Unit 3 - Week 2

Assignment 2

The due date for submitting this assignment has passed. As per our records you have not submitted this assignment. Due on 2018-08-15, 23:59 IST.

1) Consider a binary system where two phases are co-existing in equilibrium. Which property of the phases should be same for maintaining the equilibrium?

- Free energy.
- Enthalpy.
- Chemical potential.
- Enthalpy of mixing.

No, the answer is incorrect.
Score: 0

Accepted Answers:
Chemical potential.

2) According to Fick's second law, if a composition profile has a convex curvature at a point, then the composition at that point ________ with time?

- Increases.

Score: 0
3) Movement of atoms in a binary diffusion couple **always** takes place **1 point** in such a way that

- Composition is reduced to zero.
- Composition gradient is maximized.
- Composition gradient is evened out.
- Chemical potential gradient is evened out.

No, the answer is incorrect.
Score: 0

Accepted Answers:

Chemical potential gradient is evened out.

4) As shown in the figure, the chemical potential of A at composition 1 ($\mu_A^1$) is greater than **1 point** at composition 2 ($\mu_A^2$) (case A) and the chemical potential of B at composition 2 ($\mu_B^2$) is greater than at composition 1 ($\mu_B^1$) (case B). So in this two cases the flux of A and B atoms are:

- Case A: 2 to 1 and case B: 1 to 2.
- Case A: 1 to 2 and case B: 2 to 1.

There will be flux, only if in case A: $\mu_B^2 - \mu_A^1 = 0$ and in case B: $\mu_A^2 - \mu_B^1 = 0$ conditions are satisfied.

No, the answer is incorrect.
Score: 0

Accepted Answers:

Case A: 1 to 2 and case B: 2 to 1.

5) According to Fick’s first law, the direction of atomic flux is **1 point**

- Along the direction of concentration gradient.
- Opposite to the direction of a concentration gradient.
- Perpendicular to the direction of concentration gradient.
- None of the above.

No, the answer is incorrect.
Score: 0

Accepted Answers:

Opposite to the direction of a concentration gradient.

6) The point at which $\frac{\partial^2 G}{\partial x^2}$ is zero (where x represents composition) on the free energy versus
composition curve is called a _____________________ point.

No, the answer is incorrect.
Score: 0
Accepted Answers:
(String) spinodal

7) The dimensions of diffusivity are:

- \(LT^{-2}\)
- \(ML^2T^{-1}\)
- \(L^2T^{-2}\)
- \(MLT^{-2}\)

No, the answer is incorrect.
Score: 0
Accepted Answers:
\(L^2T^{-2}\)

8) The total distance moved by a carbon atom in γ-iron (for \(D = 2.5 \times 10^{-11}\) in SI units) for \(t_1 = 10\) s is \(x_1\) and \(t_2 = 5\) s is \(x_2\), then, the ratio \(\frac{x_1}{x_2}\):

- \(\frac{1}{\sqrt{2}}\)
- \(\sqrt{2}\)
- 2
- \(\sqrt{3}\)

No, the answer is incorrect.
Score: 0
Accepted Answers:
\(\sqrt{2}\)

9) The constant which relates the concentration gradient and the atomic flux is:

- Conductivity.
- Diffusivity.
- Mobility.
- None of the above.

No, the answer is incorrect.
Score: 0
Accepted Answers:
Diffusivity.
As shown in the figure, in certain cases, the diffusion takes place against composition gradient; in other words, the diffusivity becomes effectively negative. This for the following reason:

- Mobility is negative.
- Curvature of $G$ vs $x$ curve is negative.
- Curvature of $G$ vs $x$ curve is positive.
- None of the above.

**No, the answer is incorrect.**

**Score:** 0

**Accepted Answers:**

- *Curvature of $G$ vs $x$ curve is negative.*