

Unit 6 - Week 4

Course outline

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Week 4

● Lecture 16 : Transport mechanisms (combined mode)

● Lecture 17 : Transport mechanisms (adsorption / pore condensation)

● Lecture 18 : Transport mechanisms (contd.)

● Lecture 19 : Flow equation (introduction)

● Lecture 20 : Flow equations (contd.)

 Quiz : Assignment 4

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Lecture Material

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Assignment 4

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

Due on 2019-08-28, 23:59 IST.

1) If a flow conduit has a rectangular geometry with sides of length 'a' and 'b' respectively, the hydraulic diameter will be expressed as

- a) $\frac{2ab}{a+b}$
 b) $\frac{4ab}{a+b}$
 c) $\frac{ab}{a+b}$
 d) None of these

- a.
 b.
 c.
 d.

No, the answer is incorrect. Score: 0

Accepted Answers: a.

2) Pore condensation happens due to

- a) Reduced temperature in pores
 b) Surface tension force pulling the molecules together
 c) Throttling effect at pore mouth
 d) None of the above

- a.
 b.
 c.
 d.

No, the answer is incorrect. Score: 0

Accepted Answers: b.

3) If the pore radius is halved, the pore condensation will take place at

- a) Higher pressure
 b) Lower pressure
 c) Same pressure
 d) Any pressure, may be higher or lower

- a.
 b.
 c.
 d.

No, the answer is incorrect. Score: 0

Accepted Answers: b.

4) Klinkenberg effect dominates for

- a) Gas flow through low permeability shale
 b) Oil flow through regular sandstone
 c) Water flow through high temperature reservoir
 d) Exceptionally high velocity in high permeability reservoir

- a.
 b.
 c.
 d.

No, the answer is incorrect. Score: 0

Accepted Answers: a.

5) Knudsen diffusion is applied when the

- a) pore size is too small for surface diffusion to dominate
 b) pore size is too small for bulk diffusion to dominate
 c) pore size is comparable to mean free path of molecule
 d) None of the above

- a.
 b.
 c.
 d.

No, the answer is incorrect. Score: 0

Accepted Answers: c.

6) Klinkenberg effect is a combination of

- a) Knudsen diffusion and viscous flow
 b) Bulk diffusion and viscous flow
 c) Bulk diffusion and surface diffusion
 d) Surface diffusion and viscous flow

- a.
 b.
 c.
 d.

No, the answer is incorrect. Score: 0

Accepted Answers: a.

7) Darcy-Forchheimer equation accounts for

- a) Temperature effect in Darcy flow
 b) Throttling in Darcy flow
 c) Knudsen diffusion in Darcy flow
 d) Inertia in Darcy flow

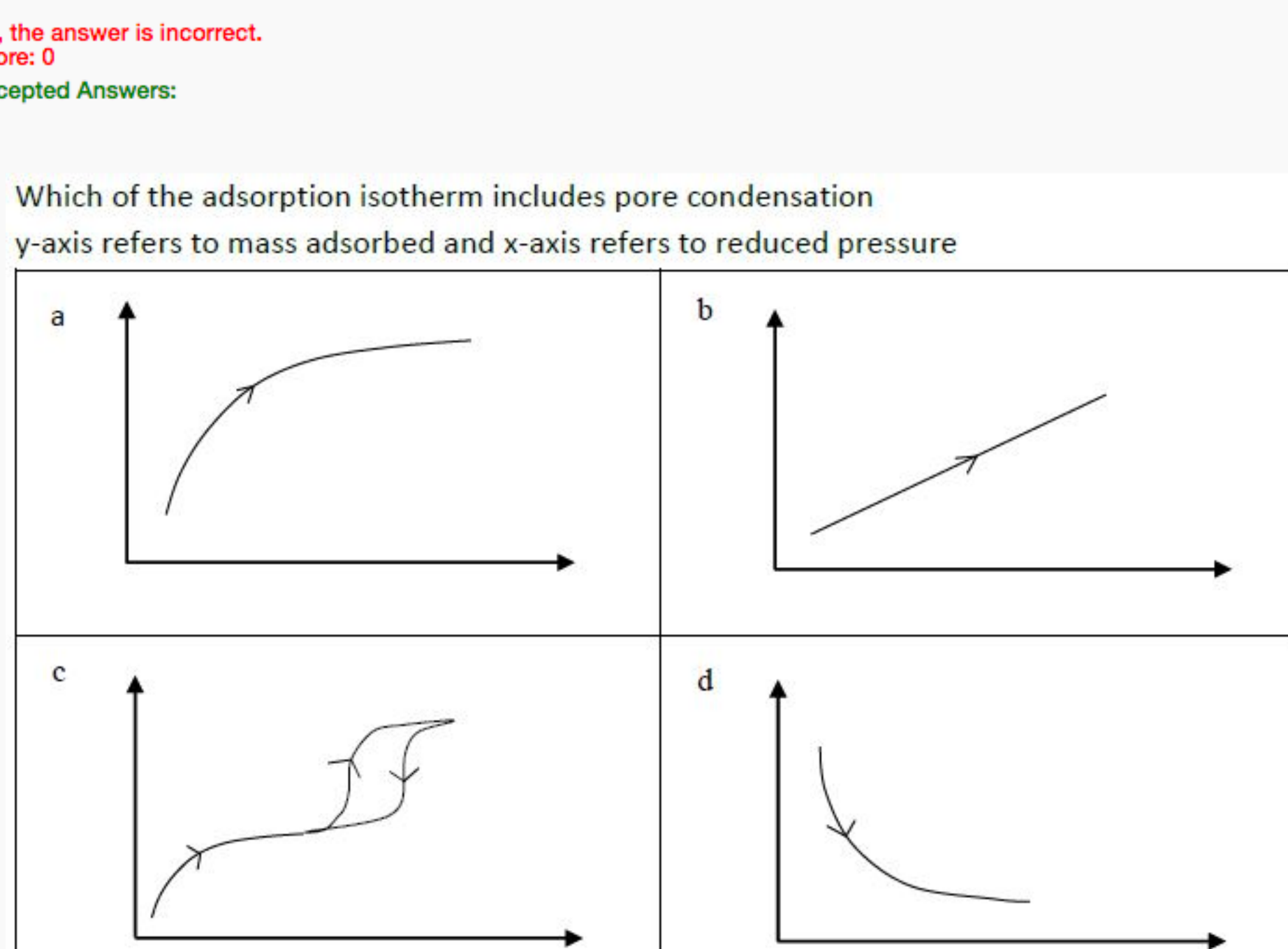
- a.
 b.
 c.
 d.

No, the answer is incorrect. Score: 0

Accepted Answers: d.

8) Which of the adsorption isotherm includes pore condensation

y-axis refers to mass adsorbed and x-axis refers to reduced pressure



- a.
 b.
 c.
 d.

No, the answer is incorrect. Score: 0

Accepted Answers: c.

9) For a medium containing pores of different sizes, if the relative pressure of vapour is reduced from 1.0, the evaporation starts in

- a) Smaller pores
 b) Larger pores
 c) All pores together
 d) Nowhere inside the porous medium

- a.
 b.
 c.
 d.

No, the answer is incorrect. Score: 0

Accepted Answers: b.

10) For a particle of arbitrary shape, the ratio of surface area of sphere (whose volume is same as the particle) to the surface area of particle is referred as

- a) Aspect ratio
 b) Sphericity
 c) Poisson's ratio
 d) Void ratio

- a.
 b.
 c.
 d.

No, the answer is incorrect. Score: 0

Accepted Answers: b.

11) Surface to volume ratio of spherical particle of diameter 'd' will be

- a) 6/d
 b) 3/d
 c) 2/d
 d) None of the above

- a.
 b.
 c.
 d.

No, the answer is incorrect. Score: 0

Accepted Answers: a.

12) For a packed bed of overall porosity 0.3 comprises of spherical particles of diameter 1mm. The average hydraulic diameter (in mm) of the flow pathways through the packed bed will be

No, the answer is incorrect. Score: 0

Accepted Answers: (Type: Range) 0.26,0.3

13) If water flows through the packed bed at a superficial velocity of 0.5mm/s, the Reynold's number will be

$$\text{Given, } \rho = \frac{10^3 \text{ kg}}{\text{m}^3}, \mu = 10^{-3} \frac{\text{kg m}}{\text{s}}$$

No, the answer is incorrect. Score: 0

Accepted Answers: (Type: Range) 0.65,0.75

14) Calculate the reduced pressure (in atm) at which the condensation takes place. The vapour properties are as follows.

Boiling point temperature = 77 K

Pore radius = 1nm

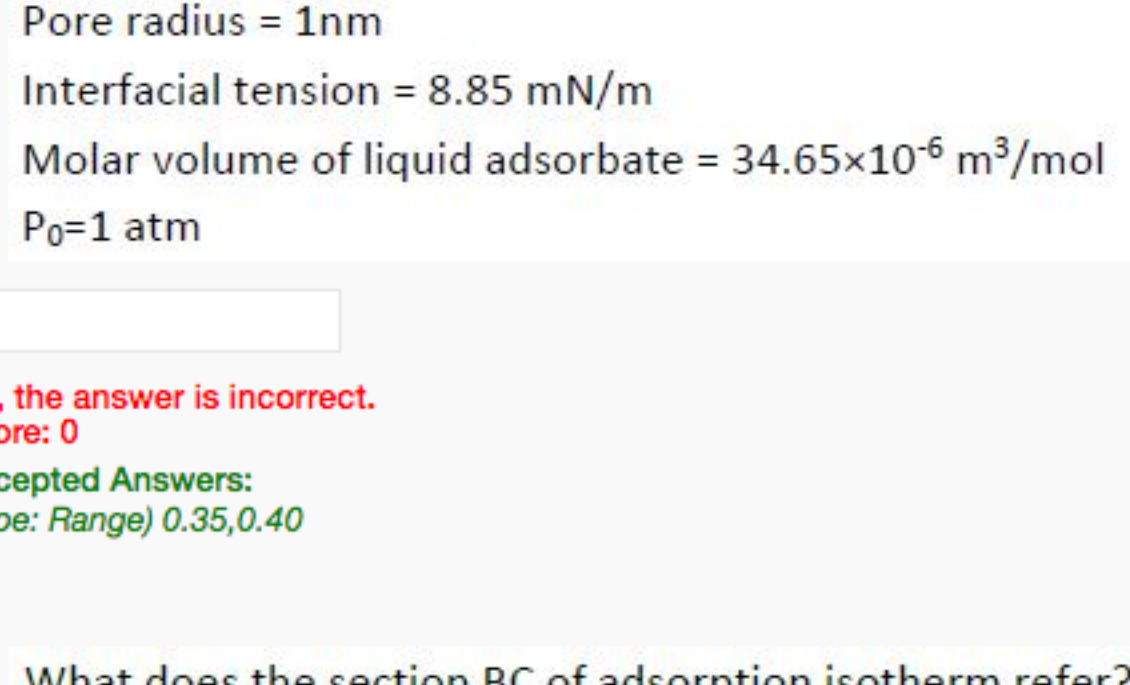
Interfacial tension = 8.85 mN/m

 Molar volume of liquid adsorbate = $34.65 \times 10^{-6} \text{ m}^3/\text{mol}$
 $P_0 = 1 \text{ atm}$

No, the answer is incorrect. Score: 0

Accepted Answers: (Type: Range) 0.35,0.40

15) What does the section BC of adsorption isotherm refer?



- a) Monolayer adsorption
 b) Multilayer adsorption
 c) Pore evaporation
 d) Pore condensation

- a.
 b.
 c.
 d.

No, the answer is incorrect. Score: 0

Accepted Answers: b.