PRAADIS EDUCATION

CHEMISTRY XII

WORKSHEET 2

1- SOLID STATE

OBJECTIVE QUESTIONS

1.	**Case based Questions:** **Passage I** **Read the passage given below and answer the questions that follow:** At absolute zero crystals tend to have perfectly ordered arrangement. As the temperature increases crystals start to deviating perfectly ordered arrangement. Point defects are the deviations from the ideal arrangement. Point defects may be classified into three types. i) stoichiometric defects ii) impurity defects and iii) non stoichiometric defects. 1) Cations are present in the interstitial sites in i) schottky defect ii) Frenkel defect iii) Metal deficiency defect iv) Vacancy defect	**Answers** ii)
2.	2) schottky defect is observed in crystals when i) some cations move from their lattice site to interstitial sites ii) equal number of cations and anions are missing from the lattice iii) some lattice sites are occupied by electrons iv) some impurity is present in the lattice	ii)
3.	3) Which of the point defects are shown by AgBr crystals? a) schottky defect b) Frenkel defect c) Metal deficiency defect d) Metal excess defect i) a) and b) ii) c) and d) iii) a) and c) iv) b) and d)	i)
4.	4) Alkali metal halide on heating with same alkali metal vapors imparts particular color to the crystal. What kind of defect is it? i) Due to impurity defect ii) Metal excess defect due to interstitial cation iii) Metal deficiency defect iv) Metal excess defect due to anionic vacancies	iv)

1.	**Passage II** **Read the passage given below and answer the questions that follow:** In solids, the constituent particles are close packed, leaving the minimum vacant space, considering the constituent particles as identical hard spheres and build up the three dimensional structure in three steps. a) close packing one-dimension b) close packing in two-dimension c) close packing in three dimension. Two types of voids namely tetrahedral voids and octahedral voids involved in close packed structures. 1) What is the coordination number in a square close packed structure in two dimensions? i) 3 ii) 4 iii) 6 iv) 2	ii)
2.	2) The correct order of packing efficiency in different types of unit cells is i) bcc < fcc > simple cubic ii) fcc < bcc <simple cubic iii) fcc > bcc > simple cubic iv) fcc < bcc > simple cubic	iii)
3.	3) The total number of tetrahedral voids in the face centered unit cell is i) 12 ii) 6 iii) 8 iv) 10	iii)
4.	4) The percentage of empty space in a face centered cubic arrangement is i) 74 ii) 68 iii) 32 iv) 26	iv)

1.	**Passage III** **Read the passage given below and answer the questions that follow:** Crystalline solids can be classified in different types on the basis of nature of intermolecular forces or bonds that hold the constituent particles together. These are Vander Waals forces, ionic bonds, covalent bonds and metallic bonds. on this basis Crystalline solids further classified in to molecular, ionic, metallic and covalent solids. Crystalline solids are anisotropic in nature whereas amorphous solids are isotropic in nature. 1) Which of the following is not a characteristic of a Crystalline solids? i) A regular periodically repeated pattern of arrangement of constituent in the crystal lattice ii) Definite and characteristic heat of fusion iii) properties of crystalline solids like electrical resistance or refractive index show different values when measured along different directions iv) properties of crystalline solids like electrical conductivity or refractive index show same values when measured in all directions	iv)
2.	2) CCl4 molecules are held in the crystal lattice by i) dipole- dipole interactions ii) dispersion forces iii) columbic forces iv) dipole –induced dipole interactions	ii)
3.	3) Which of the following is a network solid? i) H2 O (ice) ii) SO2 (solid) iii) diamond iv) I2	iii)
4.	4) The lattice site in a pure crystal cannot be occupied by i) ion ii) electron iii) molecule iv) atom	iv)

1.	**Assertion and Reason Questions:** **In the following questions a statement of Assertion (A) followed by a statement of Reason (R) is given. Choose the correct answer out of the following choices.** Assertion and Reason both are correct statements and Reason is correct explanation for Assertion. Assertion and Reason both are correct statements but Reason is not correct explanation for Assertion. Assertion is correct statement but Reason is wrong statement. Assertion is wrong statement but Reason is correct statement. 1) Assertion (A): Tetrahedral void is bigger than octahedral void. Reason (R): Octahedral void refers to six touching spheres, whereas tetrahedral void refers to four touching spheres.	a)
2.	2) Assertion (A): Packing efficiency is maximum in face centered cubic structure. Reason (R): In fcc structure, each sphere is in contact with twelve spheres.	a)
3.	3) Assertion (A): The total number of atoms present in a simple cubic unit cell is one. Reason (R): Simple cubic unit cell has atoms at its corners, each of which is shared between eight adjacent unit cells.	a)
4.	4) Assertion (A): Graphite is a good conductor of electricity, however diamond belongs to the category of insulators Reason (R): Graphite is soft nature on the other hand diamond is very hard.	b)
5.	5) Assertion (A): Crystalline solids exhibit isotropy. Reason (R): The constituent particles in a crystalline solid are arranged in an orderly arrangement	d)
6.	6) Assertion (A:) The density of a crystalline substance remains the same. Reason (R): Due to schottky defect.	c)
7.	7) Assertion (A): AgCl shows Frenkel defect. Reason (R): The substance in which there is a large difference in the size of ions.	a)
8.	8) Assertion (A): Due to frenkel defect there is no effect on the density of the crystalline solid Reason (R:) In frenkel defect no cation and anion leaves the crystal lattice	a)

9.	9. Assertion**:** Metal deficiency defect can be seen in FeO.	c)

	Reason**:** Li compound (LiCl) has pink colour due to F- centre. Ans: (b)	
10.	10. Assertion: The number of tetrahedral voids is double the number of octahedral voids. Reason: The size of tetrahedral voids is half that of the octahedral void. Ans: (c)	c)

1.	**LESSON:1. SOLID STATE(2)** **SAMPLE QUESTIONS ON ASSERTION AND REASON TYPE:** **Note: In the following questions of Solid State a statement of assertion followed by a statement of reason is given. Choose the correct answer out of the following choices.** (a) Both assertion and reason are true and the reason is the correct explanation of assertion. (b) Both assertion and reason are true but the reason is not the correct explanation of assertion. (c) Assertion is true but reason is false. (d) Assertion is false but reason is true. 1.Assertion : The total number of atoms present in a face centered cubic unit cell is four. Reason : Face centered cubic unit cell has atoms at its corners, each of which is shared between eight adjacent unit cells and atom at the center of the six faces. Ans: (a)	a)
2.	2.Assertion : Total number of octahedral voids present in unit cell of cubic close packing including the one that is present at the body center is four. Reason : Besides the body center there is one octahedral void present at the center of each of the six faces of the unit cell and each of which is shared between two adjacent unit cells. Ans: (c)	c)
3.	3. Assertion: Group-13 doped crystals of silicon are responsible for the semi-conducting properties. Reason: Holes (positive in charge) are responsible for the semi-conducting properties. Ans: (a)	a)
4.	4. Assertion : Due to the Frenkel defect the density of the crystalline solid remains same. Reason: In Frenkel defect, no cations or anions leave the lattice Ans: (a)	a)
5.	5. Assertion: In an ionic solid [MX] with Schottky defects, the number of missing positive and negative ions is the same. Reason: Equal number of cation and anion vacancies are present. Ans: (a)	a)

6.	6. Assertion: The Frenkel defect is not shown by alkali metal halides. Reason: The size of the cation is too big to be accommodated in the interstitial space. Ans: (a)	a)
7.	7. Assertion: The radius of copper atom is 128pm. it crystallizes in a face centered cubic structure. Reason: The length of the edge of the unit cell is 256pm. Ans: (c)	c)
8.	8. Assertion: $CaCO_3$ shows polymorphism. Reason: $CaCO_3$ exists in two forms called aragonite and calcite. Ans: (a)	a)
9.	9. Assertion: Metal deficiency defect can be seen in FeO. Reason: Li compound (LiCl) has pink colour due to F-centre. Ans: (b)	b)
10.	10. Assertion: The number of tetrahedral voids is double the number of octahedral voids. Reason: The size of tetrahedral voids is half that of the octahedral void. Ans: (c)	c)
1.	**Case Based Questions:** Packing refers to the arrangement of constituent units in such a way that the force of attraction among the constituent particles is maximum and the constituents occupy the maximum available space. In two-dimensions there are square close packing and hexagonal close packing. In three-dimensions, however, there are hexagonal close packing, cubic close packing and body-centered cubic packing. hcp: AB AB AB AB… arrangement co-ordination number is =12 percentage occupied space is= 74 ccp: ABC ABC …..arrangement co-ordination number is =12 percentage occupied is= 74 bcc: 68% space is occupied co-ordination number is 8 Answer the following questions:	c)

	1.The empty space left in hcp in three-dimensions is (a) 52.4% (b) 80% (c) 26% (d) 74% Ans: (c)	
2.	2. In closed packed lattice containing n particles, the number of tetrahedral and octahedral voids are (a). 2n, n (b). n, n (c). n,2n (d). 2n ,n/2 Ans: (a)	a)
3.	3. The pattern of successive layers of hcp arrangement can be designed as (a). AB AB AB AB… (b). ABC ABC… (c). AB ABC AB ABC … (d). AB BA AB BA … Ans: (a)	a)
4.	4. The space occupied by spheres in bcc arrangement is (a) 70% (b) 68% (c) 74% (d) 26% Ans: (b)	b)
5.	5. A certain oxide of metal M crystallizes in such a way that O2- occupy hcp arrangement following AB AB ….. . pattern the metal ions however, occupy 2/3rd of the octahedral voids. The formula of the compound is (a). MO2 (b). M3O (c). M2O3 (d). M8/3 O3 Ans: (c)	c)
6.	6. Which type of stacking pattern is found in sodium chloride crystal lattice (a). A-B-A-B (b). A-A-A (c). ABC-ABC-ABC (d). None of these Ans: ©	c)

7.	7.Ionic solids are composed of anions and cations that are held together by electrostatic forces. For example, common salt, NaCl, contains Na+ and Cl- ions. Ionic solids have high melting points, they are hard and brittle and conduct electricity when molten or in solution. Covalent solids are made up of atoms of the same or different elements held together by a network of covalent bonds. Diamond is the moist example of a covalent solid. Silicon and silicon dioxide are also covalent solids. These solids are very hard, strong and have high melting points due the presence of strong covalent bonds. The oxide of silicon, SiO_2 exists in several forms with crystal structures. Such different forms of the compound are called polymorphs and the phenomenon, polymorphism. 7. During the formation of a solid, (a) Some energy is lost (b) some energy is gained (c) Energy remains constant (d) some energy may be gained or lost depending on the system Ans: (a)	a)
8.	8. Molecular solids have (a) Very low melting points (b) Very high melting points (c) fairly low melting points (d) None of these Ans: (c)	c)
9.	9. Among the following, the strongest bond is the (a) hydrogen bond (b) metallic bond (c) covalent bond (d) Ionic bond Ans: (d)	d)
10	10. Metallic solids are generally (a) soft and plastically deformable (b) Malleable and ductile (c) hard brittle (d) none of these Ans: (b)	b)

Q.no	Topic: solid state(3) Questions: Multiple choice questions:	Answers:
1.	1) The edge length of the unit cell in terms of the radius of spheres constituting body centred cubic unit cell a) a= 4r/ √3 b) a= 2r c) a=4r d) a= 2 √2r	a)
2.	2) Graphite cannot be classified as a) Network solid b) conducting solid c) ionic solid d) covalent solid	c)
3.	3) Which of the following statements is not true about amorphous solids? a) They are anisotropic in nature b) On heating they may become crystalline on certain temperature c) They may become crystalline on keeping for long time d) Amorphous solids can be moulded by heating	a)
4.	4) Schottky defect is generally appears in a) KCl b) Cscl c) NaCl d) all of these	d)
5.	5) Which statement does not make sense ? a) Frenkel defect is not found in alkali metal halides b) Schottky defect lowers the density of the crystal c) Frenkel defect lowers the density of the crystal d) Schottky defect is very common in alkali metal halides	c)
6.	6) Doping of AgCl crystals with $CdCl_2$ results in a) Formation of F^- centres b) substitutional cation vacancy c) schottky defect d) frenkel defect	b)
7.	7) Cations are present in the interstitial sites in a) Metal deficiency defect b) vacancy defect c) frenkel defect d) schottky defect	c)

8.	8) Which of the following also known as dislocation defect ? a) Metal excess defect b) frenkel defect c) non stoichiometric defect d) schottky defect	a)
9.	9) Which of the following crystals does not exhibit frenkel defect ? a) a) ZnS b) Agcl c) KBr d) AgBr	c)
10.	10) The crystal with metal deficiency defect is a) FeO b) NaCl c) NaI d) ZnO	a)
11.	11) What type of solid 'quartz' is ? a) Molecular solid b) Covalent solid c) Ionic solid d) Metallic solid	b)
12.	12) Which type of solid conduct electricity in molten state but not in solid state ?. a) Covalent b) metallic c) ionic d) molecular	c)
13.	13) Which of the following is an amorphous solid ? a) Graphite (C) b) Quartz glass (SiO_2) c) Chrome alum d) Silicon carbide (SiC)	b)
14.	14) Which of the following is true about the value of refractive index of quartz glass? a) Same in all directions b) Different in different directions c) Cannot be measured d) Always zero	a)
15.	15) What is the coordination number in a hexagonal close packed structure in three dimensions? a) 9 b) 6 c)12	c)

	d) 4	
16.	16) What type of defect is produced when NaCl is doped with $SrCl_2$? a) Dislocation defect b) impurity defect c) metal excess defect d) schottky defect	b)
17.	17) The Appearance of colour in solid alkali metal halides is generally due to a) vacancy defect b) F^-centres c) interstitials d) metal deficiency defect	b)
18.	18) In FCC crystal lattice , Number of atoms per unit cell : a) 2 b) 1 c) 4 d) none of the above	c)
19.	19) A compound is formed by two elements M and N . The element N forms hcp and atoms of M occupy 2/3 rd of octahedral voids . What is the formula of the compound ? a) M_2N_3 b) MN c) M_3N_2 d) MN_3	c)
20.	20) Which of the following arrangements correctly represents ccp and hcp in three dimensions respectively ? a) ABCABC.... and ABAB... b) ABAB... and ABCABC... c) Both have ABAB .... arrangement d) ABCABC.... arrangement	a)