Unit 13 - Transport in turbulent flows.

Week 12 Assessment

The due date for submitting this assignment has passed. **Due on 2020-04-22, 23:59 IST.** As per our records you have not submitted this assignment.

1) For a Taylor dispersion in a pipe, the dispersion coefficient is

- Proportional to the diffusion coefficient. **1 point**
- Independent of the diffusion coefficient.
- Inversely proportional to the diffusion coefficient.
- None of the above.

No, the answer is incorrect.
Score: 0
Accepted Answers: *Inversely proportional to the diffusion coefficient.*

2) For dispersion in the flow through a packed bed, the dispersion coefficient is

- Proportional to the diffusion coefficient.
- Independent of the diffusion coefficient.
- Inversely proportional to the diffusion coefficient.
- None of the above.

No, the answer is incorrect.
Score: 0
Accepted Answers: *Independent of the diffusion coefficient.*

3) Which of the following factors properties is important for natural convention, but not for forced convection? **1 point**

- Flow velocity.
Forced convection.

Forced & natural convection.

Natural convection.

Transport in turbulent flows.

- High Peclet number forced convection: Solutions for an arbitrary geometry. (unit? unit=104&lesson=105)
- High Peclet number forced convection: Taylor dispersion. (unit? unit=104&lesson=106)
- Natural convection: Boussinesq equations for heat transfer. (unit? unit=104&lesson=107)
- Natural convection: Boundary layer equations. (unit? unit=104&lesson=108)
- Natural convection: Boundary layer equations convection. (unit? unit=104&lesson=109)
- Natural convection: Heat transfer correlations. (unit? unit=104&lesson=110)
- Quiz : Week 12 Assessment (assessment? name=121)

4) For natural convection heat transfer in the limit of high Grashof number and high Prandtl number,

- The momentum boundary layer thickness is much larger than the thermal boundary layer thickness.
- The momentum boundary layer thickness is much smaller than the thermal boundary layer thickness.
- The momentum boundary layer thickness is comparable to the thermal boundary layer thickness.
- None of the above.

No, the answer is incorrect.
Score: 0
Accepted Answers:
The momentum boundary layer thickness is much larger than the thermal boundary layer thickness.

5) For natural convection heat transfer into a molten metal in the limit of high Grashof number, the Nusselt number is proportional to the following powers of the Grashof number, $Gr$ and Prandtl number, $Pr$.

- $Gr^{1/4}$
- $Gr^{1/4} Pr^{1/4}$
- $Gr^{1/4} Pr^{1/2}$
- $Gr^{1/4}$
- $Pr$

No, the answer is incorrect.
Score: 0
Accepted Answers:
$Gr^{1/4} Pr^{1/2}$

6) The Nusselt number depends only on the Rayleigh number (product of the Grashof and Prandtl numbers) in the limit of

- Low Grashof number and low Prandtl number.
- Low Grashof number and high Prandtl number.
- High Grashof number and low Prandtl number.
- High Grashof number and high Prandtl number.

No, the answer is incorrect.
Score: 0
Accepted Answers:
High Grashof number and low Prandtl number.

7) Consider the natural convection into water from a horizontal cylinder heated at 75°C and diameter 1 cm to ambient water at 25°C. The density, viscosity, thermal conductivity, specific heat and thermal expansion coefficient of water are $\rho = 10^3$ kg/m³, $\mu = 10^{-3}$ kg/m/s, $k = 0.59$ W/m/K, $C_p = 4.2 \times 10^3$ J/kg/K, and $\beta = 2 \times 10^{-4}$. What is the approximate Grashof number?
8) What is the approximate Prandtl number in Question 7, to the nearest power of 10?  
- $10^4$  
- $10^5$  
- $10^6$  
- $10^7$  

No, the answer is incorrect.  
Score: 0  
Accepted Answers: $10^5$

9) Which correlation is expected to be most accurate in the case of Question 7?  
- $Nu \propto Gr^{1/4}$  
- $Nu \propto Gr^{1/4} Pr^{1/4}$  
- $Nu \propto Gr^{1/4} Pr^{1/2}$  
- $Nu \propto Gr^{1/4} Pr$  

No, the answer is incorrect.  
Score: 0  
Accepted Answers: $Nu \propto Gr^{1/4} Pr^{1/4}$

10) If it is necessary to double the rate of heat transfer for a fixed length and temperature difference by increasing the diameter of the pipe, what should be the approximate pipe diameter?  
- 1.5 cm  
- 2 cm  
- 2.5 cm  
- 2.8 cm  

No, the answer is incorrect.  
Score: 0  
Accepted Answers: 2.5 cm