CHEMISTRY

BOOKS - MBD -HARYANA BOARD

SOLID STATE

Objective Type Questions

1. In a cubic unit cell:

A. a = b = c, $\alpha = \beta = \gamma = 90^\circ$

B. a = b = c, $\alpha = \beta = \gamma = 120^\circ$

C. a ne b ne c, $\alpha \neq \beta \neq \gamma = 90^\circ$

D. a = b ne c, $\alpha = \beta \neq \gamma = 90^\circ$

Answer: A

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2. In a Tetragonal unit cell :

A. a = b = c, $\alpha = \beta = \gamma \neq 90^\circ$

B. a = b ne c, $\alpha = \beta = \gamma = 90^\circ$

C. a = b = c, $\alpha = \beta = \gamma = 90^\circ$

D. a = b ne c, $\alpha = \beta = 90^\circ, \gamma = 120^\circ$

Answer: A

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3. Percentage of empty space in a bcc arrangement is :

A. $74\ \%$

B. $68\ \%$

C. $32\ \%$

D. $26\ \%$

Answer: C

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4. Amorphous solid is :

A. Rubber

B. Plastic

C. Glass

D. All

Answer: D

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5. In a face centered unit cell (fcc) the number of atoms present

A. 4

B. 2

C. 3

D. 5

Answer: A

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6. In a tetragonal unit cell:

A. a = b = c, $\alpha = \beta = \gamma \neq 90^\circ$

B. a = b ne c, $\alpha = \beta = \gamma = 90^\circ$

C. a = b = c, $\alpha = \beta = \gamma = 90^\circ$

D. a = b ne c, $\alpha = \beta = 90^\circ, \gamma = 120^\circ$

Answer: D

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7. In AgBr, there can occur :

A. Schottky defect

B. Frenkel defect

C. Both (A) and (B)

D. None of these.

Answer: C

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8. In which of the following pairs both the solids belong to same type ?

A. Solid CO_2, NaCl

B. CaF_2, Ca

C. Graphite, Ice

D. SiC, AIN

Answer: D

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9. The arrangement of spheres in hexagonal close packing (hcp) is :

A. ABC ABC.....'

B. AAA BBB.

C. AB'AB

D. AA BC .....

Answer: A

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10. Pure silicon is:

A. Insulator

B. Semi-conductor

C. Conductor

D. None of these.

Answer: A

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11. The number of possible three dimensional lattices are :

A. 7

B. 14

C. 6

D. 8

Answer: B

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12. In a simple cubic cell, the number of atoms present :

A. 4

B. 2

C. 3

D. 5

Answer: D

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13. In a face centred unit cell (fcc), the number of atoms present is :

A. 4

B. 2

C. 3

D. 5

Answer: A

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14. In NaCl the CI^- ions occupy the space in :

A. fcc

B. hcc

C. hcp

D. None of the above.

Answer: A

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15. In a monoclinic unit cell :

A. a = b = c, $\alpha = \beta = \gamma \neq 90^\circ$

B. a = b = c, $\alpha = \beta = \gamma = 120^\circ$

C. a = b = c, $\alpha = \beta = \gamma = 90^\circ$

D. a ne b ne c, $\alpha = \gamma = 90^\circ \beta \neq 90^\circ$

Answer: D

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16. Number of tetrahedral voids in the fcc unit cell is :

A. 8

B. 4

C. 6

D. 12

Answer: A

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Very Short Answer Type Questions

1. Why are solids rigid ?

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2. Define the term 'amorphous'. Give a few examples of amorphous solids.

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3. What is the significance of lattice point ?

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4. Why is glass considered as a supercooled liquid ?

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5. What makes a glass different from a solid such as quartz ? Under what conditions could

quartz be converted into glass?

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6. Define unit cell.

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7. What are F-centres ?

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8. What is the effect of presence of Schottky defect on the density of a crystal ?

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9. What is electrical conductivity in metals due to ?

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10. Why is Frenkel defect not found in pure alkali metal halides?

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11. What is the radius ratio for an ion to occupy octahedral site ?

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12. What are 12—16 and 13—15 compounds ?

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13. Explain the nature of crystal defect produced when sodium chloride crystal is daped with $MgCl_2$

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14. Name any ionic solid in which both Frenkel and Schottky defects occur.

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15. In a compound 'A' atoms are present at the corner and 'B' atoms are at the face centres. Calculate number of 'A' and 'B' atoms.

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16. What type of defect is shown by ZnS?

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17. Give one example of an oxide which is ferromagnetic. Give its one important use.

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18. In a close packed arrangement of N spheres, how many i) tetrahedral and (ii) octahedral sites are present ?

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19. The radii of P^+ and Q^- are $0.95\dot{A}$ and $1.81\dot{A}$ respectively. Predict whether the coordination number of P^+ is 6 or 4.

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20. What are the ferromagnetic substances ?

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21. How many tetrahedral and octahedral holes are occupied hy Zn^{2+} ions in ZnS ?

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22. What happens to the structure of NaCl when pressure is applied on it ?

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23. What happens to structure of CsCl when it is heated to 760 K?

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24. MgO has the structure of NaCl and TICI has the structure of CsCl. What are the coordination number of ions in MgO and TICI ?

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25. Classify each of the following as either a p-type or an n-type semi-conductor.

(i) Ge doped with In (ii) B doped with Si.

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26. Out of n-type and p-type which is a better conductor of electricity ?

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Short Answer Type Questions

1. What are amorphous solids ? Give four important differences between Crystalline and Amorphous solids.

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2. How does electrical resistivity of the following classes of materials vary with temperature ?

Semiconductor, metallic conductor, super conductor.

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3. The A^+ ion and B^- have radii 88 pm and 200 pm respectively. In the close packed crystal of compound AB, predict the coordination number of A^+.

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4. What is the coordination number of atoms in

(i) Cubic closed packed structure

(ii) Body centred cubic structure?

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5. A cubic solid is made to two elements P and Q. Atoms Q are the corners of the cube and P at the body centre. What is the formula of the compound ? What are the coordination numbers of P and Q?

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6. How can you calculate the density of a cubic crystal whose length of the edge of the unit cell is known?

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7. Draw a neat diagram of sodium chloride structure and then describe it.

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8. If the radius of an octahedral void is r and the radius of atom is close packing is R, derive the relationship between r and R.

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9. Describe cesium chloride structure.

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10. What are the differences between Schottky and Frenkel defects ?

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11. What are the important consequences of Schottky and Frenkel defects in crystals ?

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12. Pure silicon is an insulator. Silicon doped with phosphorus is a semi-conductor. Silicon doped with gallium is also a serni-conductor. What is the difference between two doped silicon semi- conductors ?

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13. If NaCl is doped with 10^{-3} mol % of $SrCl_2$ what is the concentration of cation vacancy?

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14. Composition of a sample of Wustite is $Fe_{0-93}O_{1-0}$. What percentage of iron is present in the form of Fe (III)?

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15. (a) What is meant by term 'coordination number' ?

(b) What is the coordination number of atoms :

(i) in a cubic close packed structure

(ii) in a body centred cubic structure.

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16. Non-stoichiometric cuprous oxide, Cu_2O can be prepared in laboratory. In this oxide, copper to oxygen ratio is slightly less than 2 : 1. Can you account for the fact that this substance is a p-type semi-conductor ?

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17. A compound formed by elements X and Y crystallizes in cubic arrangement in which X atoms are at the corners of a cube and Y atoms are at the face centres. What is the formula of the compound ?

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18. Define the following with 'suitable examples :

(a) F-centres,

(b) Antiferromagnetism.

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Long Answer Type Questions

1. Distinguish between crystal lattice and unit cell.

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2. How will you distinguish between the following pairs of terms:

(a) Hexagonal close-packing and cubic close-packing ?

(b) Crystal lattice and unit cell?

(c) Tetrahedral void and octahedral void ?

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3. What are the point defects in a crystal and how do they develop ?

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4. Discuss briefly Frenkel defects in ionic crystals.

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5. Explain the following terms : (a) Schottky defect (b) Frenkel defect.

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6. Briefly discuss Schottky defects and give examples.

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7. Explain the terms

(i) Diamagnetism (ii) Ferromagnetism

(iii) Ferrimagnetism.

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8. Silver crystallizes in fec lattice. If edge length of the cell is 4.077×10^{-8} cm and density is $10.5 gcm^{-3}$. Calculate the atomic mass of silver.

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9. What is a semiconductor ? Describe the two main types of semiconductors and contrast their conduction mechanism.

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10. Calculate the value of Avogadro number (N_0) from following data :

(i) Density of $NaCl = 2.165 gm cm^{-3}$

(ii) Distance between Na^+ & Cl^- in NaCl = 281 pm.

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