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Courses » Transport Phenomena of Non-Newtonian Fluids

Announcements **Course** Ask a Question Progress FAQ

Unit 6 - Week 4: Momentum Transfer of Non-Newtonian Fluids

Register for Certification exam

Course outline

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Week 00

Week 1: Introduction of Non-Newtonian Fluids

Week 2: Rheology Measuring Instruments

Week 3: Equations of Change

Week 4: Momentum Transfer of Non-Newtonian Fluids

Lecture 1: Time Independent Non-Newtonian Fluids Flow Through Pipes - 1

Lecture 2: Time Independent Non-Newtonian

Week 04 Assignment 01

The due date for submitting this assignment has passed.

As per our records you have not submitted this assignment. **Due on 2019-02-27, 23:59 IST.**

Week 4 assignment 1

1) For a power-law fluid flowing through an infinitely long cylindrical pipe, what is ratio between its maximum and average velocities: **4 points**

- $(3n+1) \times (n+1)$
- $(3n+1)/(n+1)$
- $(n+1)/(3n+1)$
- None of the above

No, the answer is incorrect.
Score: 0

Accepted Answers:
 $(3n+1)/(n+1)$

2) A polymer solution obeying power-law model ($m = 5 \text{ Pa}\cdot\text{s}^n$ and $n = 0.5$) is flowing through a pipe of diameter 15mm and length 20m at volumetric flow rate of $5 \times 10^{-6} \text{ m}^3/\text{s}$. What is the corresponding pressure drop? **4 points**

- 347.5 kPa
- 57.9 kPa
- 231.7 kPa
- 115.8 kPa

No, the answer is incorrect.
Score: 0

Accepted Answers:
 115.8 kPa

3) A power-law fluid of power-law behaviour index value of 0.5 is pumped through a pipe of **4 points**

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Quiz : Week 04
Assignment 01

Week 5:
Momentum
Transfer of
Non-Newtonian
Fluids

Week 6: Flow of
Non-Newtonian
Fluids through
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Week 7: Heat
Transfer
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Week 8: Heat
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Week 9: Mass
Transfer
Phenomena of
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Interaction
Session

Week 10:
Simultaneous
Heat and Mass
Transfer with
Chemical
Reactions

Week 11: Mass
Transfer
Combined with
Heat Transfer

Week 12:
Boundary Layer
Flows of
Non-Newtonian
Fluids

No, the answer is incorrect.

Score: 0

Accepted Answers:

$$1.67 \times V_{avg}$$

4) Consider a power-law fluid of known rheological parameters flowing through a pipe of length L and radius R . For a fixed pipe radius and length, what is the relation between pressure drop and volumetric flow rate? **4 points**

- $-\Delta P$ directly proportional to (Q^n)
- $-\Delta P$ directly proportional to $(Q^{1/n})$
- $-\Delta P$ directly proportional to (Q^{n-1})
- All of the above points a), b) and c) are true

No, the answer is incorrect.

Score: 0

Accepted Answers:

$$-\Delta P \text{ directly proportional to } (Q^n)$$

5) Friction factor is defined as? **4 points**

- $\tau_w + (0.5\rho V^2)$
- $\tau_w \times (0.5\rho V^2)$
- $\tau_w \div (0.5\rho V^2)$
- None of the above a), b) and c) points are true

No, the answer is incorrect.

Score: 0

Accepted Answers:

$$\tau_w \div (0.5\rho V^2)$$

6) For a viscoplastic fluid flowing through a pipe due to pressure drop, why a solid plug like motion is found at the centre of pipe **4 points**

- Because shear stress at centre is infinite and viscoplastic fluids does not deform (or flow) if applied stress is very larger than their yield stress
- Because shear stress at centre is zero and viscoplastic fluids does not deform (or flow) if applied stress is less than their characteristic yield stress
- Because shear stress at centre of pipe is larger than their yield stress
- All of the above points a), b) and c) are true

No, the answer is incorrect.

Score: 0

Accepted Answers:

Because shear stress at centre is zero and viscoplastic fluids does not deform (or flow) if applied stress is less than their characteristic yield stress

7) For Herschel-Bulkley fluids to be in laminar flow regime, according to Slatter (1996) model, the modified Reynolds number (Re_{mod}) should be **4 points**

- None of the following b), c) and d) options are true
- = 2100
- > 2100
- < 2100

No, the answer is incorrect.

Score: 0

Accepted Answers:*< 2100*

8) For a Newtonian fluid flowing through a pipe under turbulent conditions, in what region of pipe the transition zone would be present: **4 points**

- $5 \leq y^+ \leq 30$
- $y^+ < 5$
- $y^+ > 30$
- None of the above a), b) and c) points

No, the answer is incorrect.

Score: 0

Accepted Answers: *$5 \leq y^+ \leq 30$*

9) For all existing velocity profiles of a power-law fluid flowing through a pipe under turbulent conditions, which of the following statements is true? **4 points**

- None of the models predict zero velocity at the wall of the pipe
- None of the models predict zero velocity gradient at the centre of the pipe
- None of the models are reliable at wall of the pipe
- None of the above a), b) and c) points

No, the answer is incorrect.

Score: 0

Accepted Answers:*None of the models predict zero velocity gradient at the centre of the pipe*

10) What do you mean by fully developed flow condition? **4 points**

- Shear stress is constant at the wall
- Velocity profile changes along the flow direction
- Velocity profile does not change in flow direction
- None of the above a), b) and c) points

No, the answer is incorrect.

Score: 0

Accepted Answers:*Velocity profile does not change in flow direction*

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