

## Unit 6 - Classification of Ionic Solids

## Course outline

## How to access the portal?

## Introduction to Materials

## Introduction to Crystallography

## Structures of Materials

## Solid Solutions &amp; Structures

## Classification of Ionic Solids

Lecture 21: Ionic Solids: Stability & Rules of Formation

Lecture 22: Ionic Solids (contd.): Formation of structure

Lecture 23: Ionic Solids (contd.): Close Packing of anions

Lecture 24: Ionic Solids (contd.): Other cubic structures

Lecture 25: Ionic Solids (ceramics): Remaining cubic & non-cubic structures

Quiz : Assignment-5

Assignment-5: Solution

## Non-Crystalline Solids

## Structure Determination

## Imperfections in Solids

## Week-0

## Assignment-5

The due date for submitting this assignment has passed.  
As per our records you have not submitted this assignment.

**Due on 2019-10-02, 23:59 IST.**

1) In ionic solids, electrostatic energy of the solid is minimum when:

1 point

- anions and cations touch each other.
- anions are close enough without touching each other.
- maximum ligancy is obtained
- cations and anions are a little away from each other.

No, the answer is incorrect.

Score: 0

Accepted Answers:

*anions and cations touch each other.*

*anions are close enough without touching each other.*

*maximum ligancy is obtained*

2) The bond energy of an ionic solid:

1 point

- increases as number of atoms increase.
- increases when atomic separation increases.
- increases when the value of Madelung constant increases.
- increases when the valence of the constituent ions increases.

No, the answer is incorrect.

Score: 0

Accepted Answers:

*increases when the value of Madelung constant increases.*

*increases when the valence of the constituent ions increases.*

3) Lattice and Motif of  $\text{CaF}_2$  is described as:

1 point

- Primitive Cubic, Ca: 0 0 0, F:  $1/4$   $1/4$   $1/4$  and  $3/4$   $1/4$   $1/4$
- FCC, Ca: 0 0 0, F:  $1/4$   $1/4$   $1/4$  and  $3/4$   $1/4$   $1/4$
- FCC, F: 0 0 0,  $1/2$  00, Ca:  $1/4$   $1/4$   $1/4$
- FCC, Ca: 0 0 0, F:  $1/4$   $1/4$   $1/4$

No, the answer is incorrect.

Score: 0

Accepted Answers:

*FCC, Ca: 0 0 0, F:  $1/4$   $1/4$   $1/4$  and  $3/4$   $1/4$   $1/4$*

*FCC, F: 0 0 0,  $1/2$  00, Ca:  $1/4$   $1/4$   $1/4$*

4) What is the coordination number of F-atom in  $\text{CaF}_2$  ionic solid? Given that radius ratio of cation to anion is 0.75.

1 point

- 4
- 6
- 8
- 12

No, the answer is incorrect.

Score: 0

Accepted Answers:

*4*

5) For an ionic solid, the bond strength rule is used to:

1 point

- determine the bond energy.
- determine the electrostatic energy.
- determine the stability.
- determine the charge neutrality.

No, the answer is incorrect.

Score: 0

Accepted Answers:

*determine the charge neutrality.*

6) What is the coordination number of Fe-atom in  $\text{FeO}$ ? Given: ionic radii of  $\text{Fe}^{2+}$  and  $\text{O}^{2-}$  are 77pm and 140pm respectively.

1 point

- 2
- 4
- 6
- 8

No, the answer is incorrect.

Score: 0

Accepted Answers:

*6*

7) Consider the polyhedron model of zinc blende structure. The tetrahedrons are stacked along which of the following crystallographic directions?

1 point

- [100]
- [110]
- [111]
- [123]

No, the answer is incorrect.

Score: 0

Accepted Answers:

*[111]*

8) A rock salt (MX) structured solid can be described as:

1 point

- X ions make a FCC lattice and M ions occupy the octahedral interstices.
- X ions make a FCC lattice and M ions occupy the tetrahedral interstices.
- Both X and M ions form FCC lattices.
- M ions make a FCC lattice and X ions occupy the octahedral interstices.

No, the answer is incorrect.

Score: 0

Accepted Answers:

*X ions make a FCC lattice and M ions occupy the octahedral interstices.*

*Both X and M ions form FCC lattices.*

*M ions make a FCC lattice and X ions occupy the octahedral interstices.*

9) In cubic Zinc sulphide ( $\text{ZnS}$ ) structure, bond strength of cations is:

1 point

- $1/3$
- 1
- $1/2$
- $1/4$

No, the answer is incorrect.

Score: 0

Accepted Answers:

*$1/2$*

10) In anti-fluorite structure coordination number of cations and anions are respectively

1 point

- 4 and 4
- 8 and 8
- 4 and 8
- 8 and 4

No, the answer is incorrect.

Score: 0

Accepted Answers:

*4 and 8*

11) In inverse spinel structured  $\text{NiFe}_2\text{O}_4$ , which is true?

1 point

- O forms the FCC lattice and Ni and Fe occupy only the tetrahedral voids.
- O forms the FCC lattice, 50% Fe occupy the tetrahedral voids and remaining 50% Fe occupy octahedral voids.
- O forms the FCC lattice and Ni occupy the tetrahedral voids while Fe occupy octahedral voids.
- O forms the FCC lattice and Fe occupy the tetrahedral voids while Ni occupy octahedral voids .

No, the answer is incorrect.

Score: 0

Accepted Answers:

*O forms the FCC lattice, 50% Fe occupy the tetrahedral voids and remaining 50% Fe occupy octahedral voids.*

12) For Perovskite structured  $\text{SrTiO}_3$ ,

1 point

- Ti ions have octahedrally coordination by anions.
- Sr ions have eight-fold coordination by anions.
- O ions are coordinated by 2 Ti ions.
- O ions are coordinated by 6 Sr ions.

No, the answer is incorrect.

Score: 0

Accepted Answers:

*Ti ions have octahedrally coordination by anions.*

*O ions are coordinated by 2 Ti ions.*

13) Which of the following materials has/have cubic coordination of both cations and anions?

1 point

- NaCl
- CsCl
- $\text{ReO}_3$
- $\text{CaF}_2$

No, the answer is incorrect.

Score: 0

Accepted Answers:

*CsCl*

14)  $\text{ReO}_3$  structure can be described by:

1 point

- Perovskite  $\text{ABO}_3$  structure with A atoms missing
- Perovskite  $\text{ABO}_3$  structure with B atoms missing
- FCC Lattice
- Simple Cubic Lattice

No, the answer is incorrect.

Score: 0

Accepted Answers:

*Perovskite  $\text{ABO}_3$  structure with A atoms missing*

*Simple Cubic Lattice*

15) If Ba is used as a dopant in a perovskite  $\text{PbTiO}_3$ , which site is it likely to go to?

1 point

- Pb sites
- Ti sites
- Either of Pb or Ti site
- Oxygen site

No, the answer is incorrect.

Score: 0

Accepted Answers:

*Pb sites*