Week 10 Assignment 1

The due date for submitting this assignment has passed. **Due on 2018-04-04, 23:59 IST.**

Submitted assignment

1) The parameter affecting the volumetric mass transfer coefficient \(k_{La}\) is

☐ Temperature
☐ Biomass
☐ Medium composition
☐ All of the above

No, the answer is incorrect.
Score: 0
Accepted Answers:
All of the above

2) Parameter that is useful of scaling up is

☐ Power consumed per unit volume of liquid
☐ Reynolds number
☐ Tip velocity of the stirrer
☐ All of the above

No, the answer is incorrect.
Score: 0
Accepted Answers:
All of the above

3) If impeller tip speed is 500 rpm, impeller diameter is 4.5 cm, density and viscosity of liquid is 1 g/cm³ and 1 cp, respectively. The agitator Reynolds number will be

- 16868
- 26850
- 32358

No, the answer is incorrect.
Score: 0
Accepted Answers:
16868
4) Power consumed by the agitator per unit liquid volume of the reactor can be expressed as

\[ \frac{P}{V} \propto n^3 D_i^2 \]

- No, the answer is incorrect.

Score: 0

Accepted Answers:

- \[ \frac{P}{V} \propto n^3 D_i^2 \]

5) The continuity equation is based on

- Mass balance
- Momentum balance
- Both mass and momentum balance
- None of the above

- No, the answer is incorrect.

Score: 0

Accepted Answers:

Mass balance

6) In steady state, rate of heat transfer through any cross section of slab is directly proportional to

- Length
- Temperature difference
- Force
- None of these

- No, the answer is incorrect.

Score: 0

Accepted Answers:

Temperature difference

7) Laminar flow of a Newtonian fluid exist, when the Reynolds number is less than

- 4000
- 2100
- 2500
- 3000

- No, the answer is incorrect.

Score: 0

Accepted Answers:

2100

8) The ratio of inertia force to viscous force is known as

- Biot number
- Reynolds number
9) Which of the following is used for agitation in the fermentation industry?  
- Propeller  
- Paddle  
- Anchor  
- Impeller  

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

10) In general, the ratio of mixing time and circulation in a bioreactor is:  
- 8  
- 6  
- 4  
- None of these  

No, the answer is incorrect.  
Score: 0  
Accepted Answers:  
4

11) The mechanism of conductive heat transfer is explained by:  
- Newtonian law  
- Fick's law  
- Fourier's law  
- Ohms law  

No, the answer is incorrect.  
Score: 0  
Accepted Answers:  
Fourier's law

12) The dimensions of kinematic viscosity of a fluid is:  
- \( LT^{-2} \)  
- \( L^2T^{-1} \)  
- \( ML^1T^{-1} \)  
- \( ML^2T^{-2} \)  

No, the answer is incorrect.  
Score: 0  
Accepted Answers:  
\( L^2T^{-1} \)
14. The variation of thermal conductivity of a metal with temperature is often correlated using an expression of the form \( k = k_0 + aT \) where, \( k \) is the thermal conductivity and \( T \) is the temperature (in K). The units of \( a \) in SI system will be

- \( \text{W/m K} \)
- \( \text{W/m} \)
- \( \text{W/m K}^2 \)
- None of the above

No, the answer is incorrect.
Score: 0
Accepted Answers:
\( \text{W/m K} \)

15. A composite flat wall of a furnace is made of two materials ‘A’ and ‘B’. The thermal conductivity of ‘A’ is twice of that of material ‘B’, while the thickness of layer of ‘A’ is half that of ‘B’. If the temperature at the two sides of the wall are 400 and 1200 K, then the temperature drop (in K) across the layer of material ‘A’ is (assume steady state heat transfer)

- 125
- 133
- 150
- 160

No, the answer is incorrect.
Score: 0
Accepted Answers:
160

16. Hot oil at 150 °C is used to pre-heat a cold fluid at 30 °C in a 1:1 shell and tube heat exchanger. The exit temperature of the hot oil is 110 °C. Heat capacities (product of mass flow rate and specific heat capacity) of both the streams are equal. The heat duty is 2 kW. Under co-current flow conditions, the overall heat transfer resistance \((1/UA)\) is

- 0.4 °C/W
- 0.04 °C/W
- 0.36 °C/W
- 0.036 °C/W

No, the answer is incorrect.
Score: 0
Accepted Answers:
0.036 °C/W

17. Diffusion is a process of

- Movement of particles from higher concentration to lower concentration

No, the answer is incorrect.
Score: 0
18) Movement of particles through a semipermeable membrane
Movement of particles from Lower concentration to higher concentration
None of the above

No, the answer is incorrect.
Score: 0
Accepted Answers:
Movement of particles from higher concentration to lower concentration

19) Gas phase diffusivity is
- Affected more by temperature than that for liquid
- Affected much less by temperature than that for liquid
- Not affected by temperature
- None of these

No, the answer is incorrect.
Score: 0
Accepted Answers:
Affected more by temperature than that for liquid

20) The SI unit of volumetric mass transfer coefficient is
- m²/s
- m/s
- s⁻¹
- s⁻²

No, the answer is incorrect.
Score: 0
Accepted Answers:
s⁻¹

20) A liquid is flowing at 11,400 L/h along a pipeline having a diameter of 4 cm. If the liquid has a density of 1 g/mL and viscosity of 0.001 kg/m s, then the liquid would be in the
- Laminar phase
- Transient phase
- Turbulent phase
- Any of the phase

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