SOLUTION TEST-B

1. Solid A is hard and electrical insulator in solid as well as in the molten state. It cannot be ionic or metallic solid. Since, it is also hard, it cannot be molecular solid. Hence, A is covalent network solid.

   The correct answer is (iv)

2. The strucutre of KCN is same as NaCl type means

$$r_{K^+} + r_{CN^-} = \frac{a}{2} = \frac{546}{2} = 273\,pm$$

   The correct answer is (iii)

3. Substance doped with an impurity with valence electron more than the given substance results in n-type semiconductor.

   The correct answer is (ii). Phosphorus has five valence electrons whereas germanium has four valnece electrons.

4. In Na^+Cl^-, both the ions Na^+ and Cl^- have a nearest noble gas configuration. There is no unpaired electrons. Hence, NaCl is diamagnetic. The assertion given is wrong.

   The correct answer is (iv)

5. The reasons is wrong. **The correct answer is (iii).**

   The number of tetrahedral voids in ccp is twice the number of octahedral voids.

6. Number of lattice points = 8 + 6 = 14

   Number of particles per unit cell = 4

   The ratio is $\frac{14}{4} = 7:2$

7. $Na_2O < MgO < Al_2O_3$

8. Z = 2, $d = 8.55\ g/cm^3$

   M = 93 g/mol, $N_A = 6.02 \times 10^{23}\ mol^{-1}$

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

$$a^3 = \frac{2 \times 93}{6.02 \times 10^{23} \times 8.55} = 3.614 \times 10^{-23}\,cm^3$$

$$a = (3.614 \times 10^{-23})^{1/3}\,cm$$

$$a = 3.306 \times 10^{-8}\ cm = 330.6\,cm$$

   For bcc $4r = \sqrt{3}a$

$$\therefore \quad r = \frac{\sqrt{3} \times 330.6}{4} = 143.15\ pm$$

9. This is a simple cubic packing in which z = 1 and a = 2r

Packing efficiency $\phi = \dfrac{Z \times \frac{4}{3}\pi r^3}{a^3}$

$$\phi = \frac{1 \times \frac{4}{3}\pi r^3}{8r^3} = \frac{\pi}{6} = 0.52$$

Coordination number of an atom in this packing is 6.

10.

		Schottky	Frenkel
(i)	Density	Density of solid with this defect decreases	Density of solid remains same.
(ii)	Coordination number	This defect is shown by solids, which are highly ionic with high coordination number.	This defect is shown by solids which are less ionic with low coordination number.

11. (i) Ionic solids are hard due to the presence of lattice structure and strong electrostatic forces of attraction holding the oppositely charged ions together. The displacement of any one ion from the lattice increases the repulsion between the like charges and results in the cleavage of whole lattice. Hence, ionic compounds are brittle.

(ii) The excess of potassium in KCl gives anionic vacancy which is filled with unpaired e^- and results in the formation of F-centre. Solids with F-center show colour.

(iii) Indium has only three valence electrons while silicon has four valence electrons. Addition of indium to silicon gives positively charged hole which move across the structure and gives conduction, called **p-type semiconductor**. Pure silicon has no unpaired e^-, **hence insulator.**

12. Al has ccp structure means fcc

$\therefore$ Z = 4, r = 125 pm

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

$\therefore \quad a = \dfrac{4 \times 125}{1.414} = 353.6\,\text{pm} = 3.536 \times 10^{-8}$ cm

$a^3 = 4.42 \times 10^{-23}$ cm^3

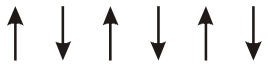
(ii) $d = \dfrac{ZM}{N_A a^3} = \dfrac{4 \times 27}{6.02 \times 10^{23} \times 4.42 \times 10^{-23}}$

$$d = 4.06\ g/cm^3$$

13. (i) Ferromagnetic

Example: Fe, Co, Ni

(ii) Anitferromagnetic



Example: MnO

(iii) Ferrimagnetic

Example: Ferrites, Chromites

14. (i) Number of A per unit cell $= \frac{1}{8} \times 7A = \frac{7}{8}A$

Number of B per unit cell $= \frac{1}{2} \times 4 = 2B$

Simple formula is $A_{7/8}B_2$

A_7B_{16}.

(ii) In end-centred cubic unit cell, the particles are present at the corners as well as at the centre of two opposite faces.

15. (i) This is due to the formation of crystalloids over a period of time.

(ii) n-type semiconductor.

(iii) This is due to the presence of electron in the intersttitial position.

(iv) Number of oxide ions in ccp = x

Number of tetrahedral voids = 2x

Number of tetrahedral voids occupied by cation $A = \frac{1}{8} \times 2x = \frac{x}{4}$

Number of octahedral voids = x

Number of octahedral voids occupied by cation $B = \frac{1}{2}x = \frac{x}{2}$

Simple formula is $A_{x/4}B_{x/2}O_x = AB_2O_4$

(v) Metallic solid are malleable and ductile while ionic solids are brittle.

