

Unit 8 - Week 6

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● Lecture 27 : Miscible displacement (step change in concentration)

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Assignment 6

The due date for submitting this assignment has passed. As per our records you have not submitted this assignment.

Due on 2019-09-11, 23:59 IST.

1) Peclet Number in the context of dispersion in porous media is defined as

1 point

- a) $\frac{d\bar{u}}{D}$
 b) $\frac{tD}{R^2}$
 c) $\frac{\mu}{\rho D}$
 d) None of the above

- a.
 b.
 c.
 d.

No, the answer is incorrect. Score: 0

Accepted Answers:

a.

2) Diffusion dominates over convection when

1 point

- a) Peclet Number is too high
 b) Peclet Number is too low
 c) Any value of the Peclet Number exists
 d) Schmidt Number is too high

- a.
 b.
 c.
 d.

No, the answer is incorrect. Score: 0

Accepted Answers:

b.

3) Axial diffusion in Taylor dispersion can be ignored at

1 point

- a) High Peclet Number
 b) Low Peclet Number
 c) High residence time
 d) Can never be ignored

- a.
 b.
 c.
 d.

No, the answer is incorrect. Score: 0

Accepted Answers:

a.

4) For flow of water through a capillary of diameter 1 mm at an average velocity of 1 cm/s, a spread of solute pulse will follow a dispersion coefficient of ----- cm²/s. Assume diffusion coefficient of 10⁻⁹ m²/s

No, the answer is incorrect. Score: 0

Accepted Answers:

(Type: Range) 5.0,5.5

1 point

5) To extend the diffusion equation to a moving front the position z with reference to fixed coordinate has to be converted to the following form.

1 point

- a) $z + \bar{u}t$
 b) $z - \bar{u}t$
 c) $z - \frac{\bar{u}d}{D}$
 d) None of the above

- a.
 b.
 c.
 d.

No, the answer is incorrect. Score: 0

Accepted Answers:

b.

6) In Question 5, the variable \bar{u} in case of a porous medium is

1 point

- a) Superficial velocity
 b) Interstitial velocity
 c) Terminal velocity
 d) none of the above

- a.
 b.
 c.
 d.

No, the answer is incorrect. Score: 0

Accepted Answers:

b.

7) Through a porous medium of length 1 m, overall diameter 0.25 m, and porosity 0.3, water is flowing unidirectionally along the length at constant flow rate. If a tracer is introduced at the inlet as a step change in concentration from 0 kg/m³ to 1 kg/m³, calculate the volume of tracer (m³) to be injected before the concentration at the outlet becomes 0.5 kg/m³.

No, the answer is incorrect. Score: 0

Accepted Answers:

(Type: Range) 0.01,0.015

1 point

8) If the flow rate is 1 mL/s, calculate the time required (in seconds) in Question 7 above for the concentration at the outlet to reach 0.5 kg/m³.

No, the answer is incorrect. Score: 0

Accepted Answers:

(Type: Range) 12000,16000

1 point

9) In the system, described in Question 8 above, if the tracer is introduced as a pulse (Dirac Delta function), the time taken (in seconds) for concentration to become maximum at the outlet would be

No, the answer is incorrect. Score: 0

Accepted Answers:

(Type: Range) 12000,16000

1 point

10) The spread of the concentration at the outlet due to Taylor dispersion depends on

1 point

- a) Peclet Number
 b) Schmidt Number
 c) Capillary Number
 d) None of the above

- a.
 b.
 c.
 d.

No, the answer is incorrect. Score: 0

Accepted Answers:

a.

11) For the system in Question 8 above, calculate the time required (in seconds) for the concentration to reach 0.95 kg/m³ at the outlet. Assume a dispersion coefficient of 10⁻⁶ m²/s.

No, the answer is incorrect. Score: 0

Accepted Answers:

(Type: Range) 18000,20000

1 point

12) For the system in Question 8 above, calculate the cumulative volume (m³) of tracer to be injected for the concentration at the outlet to reach 0.05 kg/m³. Assume a dispersion coefficient of 10⁻⁶ m²/s.

No, the answer is incorrect. Score: 0

Accepted Answers:

(Type: Range) 0.009,0.015

1 point

13) Presence of a stagnant zone in the pathways results in

1 point

- (a) greater dispersion
 (b) smaller dispersion
 (c) dispersion remaining unaffected
 (d) None of the above

- a.
 b.
 c.
 d.

No, the answer is incorrect. Score: 0

Accepted Answers:

a.

14) More heterogeneity in the porous media results in

1 point

- (a) greater dispersion
 (b) smaller dispersion
 (c) dispersion remaining unaffected
 (d) None of the above

- a.
 b.
 c.
 d.

No, the answer is incorrect. Score: 0

Accepted Answers:

a.

15) Under which condition, a tracer transport in capillary will not follow Taylor dispersion or Taylor axis dispersion

1 point

- (a) If the flow is not fully developed
 (b) If the residence time is too long
 (c) If the viscosity is too high
 (d) None of the above

- a.
 b.
 c.
 d.

No, the answer is incorrect. Score: 0

Accepted Answers:

a.