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NPTEL

Courses » Fundamentals of Material Processing - I

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Unit 4 - week 3

Course outline

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week 3

○ Lecture 11 - Heat Flow (Interface Resistance Controlled Solidification)

○ Lecture 12 - Heat Flow (Effect of Superheat)

○ Lecture 13 - Heat Flow (Solidification of Alloys)

○ Lecture 14 - Composition Variation

○ Lecture 15 - Composition Variation continued...

○ Quiz : Assignment-3

○ Assignment 3 Solution

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Assignment-3

The due date for submitting this assignment has passed. **Due on 2017-08-13, 23:59 IST.**
As per our records you have not submitted this assignment.

1) For insulating mold condition discussed in the video, which of the following assumptions are   *1 point*
true?

A. Unidirectional heat flow
B. Semi-infinite mold
C. Outside mold temperature is kept constant at T_0
D. Solidified liquid remains at T_M
E. Liquid metal remains at T_M

○ All (A,B,C,D and E) are true
○ A,B,C and D are true but E is false
○ A,B,C and E are true, but D is false
○ A is true, but B,C,D and E are false

No, the answer is incorrect.
Score: 0

Accepted Answers:
A,B,C and E are true, but D is false

2) In a general condition of sand mold casting (shown in figure), when moving from mold-air   *1 point*
interface towards mold-solidified metal interface, slope of the curve ($\partial T/\partial x$) increases while it decreases
on moving from mold-solidified metal interface to solid-liquid interface because_____

○ Mold has higher thermal conductivity than solidified metal
○ Temperature of mold is increasing while temperature of solidified metal is decreasing
○ Mold is of semi-infinite length
○ Because of absence of interface resistance at mold-solid interface

No, the answer is incorrect.
Score: 0

Accepted Answers:
Temperature of mold is increasing while temperature of solidified metal is decreasing

3) For insulating mold condition, length of solidified metal varies with time according to this   *1 point*
relation:

○ S = at + b
○ S = at – b
○ S = a√t + b
○ S = a√t – b

No, the answer is incorrect.
Score: 0

Accepted Answers:
$S = a\sqrt{t} - b$

4) Interface resistance solidification is applicable for_____   *1 point*
     A. Permanent mold casting
     B. Powder production
     C. Splat cooling

     ○ Only A
     ○ Only A and B
     ○ A, B and C
     ○ Only C

No, the answer is incorrect.
Score: 0

Accepted Answers:
A, B and C

5) For interface resistance controlled solidification, length of solidified metal varies with time   *1 point* according to this relation:

     ○ $S = at$
     ○ $S = at^2$
     ○ $S = a\sqrt{t} + b$
     ○ $S = at^{3/2}$

No, the answer is incorrect.
Score: 0

Accepted Answers:
S = at

6) Larger Width of mushy zone can lead to _____ in the alloys.   *1 point*

     ○ Earing
     ○ Hot tear
     ○ Misruns
     ○ cold shuts

No, the answer is incorrect.
Score: 0

Accepted Answers:
Hot tear

7) Total heat absorbed when the liquid at temperature T_m solidifies to solid at room temperature *1 point* (T_o) is_____

     ○ H(fusion)
     ○ $T_m - T_o$
     ○ $C_S(T_m - T_o)$
     ○ H(fusion) + $C_S(T_m - T_o)$

No, the answer is incorrect.
Score: 0

Accepted Answers:
H(fusion) + $C_S(T_m - T_o)$

8) Solidification of alloys is approximated by assumption of equilibrium at interface, which   *1 point* implies:
     A. No barrier to transport of atoms across interface of solid and liquid
     B. Equilibrium partition ratio = C_S/C_L

C. Equilibrium can be attained at $T < T_L$ (liquidus)

D. Concentration of solid and liquid at the interface is given by C_L and C_S, given by phase diagram

○ All A, B,C and D are true

○ A and B are true but C and D are false

○ A,B and C are true, but D is false

○ B is false, rest are true

No, the answer is incorrect.
Score: 0

Accepted Answers:
All A, B,C and D are true

9) By assuming the curved solidus and liquidus lines of a phase diagram as straight ones, we make_____   *1 po*

○ K>1

○ K<1

○ K constant

○ K only a function of temperature

No, the answer is incorrect.
Score: 0

Accepted Answers:
K constant

10)Under equilibrium solidification condition, we assume_____   *1 point*

A. Complete homogenization in liquid

B. Complete homogenization in solid (i.e. infinite or complete diffusion in solid)

C. At any particular temperature, liquid and solid formed have composition predicted by phase diagram

○ All A, B and C are false

○ A and B are true, but C is false

○ All A, B and C are true

○ A is true, but B and C are false

No, the answer is incorrect.
Score: 0

Accepted Answers:
All A, B and C are true

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NPTEL National Programme on Technology Enhanced Learning

In association with

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Funded by

Government of India
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