



Unit 11 - Week 10

Course outline

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- Fundamentals of Electro kinetics in Microchannels Part1
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- Two phase Heat transfer in Microchannels Part 1
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Week 10 Assignment 1

The due date for submitting this assignment has passed. **Due on 2017-10-09, 23:59 IST.**

Submitted assignment

Answer the following questions, More than one option can be correct.

1) Liquid moving relative to a stationary charged surface is characteristic phenomenon of **1 point**

- Sedimentation potential
- Electrophoresis
- Electroosmosis
- Streaming potential

No, the answer is incorrect.

Score: 0

Accepted Answers:

Electroosmosis

Streaming potential

2) Which of the following layers are formed when a stationary polar liquid is brought into contact with the surface of the solid **1 point**

- Stern layer
- Diffuse layer
- Boundary layer
- None of the above

No, the answer is incorrect.

Score: 0

Accepted Answers:

Stern layer

Diffuse layer

3) A microchannel with $200\mu m^2$ cross sectional area and surface electroosmotic ability equal to $2 * 10^{-8} m^2/Vs$ is considered. If an electric field of 100V/cm is applied, calculate the resulting fluid velocity (m^2/s) **1 point**

-
- $2 * 10^2$
-
- $4 * 10^2$
-
- $6 * 10^2$
-
- $2 * 10^{-4}$

Week 11

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

$2 * 10^{-4}$

4) Using the details from the question no.3 Calculate the volume flow rate ($\mu m^3/s$)**1 point**

$3 * 10^4$

$1 * 10^4$

$2 * 10^4$

$4 * 10^4$

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

$4 * 10^4$

5) Infinite length parallel plates are separated by $2h$ and aqueous solution is filled in the gap. Assume an electroosmotic mobility is $4 * 10^{-8}$ and $2 * 10^{-8} m^2/Vs$ for top and bottom plate respectively. If an electric field of $150V/cm$ is applied. Calculate the top plate velocity ($\mu m^2/s$)**1 point**

$6 * 10^2$

$7 * 10^2$

$12 * 10^2$

$8 * 10^3$

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

$6 * 10^2$

6) Considering the data from problem 5, and assuming Couette flow between the plate. Calculate the mid plane velocity ($\mu m^2/s$).**1 point**

$4.5 * 10^2$

$6 * 10^2$

$3 * 10^2$

$7 * 10^2$

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

$4.5 * 10^2$

7) Consider a sodium ion motionless in water at time $t=0$. Calculate the electrophoretic force on the ion if an electric field of $100V/cm$ is applied. ($Z^{Na+} = 1, e = 1.6 * 10^{-19}C$)**1 point**

$1.6 * 10^{-15}$

$3.2 * 10^{-16}$

$1.6 * 10^{-14}$

$1.6 * 10^{-16}$

No, the answer is incorrect.

Score: 0

Accepted Answers:

$1.6 * 10^{-15}$

8) With the data from the problem 7. Calculate the ion acceleration at $t=0$ (m^2/s)

1 point

$4 * 10^9$

$4 * 10^{17}$

$4 * 10^{15}$

$4 * 10^{10}$

No, the answer is incorrect.

Score: 0

Accepted Answers:

$4 * 10^{10}$

9) Following forces are negligible in microchannel

1 point

Viscous

Surface tension

Gravity

Inertia

No, the answer is incorrect.

Score: 0

Accepted Answers:

Gravity

10) Which one of the following number is not a hydrodynamic quantity

1 point

Bond number

Weber number

Jakob number

Ohnesorge number

No, the answer is incorrect.

Score: 0

Accepted Answers:

Jakob number

11) Relative importance of buoyancy force to surface tension force is given by

1 point

Boiling number

Bond number

Capillary number

Eotvos number

No, the answer is incorrect.

Score: 0

Accepted Answers:

Bond number

Eotvos number

12) Two phase heat transfer is suitable for high heat transfer application due to

1 point

- Latent heat > Specific heat
- None of the above
- Effective cooling for given volume of coolant
- High heat transfer coefficient

No, the answer is incorrect.

Score: 0

Accepted Answers:

Latent heat > Specific heat

High heat transfer coefficient

Effective cooling for given volume of coolant

13) Which of the following regimes are encountered in microchannel flow

1 point

- Bubbly flow
- Spray flow
- Slug flow
- Wavy flow

No, the answer is incorrect.

Score: 0

Accepted Answers:

Slug flow

Bubbly flow

14) Weber number considers the ratio of the following forces

1 point

- Inertia and surface tension
- Viscous and surface tension
- Sensible heat and latent heat
- Buoyancy and surface tension

No, the answer is incorrect.

Score: 0

Accepted Answers:

Inertia and surface tension

15) Type of boiling regime preferred for high heat transfer application

1 point

- Film boiling
- Transition boiling
- Nucleate boiling
- Natural convection boiling

No, the answer is incorrect.

Score: 0

Accepted Answers:

Nucleate boiling

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