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Courses » Introduction to Materials Science and Engineering

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Unit 12 - Week 9 - Phase Transformations I

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Course outline

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Week 5 - Defects
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Week 7 - Phase
Diagrams I

Assignment 9

The due date for submitting this assignment has passed.

As per our records you have not submitted this **Due on 2019-04-03, 23:59 IST.**
assignment.

1) If a eutectoid steel is quenched (avoiding the nose of the TTT curve) to a temperature **1 point**
below the martensitic finish temperature, the immediate microstructure will consist of _____.

- austenite and martensite
- martensite alone
- tempered martensite
- ferrite and martensite

No, the answer is incorrect.

Score: 0

Accepted Answers:

martensite alone

2) Three samples of eutectoid steel are held at a temperature above T_E such that they **1 point**
completely transform into austenite. They are cooled differently as represented by the cooling curves
shown in figure below. (T_E : eutectoid temperature, M_S : Martensitic start temperature, M_F : Martensitic
finish temperature.) Which of the following is the correct order of hardness?

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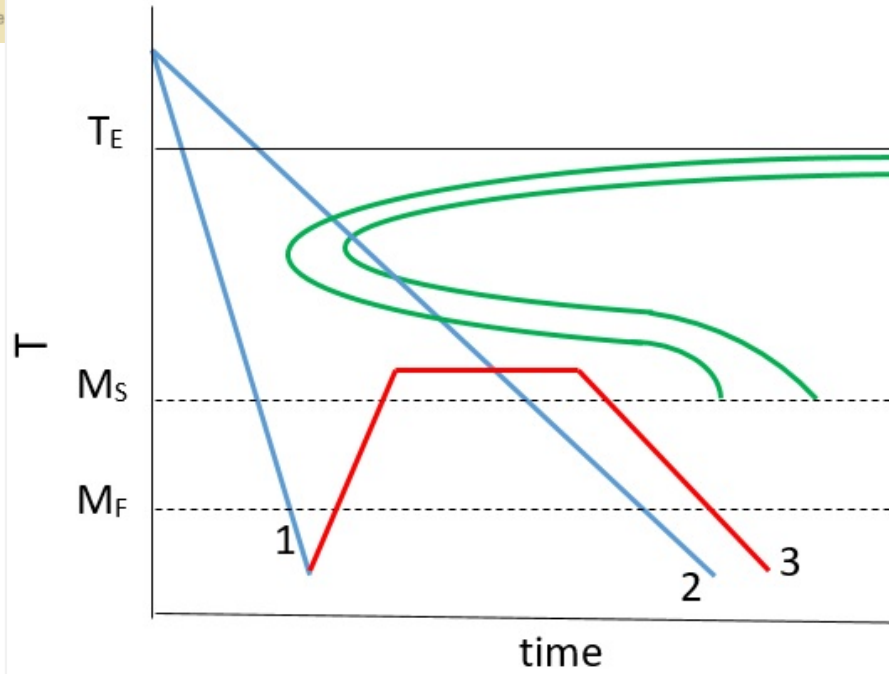
- Week 9 Overview
- 9.1 Phase transformations
- 9.2 Nucleation
- 9.3 Nucleation and capillary rise
- 9.4 Nucleation, growth and overall transformation
- 9.5 Homogeneous and heterogeneous nucleation
- 9.6 Time-temperature-transformation (TTT) diagram
- 9.7 Heat treatment of steels
- 9.8 TTT diagram of eutectoid steels
- Quiz : Assignment 9

Week 10 - Phase Transformations II + Mechanical Behaviour of Materials I

Week 11 - Mechanical Behaviour of Materials II

Week 12 - Mechanical Behaviour of Materials III + Fracture

Interactive Session



- 1>2>3
- 1>3>2
- 2>1>3
- 2>3>1

No, the answer is incorrect.

Score: 0

Accepted Answers:

1>3>2

3) "When a liquid is cooled down to its freezing point, it completely solidifies instantly." 1 point

True/False?

- True
- False

No, the answer is incorrect.

Score: 0

Accepted Answers:

False

4) Which of the following are solid state transformations in the Iron-carbon system? (the forward arrow indicates cooling) 1 point

P: the eutectoid reaction

Q: the eutectic reaction

R: $\gamma \rightarrow \alpha$

S: $\delta \rightarrow \gamma$

- P and Q
- R and S
- Q, R and S
- P, R and S

No, the answer is incorrect.

Score: 0

Accepted Answers:*P, R and S*

5) Choose the correct statement(s): P: When the radius of a solidifying nucleus is equal to the **1 point** critical radius, it is in stable equilibrium. Q: When a liquid has risen/fallen within a capillary tube, it is in unstable equilibrium.

- Both P and Q are wrong
- Only P is true
- Only Q is true
- Both P and Q are true

No, the answer is incorrect.**Score: 0****Accepted Answers:***Both P and Q are wrong*

6) 20000 stable solid nuclei have formed within 200 mL of a liquid in 10 s. Calculate the **1 point** nucleation rate in ($\text{m}^{-3}\text{s}^{-1}$).

- 200
- 10^5
- 10
- 10^7

No, the answer is incorrect.**Score: 0****Accepted Answers:** *10^7*

7) If the ratio of the volumes of the nuclei formed during heterogeneous nucleation to that **1 point** which formed during homogeneous nucleation is 0.6, which of the following is the contact angle θ between the substrate and the liquid?

- 90.2°
- 97.7°
- 117.7°
- 151°

No, the answer is incorrect.**Score: 0****Accepted Answers:** *97.7°*

8) At the temperature corresponding to the nose of the C-curve of a TTT diagram, **1 point**

- the nucleation rate is maximum
- the growth rate is maximum
- the overall transformation rate is maximum
- nucleation rate is minimum

No, the answer is incorrect.**Score: 0****Accepted Answers:***the overall transformation rate is maximum*

9) Choose the correct statement: **1 point**

- Tempered martensite is harder and less ductile than martensite
- Tempered martensite is softer and less ductile than martensite
- Tempered martensite is softer and more ductile than martensite
- Tempered martensite is harder and more ductile than martensite

No, the answer is incorrect.

Score: 0

Accepted Answers:

Tempered martensite is softer and more ductile than martensite



10) Which of the following statements is true?

1 point

- Pearlitic transformation in steels involves the movement of iron atoms alone
- Pearlitic transformation in steels involves the movement of carbon atoms alone
- Pearlitic transformation in steels involves the movement of both iron and carbon atoms
- Pearlitic transformation in steels involves neither the movement of iron atoms nor the movement of carbon atoms



No, the answer is incorrect.

Score: 0

Accepted Answers:

Pearlitic transformation in steels involves the movement of both iron and carbon atoms

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