Solid State

Set – 1

Table 1.1: Distinction between Crystalline and Amorphous Solids

Property	Crystalline solids	Amorphous solids
Shape	Definite characteristic geometrical shape	Irregular shape
Melting point	Melt at a sharp and characteristic temperature	Gradually soften over a range of temperature
Cleavage property	When cut with a sharp edged tool, they split into two pieces and the newly generated surfaces are plain and smooth	When cut with a sharp edged tool, they cut into two pieces with irregular surfaces
Heat of fusion	They have a definite and characteristic enthalpy of fusion	They do not have definite enthalpy of fusion

Q1. Which of the following is not the property of crystalline solids?

A. Definite enthalpy of fusion
B. Isotropic in nature
C. Long range order
D. Melt at sharp temperature

Ans. (B)

Q2. Which of the following is the property of amorphous solids?

A. Long range order
B. Definite enthalpy of fusion
C. Pseudo solids
D. True solids

Ans. (C)

Q3. Which of the following property is shared by both crystalline solids and amorphous solids?

A. Definite geometric shape
B. Definite enthalpy of fusion

C. Anisotropic in nature
D. Irregular shape

Ans. (B)

Q4. Which of the following is not the property of Amorphous solids?

A. Cut into two irregular pieces when cut with sharp edged tool
B. Isotropic in nature
C. Definite enthalpy of fusion
D. Sharp melting point

Ans. (D)

Set – 2

Table 1.2: Different Types of Solids

Type of Solid	Constituent Particles	Bonding/ Attractive Forces	Examples	Physical Nature	Electrical Conduc-tivity	Melting Point
(1) Molecular solids (i) Non polar	Molecules	Dispersion or London forces	Ar, CCl_4, H_2, I_2, CO_2	Soft	Insulator	Very low
(ii) Polar		Dipole-dipole interactions	HCl, SO_2	Soft	Insulator	Low
(iii) Hydrogen bonded		Hydrogen bonding	H_2O (ice)	Hard	Insulator	Low
(2) Ionic solids	Ions	Coulombic or electrostatic	NaCl, MgO, ZnS, CaF_2	Hard but brittle	Insulators in solid state but conductors in molten state and in aqueous solutions	High
(3) Metallic solids	Positive ions in a sea of delocalised electrons	Metallic bonding	Fe, Cu, Ag, Mg	Hard but malleable and ductile	Conductors in solid state as well as in molten state	Fairly high

Q1. Which of the following is not a type of molecular solids?

A. Non-polar
B. Polar
C. Ionic
D. Hydrogen bonded

Ans. (C)

Q2. Type of forces acting between molecules of Non-polar molecular solids?

A. Dipole-dipole interactions
B. Dispersion or london forces
C. Electrostatic forces
D. Covalent bonding

Ans. (B)

Q3. Which of the following is not an example of Ionic solids?

A. NaCl
B. ZnS
C. AlN
D. MgO

Ans. (C)

Q4. Which of the following is hard and has a very high melting point, is an insulator?

A. Cu
B. NaCl
C. C(graphite)
D. CCl_4

Ans. (B)

Q5. Which of the following is an insulator and has a high melting point?

A. SO_2
B. H_2O

C. AlN
D. Ar

Ans. (C)

Q6. What type of bonding exists between Fe crystal solid?

A. Electrostatic
B. Covalent
C. Hydrogen bonding
D. Metallic bonding

Ans. (D)

Q7. Which of the following is not an example of covalent solids?

A. SiO_2
B. SiC
C. SO_2
D. AlN

Ans. (C)

Q8. Which of the following is hard but brittle?

A. ZnS
B. Fe
C. SiC
D. HCl

Ans. (A)

Q9. Argon is an example of which of the following solids?

A. Non-polar molecular solids
B. Polar molecular solids
C. Metallic solids
D. Covalents solids

Ans. (A)

Set – 3

Table 1.3: Seven Primitive Unit Cells and their Possible Variations as Centred Unit Cells

Crystal system	Possible variations	Axial distances or edge lengths	Axial angles	Examples
Cubic	Primitive, Body-centred, Face-centred	$a = b = c$	$\alpha = \beta = \gamma = 90°$	NaCl, Zinc blende, Cu
Tetragonal	Primitive, Body-centred	$a = b \neq c$	$\alpha = \beta = \gamma = 90°$	White tin, SnO_2, TiO_2, $CaSO_4$
Orthorhombic	Primitive, Body-centred, Face-centred, End-centred	$a \neq b \neq c$	$\alpha = \beta = \gamma = 90°$	Rhombic sulphur, KNO_3, $BaSO_4$
Hexagonal	Primitive	$a = b \neq c$	$\alpha = \beta = 90°$ $\gamma = 120°$	Graphite, ZnO, CdS,
Rhombohedral or Trigonal	Primitive	$a = b = c$	$\alpha = \beta = \gamma \neq 90°$	Calcite ($CaCO_3$), HgS (cinnabar)

Q1. Which of the following is not a possible variation of cubic unit cell

A. Primitive
B. Body-centred
C. Face-centred
D. Edge-centred

Ans. (D)

Q2. Which of the following crystal systems has 4 types of variation in their lattice system?

A. Tetragonal
B. Orthorhombic
C. Rhombohedral
D. Triclinic

Ans. (B)

Q3. Which of the following is the correct relationship between the axial angles of Monoclinic crystal systems?

A. $\alpha = \square eta = \gamma$

B. $\alpha eq\square etaeq\gamma$

C. $\alpha eq\square eta, \gamma = 90$

D. $\alpha = \gamma = 90, \square etaeq90/$

Ans. (D)

Q4. Which of the following is an example of hexagonal crystal systems?

A. ZnO
B. TiO_2
C. HgS
D. H_3BO_3

Ans. (A)

Q5. Calcite is an example of which of the following systems?

A. Cubic
B. Tetragonal
C. Hexagonal
D. Rhombohedral

Ans. (D)

Q6. Total no. of effective atoms in face centred system is:

A. 1
B. 8
C. 4
D. 3

Ans. (c)

Q7. Which of the following is correct packing in cubic close packing?

A. AAAAAA type
B. ABABAB type

C. ABCABC type
D. None of these

Ans. (C)

Q8. Coordination no. of atom residing in octahedral void is:

A. 2
B. 4
C. 6
D. 8

Ans. (C)

Set – 4

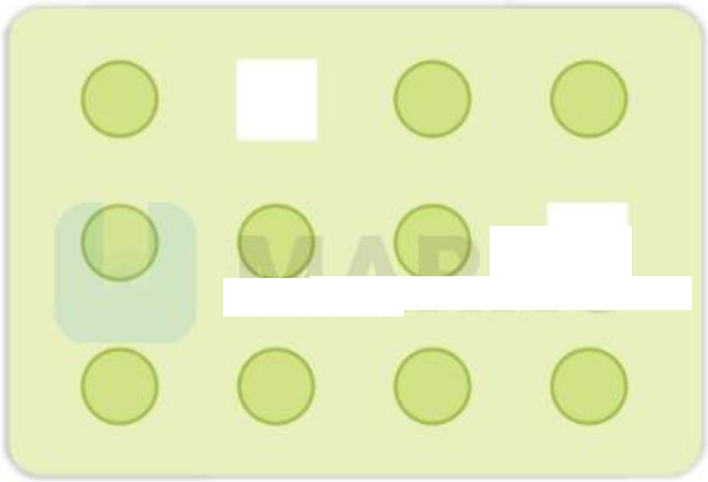


Fig. 1.27: Vacancy defects

Q1. Which of the following is not a property of vacancy defect?

A. Decrease in density
B. Some lattice site are vacant
C. Generated due to heating
D. Some Particles occupy interstitial site

Ans. (D)

Q2. Which of the following is a property of interstitial defect?

A. Caused by vacant lattice site
B. Caused by atoms occupying interstitial site
C. Occurs in ionic solids
D. Increases the density of solids

Ans. (B)

Q3. Which of the following is not a property of frenkel defect?

A. Occurs in non-ionic solids
B. Doesn't affects the density of solids
C. Vacancy and interstitial defect occur at same time
D. Occurs in ionic solids

Ans. (A)

Q4. Which of the following is a property of schottky defect?

A. Electrical neutrality is not maintained
B. Occurs in non-ionic solids
C. No. of missing cations and anions are equal
D. Increases the density

Ans. (C)

Q5. Which of the following is a property of impurity defect?

A. Electrical neutrality is maintained by vacancy of cation and anions
B. Is a thermodynamic defect
C. Electrical neutrality is maintained by vacancy of cation and adding another cation of different charge
D. Doesn't affects the density of solids

Ans. (C)

Q6. Which of the following is not a property of Metal Excess Defect?

A. Electrical neutrality is not maintained
B. Coloured due to free electrons

C. Only alkali metals show this defect
D. Doesn't affects the density of solids

Ans. (D)

Set – 5

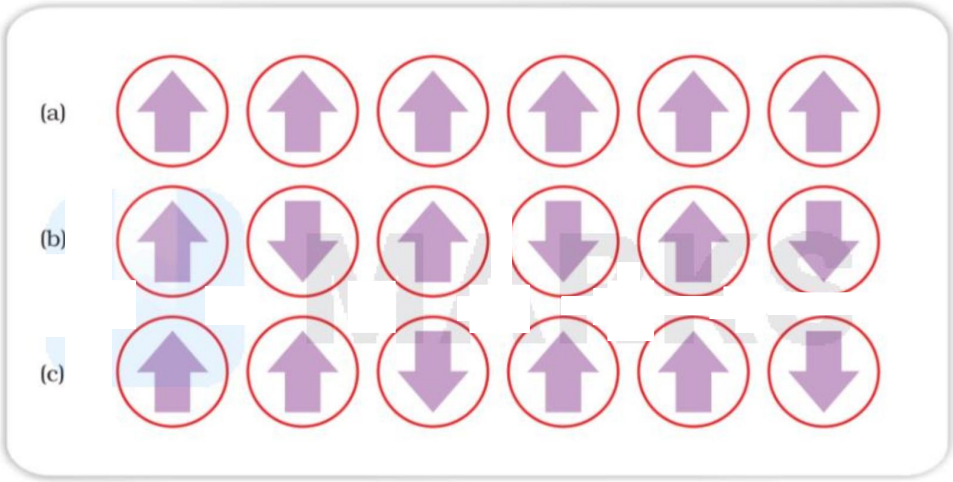


Fig 1.36: Schematic alignment of magnetic moments in (a) ferromagnetic (b) antiferromagnetic and (c) ferrimagnetic.

Q1. Which of the following show Antiferromagnetism?

A. MnO
B. CrO_2
C. H_2O
D. C_6H_6

Ans. (A)

Q2. Which of the following compounds doesnâ€™t show ferrimagnetism?

A. Fe_3O_4
B. Fe_2O_3
C. $ZnFe_2O_4$
D. $MgFe_2O_4$

Ans. (B)

Q3. _____ is observed when substances are weakly repelled by a magnetic field.

A. Ferrimagnetism
B. Ferromagnetism
C. Diamagnetism
D. Paramagnetism

Ans. (C)

Q4. _____ is observed when the magnetic moments of the domains in the substance are aligned in parallel and antiparallel directions in unequal numbers.

A. Ferromagnetism
B. Ferrimagnetism
C. Antiferromagnetism
D. Paramagnetism

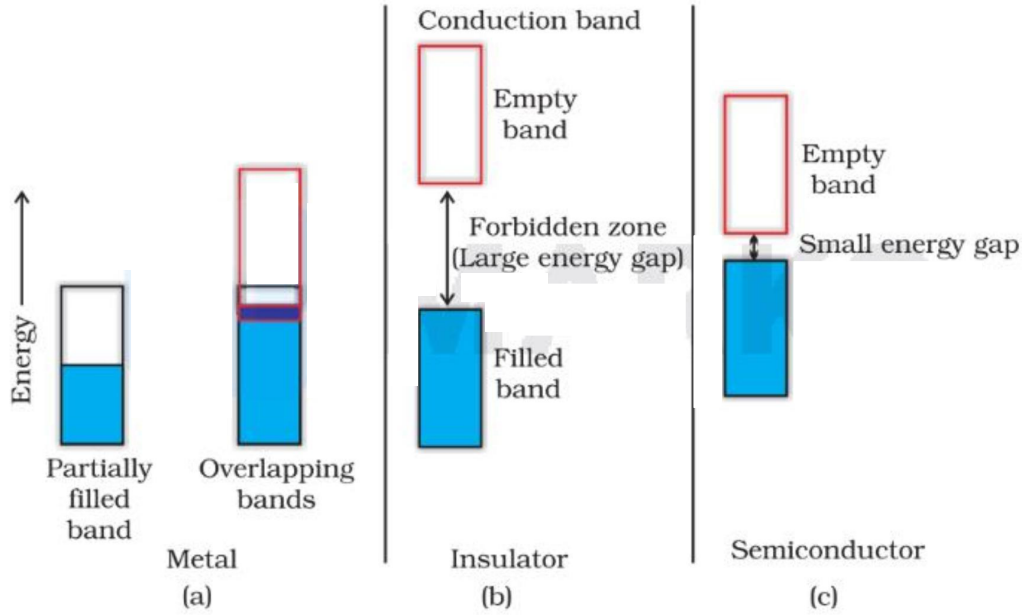
Ans. (B)

Q5. Which of the following are paramagnetic?

A. O_2
B. C_6H_6
C. $ZnFe_2O_4$
D. CrO_2

Ans. (A)

Set – 6



Q1. _____ has partially filled energy bands.

A. Metals
B. Insulators
C. Semiconductors
D. None of the above

Ans. (A)

Q2. _____ has a large gap between energy bands.

A. Metals
B. Insulators
C. Semiconductors
D. None of the above

Ans. (B)

Q3. _____ has a small gap between energy bands.

A. Metals
B. Insulators

C. Semiconductors
D. None of the above

Ans. (C)

Q4. Which of the following is a n-type semiconductor?

A. Doping if Si in Si
B. Doping if Al in Si
C. Doping if P in Si
D. None of the above

Ans. (C)

Q5. Which of the following is a p-type semiconductor?

A. Doping if Si in Si
B. Doping if Al in Si
C. Doping if P in Si
D. None of the above

Ans. (B)