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Unit 7 - Week 6: Welding Metallurgy

Assignment 6

The due date for submitting this assignment has passed. **Due on 2018-03-18, 23:59 IST.**

Submitted assignment

1) Which one of the following shielding gas is suitable for welding carbon steels using GMAW process? ***1 point***

- Argon
- Helium
- Carbon dioxide
- Oxygen

No, the answer is incorrect.
Score: 0

Accepted Answers:
Carbon dioxide

2) Which of the following flux is suitable for welding titanium and aluminum alloys? ***1 point***

- CaF_2–$BaCl_2$–NaF
- CaF_2–CaO–Al_2O_3
- CaF_2–CaO–SiO_2
- MnO–SiO_2

No, the answer is incorrect.
Score: 0

Accepted Answers:
CaF_2–$BaCl_2$–NaF

3) Which of the following parameter determines size of the solidification structure? ***1 point***

- Temperature gradient (G)
- Growth rate (R)
- Product of G and R
- Ratio of G and R

No, the answer is incorrect.
Score: 0

Accepted Answers:
Product of G and R

4) The mode of solidification is determines by which of the following parameter? ***1 point***

- Ratio of G and R
- Temperature gradient (G)
- Growth rate (R)
- Product of G and R

No, the answer is incorrect.
Score: 0

Accepted Answers:
Ratio of G and R

5) What is the condition for a planar solid liquid interface to be stable at the steady state? ***1 point***

- $\frac{G}{R} < \frac{\Delta T}{D_L}$
- $\frac{G}{R} \geq \frac{\Delta T}{D_L}$
- $\frac{G}{R} \neq \frac{\Delta T}{D_L}$
- $\frac{G}{R} < \frac{D_L}{\Delta T}$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$\frac{G}{R} \geq \frac{\Delta T}{D_L}$

6) The possible easy-growth direction of columnar dendrites in ferritic stainless steels is? ***1 point***

- $<10\bar{1}0>$
- $<110>$
- $<101>$
- $<100>$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$<100>$

7) Which of the following nucleation process has to overcome a less critical energy barrier to form stable nuclei in the weld metal? ***2 points***

- Heterogeneous nucleation
- Homogeneous nucleation
- Both heterogeneous and homogeneous nucleation has to overcome same critical energy barrier
- Nucleation is independent of critical energy barrier

No, the answer is incorrect.
Score: 0

Accepted Answers:
Heterogeneous nucleation

8) Which one of the following techniques is **NOT** suitable for obtaining fine grains in the weld fusion zone? ***2 points***

- Arc pulsation
- Weld pool stirring

- By rapid cooling of the fusion zone
- By slow cooling of the fusion zone

No, the answer is incorrect.
Score: 0

Accepted Answers:
By slow cooling of the fusion zone

9) With decreasing in G/R ratio (where G- temperature gradient and R- growth rate) the mode of solidification changes in the sequence **2 points**

- Cellular → Planar → Equiaxed → Columnar dendritic
- Cellular → Equiaxed → Columnar dendritic → Planar
- Planar → Cellular → Columnar dendritic → Equiaxed
- Equiaxed → Cellular → Planar → Columnar dendritic

No, the answer is incorrect.
Score: 0

Accepted Answers:
Planar → Cellular → Columnar dendritic → Equiaxed

10) Which grain structure is more susceptible to solidification cracking? **2 points**

- Coarse columnar grain
- Fine equiaxed grain
- Both of the above are equally susceptible to solidification cracking
- Grain structure has no effect on solidification cracking

No, the answer is incorrect.
Score: 0

Accepted Answers:
Coarse columnar grain

11) Postweld heat treatment of the welded component results in tempering of martensite which further results in **2 points**

- increasing ductility and toughness
- increasing hardness
- rise in residual stresses
- increasing in distortion

No, the answer is incorrect.
Score: 0

Accepted Answers:
increasing ductility and toughness

12) For the solidification of a pure metal, calculate the critical radius(r*) and the activation free energy if the nucleation is homogeneous. Values for the latent heat of fusion and surface free energy are -1.2×10^{9} J/m^3 and 0.14 J/m^2 respectively. The value of melting temperature and degree of supercooling are 1300°C and 295°C respectively. **2 points**

- 1.3 nm and 9×10^{-16} J respectively
- 1.24 nm and 9×10^{-16} J respectively
- 1.24 nm and 9×10^{-19} J respectively
- 1.3 nm and 9×10^{-19} J respectively

No, the answer is incorrect.
Score: 0

Accepted Answers:
1.24 nm and 9×10^{-19} J respectively

13) For a binary alloy system the equilibrium freezing range is about 50°C. If the growth rate is 5×10^{-3} mm/s and the diffusion coefficient D_L is 2.5×10^{-3} mm^2/s, the **2 points**

minimum temperature gradient required for planar solidification at the weld centerline is

- 100 °C/mm
- 105 °C/mm
- 110 °C/mm
- 25 °C/mm

No, the answer is incorrect.
Score: 0

Accepted Answers:
100 °C/mm

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