

Unit 5 - Week 3 : Arterial Bifurcations and Pulsatile Flow

Course outline

How does an NPTEL online course work?

Week 0 : Prerequisite

Week 1 : Review of Basic Concepts

Week 2 : Rheology of Blood

Week 3 : Arterial Bifurcations and Pulsatile Flow

- Lec 1: Viscoelasticity
- Lec 2: Flow Bifurcation
- Lec 3: Pulsatile Flow 1

- Quiz : Assignment 3

- Feedback form

Week 4 : Pulsatile Flow and Elastic tubes

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Assignment 3

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

Due on 2020-02-19, 23:59 IST.

1) Womersley number is _____.

1 point

- Elastic force/ viscous force
 Inertial Force/ Oscillatory viscous force
 Oscillatory inertial force/ viscous force
 Oscillatory elastic force/ viscous force

No, the answer is incorrect.
Score: 0

Accepted Answers:
Oscillatory inertial force/ viscous force

2) Weissenberg effect can be observed with_____.

1 point

- Mucus
 Toothpaste
 Water
 Silicon oil

No, the answer is incorrect.
Score: 0

Accepted Answers:
Mucus

3) A fluid (viscosity 0.003 Pa s) and density 1060 kg/m³. This fluid is flowing through the aorta having radius of 15 mm at a frequency of 1.2 Hz. The Womersley number (α^2) in this case is

1 point

- 600
 150
 1350
 2000

No, the answer is incorrect.
Score: 0

Accepted Answers:
600

4) A fluid has dynamic viscosity and density 0.0035 Pa.s and 1210 kg/m³, respectively. This fluid flows through a vessel in a pulsatile manner having radius of 8 mm with a frequency of 2 Hz. The Womersley number (α) in this case is

1 point

- 16.68
 8.33
 25.01
 1.63

No, the answer is incorrect.
Score: 0

Accepted Answers:
16.68

5) On doubling the radius of blood vessel, how much is the increase in the blood flow rate as compared to previous diameter? Assume the pressure drop per unit length to be same in both the cases and the flow in the vessel to be fully-developed.

1 point

- 16
 8
 4
 2

No, the answer is incorrect.
Score: 0

Accepted Answers:
16

6) When a vessel bifurcates symmetrically into two other vessels, the diameter of the parental vessel is _____ of that of the daughter vessel. Assume Murray's law to be applicable

1 point

- 0.79
 1.26
 8
 2

No, the answer is incorrect.
Score: 0

Accepted Answers:
1.26

7) Pressure gradient in circulatory system is _____?

1 point

- Periodic and time independent
 Periodic and time dependent
 Aperiodic and time dependent
 Aperiodic and time independent

No, the answer is incorrect.
Score: 0

Accepted Answers:
Periodic and time dependent

8) At low Womersley number oscillatory boundary layer thickness will be _____?

1 point

- Thin
 Thick
 Negligible
 Does not depend on Womersley number

No, the answer is incorrect.
Score: 0

Accepted Answers:
Thick

9) For small Womersley number (α), $\partial p/\partial z$ and v_z are

1 point

- 0° out of phase
 90° out of phase
 180° out of phase
 120° out of phase

No, the answer is incorrect.
Score: 0

Accepted Answers:
180° out of phase

10) As Womersley number decreases flow profile _____

1 point

- Changes from parabolic to flatter
 Changes from flatter to parabolic
 Changes to plug type
 Remains unchanged

No, the answer is incorrect.
Score: 0

Accepted Answers:
Changes from flatter to parabolic

11) Murray's law is based upon

1 point

- Conservation of momentum
 Principle of minimum work
 Principle of minimum force
 Conservation of mass

No, the answer is incorrect.
Score: 0

Accepted Answers:
Principle of minimum work

12) Murray's law works on _____ generation of branching.

1 point

- Only till first
 Only till second
 Only till third
 For any

No, the answer is incorrect.
Score: 0

Accepted Answers:
For any

13) In the vascular bifurcations, flow separation occurs _____.

1 point

- In the mother vessel
 At the outer wall of the daughter vessel
 At the inner wall of the daughter vessel
 At the inner and outer walls of the daughter vessel

No, the answer is incorrect.
Score: 0

Accepted Answers:
At the outer wall of the daughter vessel

14) A rotating rod immersed in a viscoelastic fluid causes the fluid level to climb up the rod unlike a Newtonian fluid for which the fluid level falls near the rod. This phenomenon in viscoelastic fluids is known as

1 point

- Weissenberg effect
 Deborah Effect
 Womersley effect
 Die-swell effect

No, the answer is incorrect.
Score: 0

Accepted Answers:
Weissenberg effect

15) Which of the following phenomena is NOT observed at the bifurcations?

1 point

- Secondary vortices
 Flow separations on the inner wall
 Flow separation on the outer wall
 Recirculation along the streamwise direction

No, the answer is incorrect.
Score: 0

Accepted Answers:
Flow separations on the inner wall

16) In the spring-dashpot type model for viscoelastic fluid, the dashpot element represents the

1 point

- Elastic component
 Viscous component
 Pressure component
 Tensile component

No, the answer is incorrect.
Score: 0

Accepted Answers:
Viscous component

17) Deborah number is defined as _____

1 point

- Relaxation time/ Observation time
 Observation time/ Relaxation time
 Characteristic relaxation time/ Characteristic time measure of shear rate
 Characteristic time measure of shear rate/ Characteristic relaxation time

No, the answer is incorrect.
Score: 0

Accepted Answers:
Relaxation time/ Observation time

18) In the Voigt Kelvin model for evaluating viscoelastic nature of materials_____.

1 point

- The spring and the dashpot are connected in series
 The spring and the dashpot are connected in parallel
 Sample does not oscillate
 Sample does pulsatile motion

No, the answer is incorrect.
Score: 0

Accepted Answers:
The spring and the dashpot are connected in parallel

19) Bessel differential equation _____

1 point

- Is linear ordinary differential equation
 Is non-linear ordinary differential equation
 Is a linear partial differential equation
 Is a non-linear partial differential equation

No, the answer is incorrect.
Score: 0

Accepted Answers:
Is linear ordinary differential equation

20) Following the principle of cost function minimization in Hagen-Poiseuille flow, flow rate is proportional to tube radius raised to the power?

1 point

- 3
 4
 2
 6

No, the answer is incorrect.
Score: 0

Accepted Answers:
3