

SOLUTION TEST-A

1. A/N → Covalent network solid, Benzene → Molecular solid, Graphite → Covalent network solid, Hydrogen chloride → molecular solid.

The correct answer is (i)

$$2. \quad M = 2.7 \times 10^{-7} \text{ kg mol}^{-1} = 27 \text{ g mol}^{-1}, \quad d = 2.7 \times 10^{-3} \text{ kg m}^{-3} = 2.7 \text{ g cm}^{-3}$$

$$a = 405 \text{ pm} = 4.05 \times 10^{-8} \text{ cm}$$

$$a^3 = 6.64 \times 10^{-23} \text{ cm}^3$$

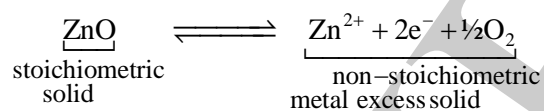
$$z = \frac{d N_A a^3}{M} = \frac{2.7 \times 6.02 \times 10^{23} \times 6.64 \times 10^{-23}}{27} = 3.999 \approx 4 \text{ (fcc)}$$

The correct answer is (iii)

3. In zinc blende type structure, the S^{2-} ions are in a ccp arrangement whereas Zn^{2+} occupies half of the tetrahedral voids and not all tetrahedral voids.

The correct answer is (ii)

4. Both assertion and reason are correct and reason is the correct explanation of assertion.



The correct answer is (i)

5. Reason is incorrect

In ferrimagnetic substances, magnetic moments of the domains are aligned in parallel and anti parallel direction in *unequal* numbers and they have a net magnetic moment.

The correct answer is (iii)

$$6. \quad \text{Number of A per unit cell} = \frac{1}{8} \times 8A = 1A$$

There are only two alternate faces in a cube and each face contributes only half towards the unit cell. Number of B per unit cell = $\frac{1}{2} \times 2B = 1B$. The formula of the solid = AB.

7. This is a face-centred cubic packing so, the % of the unoccupied space is 26%.

$$8. \quad d = 10.2 \text{ g cm}^{-3}$$

$$Z = \frac{1}{8} \times 8 + \frac{1}{2} \times 6 = 4 \text{ (fcc)}$$

$$2r = 288 \text{ and for fcc}$$

$$4r = \sqrt{2}a = 2(2r)$$

$$\therefore a = \frac{2(2r)}{\sqrt{2}} = \sqrt{2} \times 288$$

$$a = 407.23 \text{ pm}$$

$$a = 4.072 \times 10^{-8} \text{ cm}$$

$$a^3 = 6.74 \times 10^{-23} \text{ cm}^3$$

$$d = \frac{ZM}{N_A a^3}$$

$$\therefore N_A = \frac{ZM}{da^3} = \frac{4 \times 108}{10.2 \times 6.74 \times 10^{-23}}$$

$$N_A = 6.284 \times 10^{23} \text{ mol}^{-1}$$

9. (i) This is due to randomization of dipoles at high temperature
 (ii) ZnO is a stoichiometric solid at low temperature and loses oxygen reversibly at high temperature to form metal excess defect with extra cation in the interstitial position, hence appears yellow at high temperature.
10. For fcc, $4r = \sqrt{2} a$

$$\therefore a = \text{length of a side of unit cell} = \frac{4r}{\sqrt{2}}$$

$$a = \frac{4 \times 1.44}{\sqrt{2}} = 4.074 \text{ \AA}$$

$$\text{Volume of the unit cell} = a^3$$

$$= (4.074 \times 10^{-8} \text{ cm})^3$$

$$= 6.762 \times 10^{-23} \text{ cm}^3$$

11. Number of N in ccp = x

$$\text{Number of tetrahedral voids} = 2x$$

$$\text{Number of tetrahedral voids occupied by M} = \frac{2}{3}(2x) = \frac{4}{3}x$$

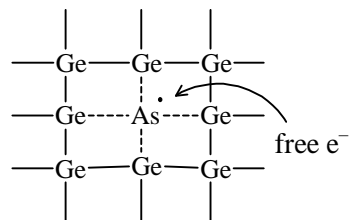
$$\text{Formula of the solid is } M_{\frac{4x}{3}} N_x \text{ or } M_4 N_3$$

If atom M is slipped into an octahedral void, then number of octahedral voids = x

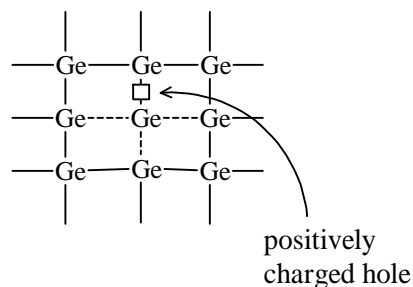
$$\text{Number of octahedral voids occupied by atom M} = x$$

$$\text{Formula of the solid} = M_x N_x = MN$$

12. (i) Arsenic belongs to group 15 of the periodic table and has 5 valence electrons. Out of these five valence electrons, four are used in the bond formation with germanium. The fifth electron is free to move and conducts electricity. This is called **n-type semiconductors**.



(ii) Gallium belongs to group 13 and has three valence electrons. Gallium has one e^- less than that of germanium and results in the formation of positively charged holes. This gives rise to p-type semiconductor.



13. (i) Concentration of cation vacancies = concentration of Sr^{2+}

$$= \frac{10^{-3}}{100} = 10^{-5} \text{ mol } Sr^{2+}$$

(ii) Doping decreases the melting point of NaCl.

(iii) This is called impurity defect.

14. Formula $Fe_{0.85}O_{1.00}$ means that 0.15 Fe^{2+} ions are missing from the lattice. We know that missing 1 Fe^{2+} gives 2 Fe^{3+} ions in order to maintain electrical neutrality. So, missing 0.15 Fe^{2+} ions gives $2 \times 0.15 = 0.30 Fe^{3+}$ ion.

$$\text{So, percentage of } Fe^{3+} \text{ ions} = \frac{0.30}{0.85} \times 100 = 35.29\%$$

$$\text{percentage of } Fe^{2+} \text{ ion} = 64.71\%$$

15. (i) Both Schottky and Frenkel defect

(ii) Amorphous silicon is used in photovoltaic cells.

(iii) The crystalline quartz can be changed into amorphous glass by melting followed by rapid cooling.

(iv) A spontaneous alignment of magnetic moments in the same direction gives rise to ferromagnetism.

Ferromagnetic solids are strongly attracted by magnetic field. $\uparrow \uparrow \uparrow \uparrow \uparrow$

(v) The coordination number of each atom in simple cubic packing is six.

