is (N_A Avogadro's constant = 6.02×10^{23} mol^{-1}) [NEET 2013]

(1) 27 g mol^{-1} (2) 20 g mol^{-1}

(3) 40 g mol^{-1} (4) 30 g mol^{-1}

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Q.21 The number of carbon atoms per unit cell of diamond unit cell is [NEET 2013]

(1) 6 (2) 1 (3) 4 (4) 8

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Q.22 Structure of a mixed oxide is cubic close packed (ccp). The cubic unit cell of mixed oxide is composed of oxide ions. One fourth of the tetrahedral voids are occupied by divalent metal A and the octahedral voids are occupied by a monovalent metal B. The formula of the oxide is [AIPMT 2012 (Mains)]

(1) ABO_2 (2) A_2BO_2
(3) $A_2B_3O_4$ (4) AB_2O_2

Solution

Q.23 A metal crystallises with a face-centred cubic lattice. The edge of the unit cell is 408 pm. The diameter of the metal atom is [AIPMT 2012 (Prelims)]

(1) 288 pm (2) 408 pm (3) 144 pm (4) 204 pm

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Q.24 The number of octahedral void(s) per atom present in a cubic close-packed structure is [AIPMT 2012 (Prelims)]

(1) 1 (2) 3 (3) 2 (4) 4

Scan or tap for the full solution

Q.25 A solid compound XY has NaCl structure. If the radius of the cation is 100 pm, the radius of the anion (Y^-) will be [AIPMT 2011 (Mains)]

(1) 275.1 pm (2) 322.5 pm
(3) 241.5 pm (4) 165.7 pm

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Q.26 AB crystallizes in a body centred cubic lattice with edge length 'a' equal to 387 pm. The distance between two oppositely charged ions in the lattice is [AIPMT 2010 (Prelims)]

(1) 335 pm (2) 250 pm (3) 200 pm (4) 300 pm

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Q.27 Sodium has body centred packing. Distance between two nearest atoms is 3.7 Å. The lattice parameter is [AIPMT 2009]

(1) 4.3 Å (2) 3.0 Å (3) 8.6 Å (4) 6.8 Å

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Q.28 Lithium metal crystallises in a body-centred cubic crystal. If the length of the side of the unit cell of lithium is 351 pm, the atomic radius of lithium will be [AIPMT 2009]

(1) 151.8 pm (2) 75.5 pm
(3) 300.5 pm (4) 240.8 pm

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Q.29 Copper crystallises in a face-centred cubic lattice with a unit cell length of 361 pm. What is the radius of copper atom in pm? [AIPMT 2009]

(1) 157 (2) 181 (3) 108 (4) 128

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Q.30 If the lattice parameter for a crystalline structure is 3.6 Å, then the atomic radius in fcc crystal is [AIPMT 2008]

(1) 2.92 Å (2) 1.27 Å
(3) 1.81 Å (4) 2.10 Å

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Q.31 Percentage of free space in a body centred cubic unit cell is [AIPMT 2008]

(1) 34% (2) 28% (3) 30% (4) 32%

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Q.32 Which of the following statements is not correct? [AIPMT 2008]

(1) The number of carbon atoms in a unit cell of diamond is 8
(2) The number of Bravais lattices in which a crystal can be categorized is 14
(3) The fraction of the total volume occupied by the atoms in a primitive cell is 0.48.
(4) Molecular solids are generally volatile.

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Q.33 With which one of the following elements silicon should be doped so as to give p-type of semiconductor? [AIPMT 2008]

(1) Selenium (2) Boron
(3) Germanium (4) Arsenic

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Q.34 If a stands for the edge length of the cubic systems: simple cubic, body centred cubic and face centred cubic, then the ratio of radii of the spheres in these systems will be respectively [AIPMT 2008]

(1) $\frac{1}{2}a : \frac{\sqrt{3}}{2}a : \frac{\sqrt{2}}{2}a$ (2) $1a : \sqrt{3}a : \sqrt{2}a$
(3) $\frac{1}{2}a : \frac{\sqrt{3}}{4}a : \frac{1}{2\sqrt{2}}a$ (4) $\frac{1}{2}a : \sqrt{3}a : \frac{1}{\sqrt{2}}a$

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Q.35 For a cubic crystal structure which one of the following relations indicating the cell characteristics is correct? [AIPMT 2007]

(1) $a \neq b \neq c$ and $\alpha = \beta = \gamma = 90°$

(2) $a = b = c$ and $\alpha \neq \beta \neq \gamma = 90°$

(3) $a = b = c$ and $\alpha = \beta = \gamma = 90°$

(4) $a \neq b \neq c$ and $\alpha \neq \beta$ and $\gamma = 90°$

Solution

Q.36 The fraction of total volume occupied by the atoms present in a simple cubic unit cell is [AIPMT 2007]

(1) $\frac{\pi}{3\sqrt{2}}$ (2) $\frac{\pi}{4\sqrt{2}}$ (3) $\frac{\pi}{4}$ (4) $\frac{\pi}{6}$

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Q.37 If NaCl is doped with 10^{-4} mol% of $SrCl_2$, the concentration of cation vacancies will be ($N_A = 6.02 \times 10^{23}$ mol^{-1}) [AIPMT 2007]

(1) 6.02×10^{16} mol^{-1} (2) 6.02×10^{17} mol^{-1}

(3) 6.02×10^{14} mol^{-1} (4) 6.02×10^{15} mol^{-1}

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Q.38 The appearance of colour in solid alkali metal halides is generally due to [AIPMT 2006]

(1) interstitial positions (2) F-centres

(3) Schottky defect (4) Frenkel defect

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Q.39 CsBr crystallises in a body centered cubic lattice. The unit cell length is 436.6 pm. Given that the atomic mass of Cs = 133 and that of Br = 80 amu and Avogadro number being 6.02×10^{23} mol^{-1}, the density of CsBr is [AIPMT 2006]

(1) 4.25 g/cm^3 (2) 42.5 g/cm^3

(3) 0.425 g/cm^3 (4) 8.25 g/cm^3

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Q.40 Copper has face centered cubic (fcc) lattice with interatomic spacing equal to 2.54 Å. The value of lattice constant for this lattice is [AIPMT 2005]

(1) 2.54 Å (2) 3.59 Å

(3) 1.27 Å (4) 5.08 Å

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Q.41 In a face-centered cubic lattice, a unit cell is shared equally by how many unit cells? [AIPMT 2005]

(1) 2 (2) 4 (3) 6 (4) 8

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Q.42 A compound formed by elements X and Y crystallizes in a cubic structure in which the X atoms are at the corners of a cube and the Y atoms are at the face-centers. The formula of the compound is :- [AIPMT 2004]

(1) XY_3 (2) X_3Y (3) XY (4) XY_2

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Q.43 The pyknometric density of sodium chloride crystal is 2.165×10^3 kg m^{-3} while its X-ray density is 2.178×10^3 kg m^{-3}. The fraction of unoccupied sites in sodium chloride crystal is [AIPMT 2003]

(1) 5.96 (2) 5.96×10^{-2}

(3) 5.96×10^{-1} (4) 5.96×10^{-3}

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Q.44 Number of atoms per unit cell in B.C.C. is [AIPMT 2002]

(1) 9 (2) 4 (3) 2 (4) 1

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Q.45 When Zn converts from melted state to its solid state, it has hcp structure, then find the number of nearest atoms. [AIPMT 2001]

(1) 6 (2) 8 (3) 12 (4) 4

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Q.46 The cations and anions are arranged in alternate form in [AIPMT 2000]

(1) metallic crystal (2) ionic crystal

(3) covalent crystal (4) semi-conductor crystal

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Q.47 Cations and anions combine in a crystal to form the following type of compound [AIPMT 2000]

(1) ionic (2) metallic

(3) covalent (4) dipole-dipole

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Q.48 In a cubic crystal, A-atoms are placed at every corner and B-atoms at the centre of every face. The formula of the compound is [AIPMT 2000]

(1) AB (2) AB_3 (3) A_2B_2 (4) A_2B_3

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ANSWER KEY

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

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