Assignment 2

The due date for submitting this assignment has passed. Due on 2018-09-05, 23:59 IST.

As per our records you have not submitted this assignment.

1) Which statement is NOT true regarding a defect reaction?

- Radio of regular cation and anion sites is conserved.
- Mass balance to be preserved.
- Electrical neutrality is to be preserved.
- Defect reactions result in significant changes in the number of surface atoms.

No, the answer is incorrect.

Score: 0

Accepted Answers:

Defect reactions result in significant changes in the number of surface atoms.

2) (Note: Q2 and Q3 are based on this figure).

(2) What is the radius of the largest sphere that can be placed in a tetrahedral void with pushing the spheres apart, given that radius of surrounding atoms is $r$?
3) What is the coordination number of a tetrahedral void?  

- 6
- 4
- 8
- 2

No, the answer is incorrect.

Score: 0

Accepted Answers:

41

(3) What is the coordination number of a tetrahedral void?

4) (Note: Q4 and Q5 are based on this figure).

(4) What is the radius of the largest sphere that can be placed in an octahedral void without pushing the spheres apart, given that radius of surrounding atoms is ‘r’?

- 0.225r
- 0.723r
- 0.414r
- 0.500r

No, the answer is incorrect.

Score: 0

Accepted Answers:

41

5) What is the coordination number of an octahedral void?

- 8
- 4
- 6
- 2

Score: 0

Accepted Answers:

41
6) Calculate the number of Frenkel defect pair (cation-vacancy and cation-interstitial defect pair) at 700K. It is given that energy for the formation of each pair of Frenkel defect is 5eV and total number of lattice sites is $1.8 \times 10^{28}$ lattice sites/m$^3$. You can assume that vibrational entropy contribution is negligible.

- $0.91 \times 10^{10}$ defects/m$^3$
- $1.92 \times 10^{09}$ defects/m$^3$
- $1.72 \times 10^{11}$ defects/m$^3$
- $1.82 \times 10^{10}$ defects/m$^3$

7) Calculate the number of Schottky defect pair (cation-vacancy and anion-vacancy defect pair) per cubic meter in Potassium Chloride at 700 °C. It is given that the energy of formation for each pair of Schottky defect is 3.2 eV, while the density of KCl is 1.955g/cm$^3$.

- $8.2 \times 10^{19}$ defects/m$^3$
- $10.2 \times 10^{19}$ defects/m$^3$
- $6.2 \times 10^{20}$ defects/m$^3$
- $6.2 \times 10^{19}$ defects/m$^3$

8) According to the Kroger-Vink notation, what does $\text{Ni}^{x+}_{\text{Cu}}$ represents?

- Nickel ion sitting on a Copper lattice site, with no net change in the total charge for the site.
- Nickel ion sitting on a Copper lattice site, with a negative charge for the Ni ion.
- Copper ion sitting on a Nickel lattice site, with no net change in the total charge for the site.
- Copper ion sitting on a Nickel lattice site, with no net change in the total charge for the site.

9) Which of the following reactions correctly represents a Frenkel defect formation in MgO?

- $\text{Mg}^{x}_{\text{Mg}} + \text{O}^{y}_{\text{O}} \rightleftharpoons \text{Mg}^{y+}_{\text{i}} + \text{V}^{-}_{\text{Mg}} + \text{O}^{y}_{\text{O}}$
- $\text{Mg}^{x}_{\text{Mg}} + \text{O}^{y}_{\text{O}} \rightleftharpoons \text{O}^{y+}_{\text{i}} + \text{V}^{y+}_{\text{O}} + \text{Ni}^{x+}_{\text{Mg}}$
- $\text{Mg}^{x}_{\text{Mg}} + \text{O}^{y}_{\text{O}} \rightleftharpoons \text{O}^{y+}_{\text{i}} + \text{Mg}^{x}_{\text{O}}$
- $\text{Mg}^{x}_{\text{Mg}} + \text{O}^{y}_{\text{O}} \rightleftharpoons \text{Mg}^{y+}_{\text{O}} + \text{O}^{y-}_{\text{Mg}}$

10) Which of the following reaction shows a Schottky defect formation in MgO?
No, the answer is incorrect.
Score: 0
Accepted Answers:
\[ Mg^\times_{Mg} + O^\times_O \rightleftharpoons V^\times_{Mg} + Mg^\times_{surface} + O^\times_O \]