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NPTEL

Courses » **Phase field modelling: the materials science, mathematics and computational aspects**

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Unit 12 - Week 11

Course outline

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○ Module 18 - Lecture 70 : Spinodal decomposition in 2D

○ Module 18 - Lecture 71 : Order-disorder transformation

○ Module 18 -

Assignment 11

The due date for submitting this assignment has passed.
As per our records you have not submitted this   **Due on 2018-10-17, 23:59 IST.**
assignment.

1) Consider two cases of two-phase equilibrium; in the first case, the interface between the   ***1 point***
two phases in equilibrium is flat but in the other case, it is curved with a radius of curvature R. If we
consider the two phase equilibrium at the same composition from a phase diagram, which of these two
cases does it represent?

○ Case 1

○ Case 2

○ both cases

○ neither of the cases

No, the answer is incorrect.
Score: 0

Accepted Answers:
Case 1

2) Generate an initial profile of the form : $c(i) = 0.5 + 0.001 * (1 - rand())$; in GNU   ***1 point***
Octave and evolve this using the Cahn-Hilliard script. The parameters to be used are
: $N = 128, \ A = 1, \ \kappa = 1$. The simulation is to be run for 4000 time steps. The resulting profile is
phase separated. What can be said about the average composition of the simulation domain at this
timestep?

○ same as the initial profile

○ slightly higher than the initial profile

○ slightly smaller than the initial profile

○ zero

No, the answer is incorrect.
Score: 0

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◯ not same as the initial profile

No, the answer is incorrect.
Score: 0

Accepted Answers:
not same as the initial profile

4) State whether true or false : "In the following image, precipitate and matrix compositions along the central line of a 2-D simulation, consisting of a circular precipitate embedded in a matrix, are shown at the beginning of the simulation and at a later time step. The compositions of the phases have deviated from equilibrium values of zero and unity for the matrix and precipitate phases, respectively. This change is because of the Gibbs-Thomson effect"
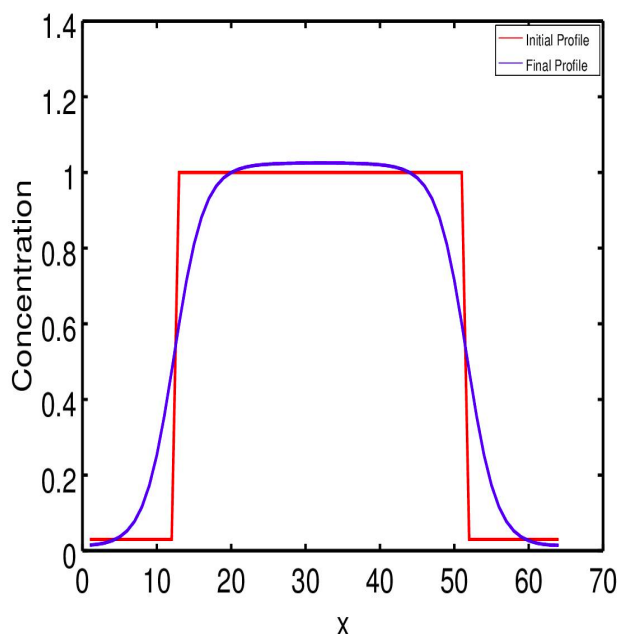
No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: String) true

1 point

5) State whether true or false: "In a solid solution with two precipitates of radii r_1 and r_2, (where $r_2 > r_1$) the precipitate 1 will grow at the expense of precipitate 2."

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: String) false

1 point

6) In a coupled Cahn-Hilliard-Allen-Cahn formulation, which among the following options is a   *1 point* good choice for the free energy functional? The free energy profile should be constructed in such a way that there is a minima when the order parameters are 0 and 1 respectively.
(Note: Here, A, B and P are coefficients and $W(\phi)$ represents a fifth order interpolation polynomial which goes from zero to unity smoothly)

○

$$Ac^2(1 + W(\phi)) + B(1 + c)^2 W(\phi) + P\phi^2(1 + \phi)^2$$

○

$$Ac^2(1 - W(\phi)) + B(1 - c)^2 W(\phi) + P\phi^2(1 + \phi)^2$$

○

$$Ac^2(1 - W(\phi)) + B(1 + c)^2 W(\phi) + P\phi^2(1 + \phi)^2$$

○

$$Ac^2(1 - W(\phi)) + B(1 - c)^2 W(\phi) + P\phi^2(1 - \phi)^2$$
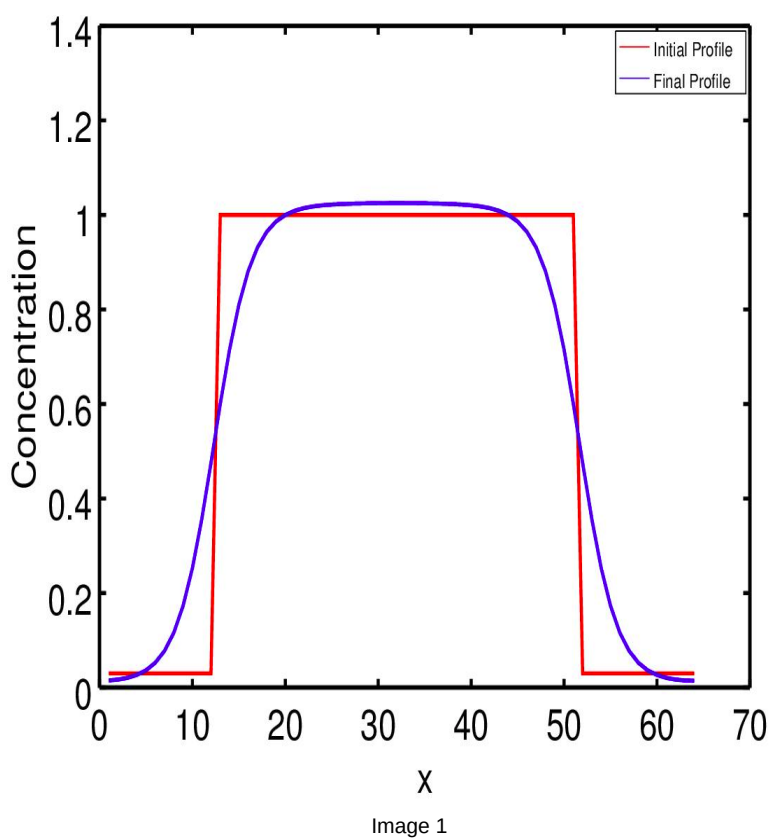
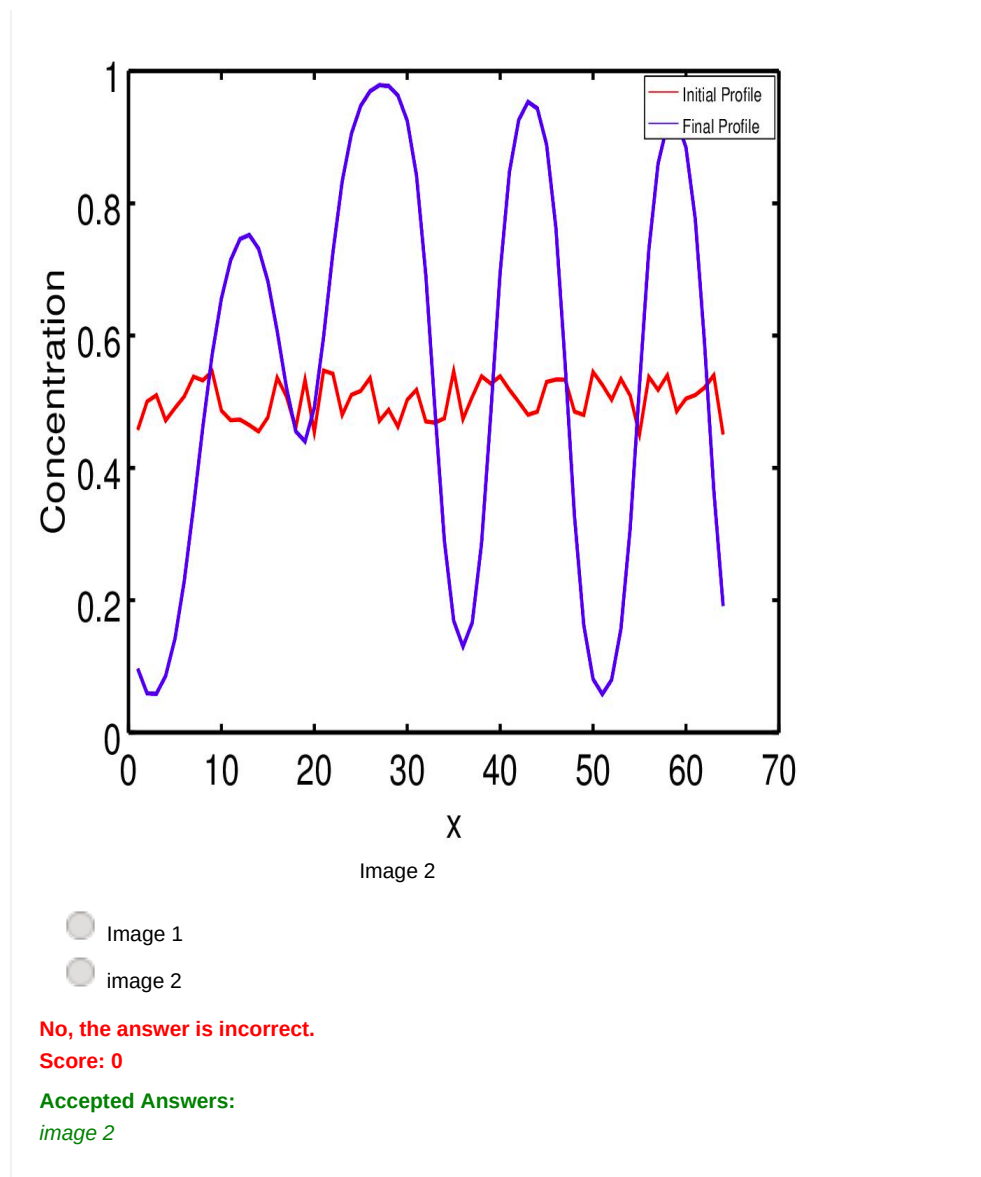**No, the answer is incorrect.**
Score: 0

Accepted Answers:
$$Ac^2(1 - W(\phi)) + B(1 - c)^2 W(\phi) + P\phi^2(1 - \phi)^2$$

7) Which of the following composition profile shows spinodal decomposition: *1 point*

Image 1

Image 2

○ Image 1

○ image 2

No, the answer is incorrect.
Score: 0

Accepted Answers:
image 2

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