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NPTEL

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Courses » Introduction to Materials Science and Engineering

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Unit 11 - Week 8 - Phase Diagrams II + Diffusion

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Course outline

Assignment 8

The due date for submitting this assignment has passed.
As per our records you have not submitted this assignment. **Due on 2019-03-27, 23:59 IST.**

1) If the activation energy for diffusion is 80 kJ/mol, at what temperature will the depth of diffusion be 5 times that at 25°C for the same diffusion time? ***1 point***

- 58°C
- 331°C
- 68°C
- 302°C

No, the answer is incorrect.
Score: 0

Accepted Answers:
58°C

2) Which of the following plain carbon steesl does not have any proeutectoid microconstutuent in its microstructure at room temperature? ***1 point***

- hypoeutectoid steel
- hypereutectoid steel
- eutectoid steel
- eutectic steel

No, the answer is incorrect.
Score: 0

Accepted Answers:
eutectoid steel

3) “In a plain carbon steel in equilibrium at room temperature, the proeutectoid ferrite has the same chemical composition as the ferrite lamellae that constitute pearlite.” True/False? ***1 point***

- True

4) Find the diffusivity (in m^2s^{-1}) of a material with D_0= 2.5 x 10^{-3} m^2s^{-1} and activation energy, Q = 24.942 kJ/mol at 78°C. (Take gas constant R = 8.314 J $K^{-1}mol^{-1}$) ***1 point***

- 8.42 x 10^{-6}
- 2.43 x 10^{-7}
- 4.85 x 10^{-7}
- 3.48 x 10^{-7}

No, the answer is incorrect.
Score: 0

Accepted Answers:
4.85 x 10^{-7}

5) Determine the composition (in wt.% C) of proeutectoid ferrite in a steel with 0.5 wt.% carbon at the eutectoid temperature. ***1 point***

- 0.8
- 0.5
- 0.02
- 0.1

No, the answer is incorrect.
Score: 0

Accepted Answers:
0.02

6) Find the composition of steel in which the amount of proeutectoid ferrite is half the amount of total ferrite. Use eutectoid composition=0.8 wt% C for calculations. ***1 point***

- 0.25
- 0.43
- 0.67
- 0.8

No, the answer is incorrect.
Score: 0

Accepted Answers:
0.43

7) In plain carbon steel samples P (wt.% C= 0.9) and Q (wt.% C= 1.1). At any given temperature below the eutectoid temperature, the amount of total cementite is greater in sample ___ and the amount of proeutectoid cementite is greater in sample ___. ***1 point***

- P, Q
- Q, P
- P, P
- Q, Q

No, the answer is incorrect.
Score: 0

Accepted Answers:
Q, Q

8) At 912°C, what is the time required to carburize a steel with an initial composition of 0.29 wt% C to a carbon concentration of 1.11 wt% C at a depth of 0.1 mm? A carburizing atmosphere provides a constant surface concentration of 2% C. The diffusivity of C in gamma Fe is given by ***1 point***

$$D = D_0 exp(\frac{-Q}{RT})$$

Fracture

Interactive Session

with $D_0=7\times10^{-5}$ m^2 s^{-1} and Q=150 kJ mol^{-1}. The Error function table is given below:

z	0.25	0.3	0.35	0.4	0.45	0.5
Erf[z]	0.276	0.329	0.379	0.428	0.475	0.520

- 6230 s
- 585 s
- 121 s
- 293 s

No, the answer is incorrect.
Score: 0

Accepted Answers:
585 s

9) Vacancies play an important role in which of the following diffusion mechanisms? ***1 point***

- interstitial diffusion only.
- substitutional diffusion only.
- Both interstitial and substitutional diffusion.
- Neither interstitial nor substitutional diffusion.

No, the answer is incorrect.
Score: 0

Accepted Answers:
substitutional diffusion only.

10) A plain carbon steel has 1.6 wt.% carbon. Find the percentage of vacant octahedral sites in austenite in equilibrium at 1150°C. ***1 point***

- 90.6
- 8.7
- 9.4
- 91.3

No, the answer is incorrect.
Score: 0

Accepted Answers:
91.3

Previous Page End