
	INDIAN SCHOOL AL WADI AL KABIR	
Class: XII	DEPARTMENT: SCIENCE 2021-22 SUBJECT: CHEMISTRY	Date of completion: II week of September, 2021
Worksheet No:07 with answers	TOPIC: THE SOLID STATE	Note: A4 FILE FORMAT
NAME OF THE STUDENT	CLASS & SEC:	ROLL NO.

MULTIPLE CHOICE QUESTIONS

- Which one of the following is an example of molecular solid?
 - NaCl
 - Mg
 - Diamond
 - I₂
- Solid A conducts electricity in molten state but not in solid state. Identify the solid.
 - NaCl
 - Fe
 - CCl₄
 - Diamond
- Which of the following statements is true for graphite?
 - It is a molecular solid
 - It is the hardest substance known
 - It is a good conductor of electricity
 - Each carbon is bonded to 4 other carbon atoms

4. Identify a solid which is an electrical conductor, malleable and ductile.
- a) CaO b) Zn
- c) CO₂ d) Diamond
5. How many atoms constitute one-unit cell of fcc?
- a) 1 b) 2
- c) 4 d) 6
6. What is the coordination number of hexagonal close packing of spheres in two dimensions?
- a) 6 b) 4
- c) 8 d) 12
7. Atoms of element B form hcp lattice and those of the element A occupy 1/3rd of tetrahedral voids. What is the formula of the compound formed by the elements A and B?
- a) AB₃
- b) A₃B
- c) A₃B₂
- d) A₂B₃
8. Packing Efficiency of simple cubic lattice is
- a) 68 %
- b) 52.4%
- c) 74%
- d) 54.2 %
9. The compound that shows both Frenkel and Schottky defects is
- a) AgCl
- b) ZnS
- c) AgBr
- d) NaCl

10. Due to Interstitial defect, the density of the substance
- a) increases
 - b) decreases
 - c) remains the same
 - d) None of these

Read the given passage and answer the questions that follow:

Usually a solid consists of an aggregate of large number of small crystals. These small crystals have defects in them. This happens when crystallisation process occurs at fast or moderate rate. Single crystals are formed when the process of crystallisation occurs at extremely slow rate. Even these crystals are not free of defects. The defects are basically irregularities in the arrangement of constituent particles. Broadly speaking, the defects are of two types; point defects and line defects. Point defects are the irregularities or deviations from ideal arrangement around a point or an atom in a crystalline substance, whereas the line defects are the irregularities or deviations from ideal arrangement in entire rows of lattice points. These are called crystal defects.

- 11. Name the stoichiometric defect that can be developed when a substance is heated.
- 12. NaCl shows Schottky defect. Why?
- 13. F-centres impart colour to the crystals. Explain.

Assertion and Reasoning Questions

14. **Assertion:** ZnS shows Frenkel defect.

Reason: This is due to the smaller size of Zn^{2+} ion compared S^{2-} to ion.

- a) Assertion and reason both are correct statements and reason is correct explanation for assertion.
 - b) Assertion and reason both are correct statements but reason is not correct explanation for assertion.
 - c) Assertion is correct statement but reason is wrong statement.
 - d) Assertion is wrong statement but reason is correct statement.
15. **Assertion:** Zinc oxide is white at room temperature. On heating it turns yellow.

Reason: This is because of metal excess defect due to the presence of extra anions at interstitial sites.

- a) Assertion and reason both are correct statements and reason is correct explanation for assertion.
- b) Assertion and reason both are correct statements but reason is not correct explanation for assertion.
- c) Assertion is correct statement but reason is wrong statement.
- d) Assertion is wrong statement but reason is correct statement.

16. Assertion: Metals conduct electricity even in the solid state

Reason: Metals are ductile and malleable.

- a) Assertion and reason both are correct statements and reason is correct explanation for assertion.
- b) Assertion and reason both are correct statements but reason is not correct explanation for assertion.
- c) Assertion is correct statement but reason is wrong statement.
- d) Assertion is wrong statement but reason is correct statement.

17. Assertion: Packing efficiency in Body centred cubic structures is more than that in fcc.

Reason: Two atoms constitute the unit cell of bcc and 4 atoms constitute the unit cell of fcc.

- a) Assertion and reason both are correct statements and reason is correct explanation for assertion.
- b) Assertion and reason both are correct statements but reason is not correct explanation for assertion.
- c) Assertion is correct statement but reason is wrong statement.
- d) Assertion is wrong statement but reason is correct statement.

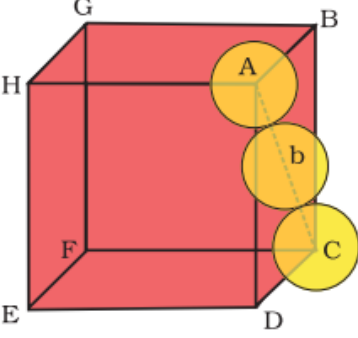
Question – Answer Type:

- 18.** Atoms of element Q form hcp lattice and those of the element P occupy $\frac{1}{4}$ th of octahedral voids. What is the formula of the compound formed by the elements P and Q? **1**
- 19.** Identify the non-stoichiometric defect responsible for the yellow colour of ZnO at high temperatures. **1**

20. Amorphous solids are called pseudo solids or super cooled liquids. Why? 1
21. Derive the packing efficiency in hcp and ccp structures. 2
22. Analysis shows that manganese oxide has the formula $Mn_{0.91}O_{1.00}$. What fractions of manganese exist as Mn^{2+} and Mn^{3+} ions? 2
23. An element with density 11.2 g cm^{-3} forms a fcc lattice with edge length of $4 \times 10^{-8} \text{ cm}$. Calculate the atomic mass of the element. 2
24. An element crystallizes in a fcc lattice with cell edge of 250 pm. Calculate the density if 300 g of this element contains 2×10^{24} atoms. 3
25. (a) What type of stoichiometric defect is shown by AgCl and why? 3
(b) Calculate the efficiency of packing in case of a metal crystal for simple cubic unit cell.

ANSWERS

1.	d) I_2
2.	a) NaCl
3.	c) It is a good conductor of electricity
4.	b) Zn
5.	c) 4
6.	a) 6
7.	d) A_2B_3
8.	b) 52.4%
9.	c) AgBr
10.	a) increases
11.	Vacancy defect
12.	Na^+ and Cl^- are of almost similar sizes.
13.	The colour results by excitation of unpaired electrons when they absorb energy from the visible light falling on the crystals.
14.	a) Assertion and reason both are correct statements and reason is correct explanation for assertion.
15.	c) Assertion is correct statement but reason is wrong statement.
16.	b) Assertion and reason both are correct statements but reason is not correct explanation for assertion.
17.	d) Assertion is wrong statement but reason is correct statement.
18.	PQ_4

19.	Metal excess defect due to the presence of extra cations at interstitial sites.
20.	Like liquids, amorphous solids tend to flow, though very slowly. Therefore, sometimes these are called pseudo solids or super cooled liquids.
21.	 <p>In ΔABC $AC^2 = b^2 = BC^2 + AB^2$ $= a^2 + a^2 = 2a^2$ or $b = \sqrt{2}a$</p> <p>If r is the radius of the sphere, we find $b = 4r = \sqrt{2}a$ or $a = \frac{4r}{\sqrt{2}} = 2\sqrt{2}r$</p> <p>Packing efficiency = $\frac{\text{Volume occupied by four spheres in the unit cell} \times 100}{\text{Total volume of the unit cell}} \%$</p> $= \frac{4 \times \left(\frac{4}{3}\right) \pi r^3 \times 100}{(2\sqrt{2}r)^3} \%$ $= \frac{(16/3) \pi r^3 \times 100}{16\sqrt{2}r^3} \% = 74\%$
22.	$Mn^{2+} - 73/91$ $Mn^{3+} - 18/91$
23.	$d = \frac{zM}{a^3 N_a}$ $z = 4$ $11.2 = \frac{4 \times M}{(4 \times 10^{-8})^3 \times (6.02 \times 10^{23})}$ <p>$M = 107.9 \text{ g/mol}$ Atomic mass = 107.9 u</p>
24.	2×10^{24} atoms weigh = 300g 6.023×10^{23} weigh = $\frac{300 \times 6.023 \times 10^{23}}{2 \times 10^{24}} = 90.3\text{g}$ $\rho = \frac{(zM)}{a^3 \times N_a}$ $= \frac{4 \times 90.3}{[(250 \times 10^{-10})^3 \times 6.022 \times 10^{23}]}$ $= 38.4 \text{ g cm}^{-3}$

25.

a) Frenkel defect; Due to the large difference in size of ions.

b)

Packing efficiency

$$= \frac{\text{Volume of one atom}}{\text{Volume of cubic unit cell}} \times 100\%$$

$$= \frac{4}{3} \frac{\pi r^3}{8r^3} \times 100 = \frac{\pi}{6} \times 100$$

$$= 52.36\% = 52.4 \%$$

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