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Fundamentals of Chemical Engineering

Group Number :	1
Group Id :	489994195
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Fundamentals of Chemical Engineering

Section Id :	489994251
Section Number :	1
Section type :	Online
Mandatory or Optional:	Mandatory
Number of Questions:	72
Number of Questions to be attempted:	72
Section Marks:	100
Display Number Panel:	Yes
Group All Questions:	No

Sub-Section Number:	1
Sub-Section Id:	489994269
Question Shuffling Allowed :	Yes

Question Number : 1 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

The dimension of 'Thermal conductivity' is

a) $\frac{ML\theta^{-3}}{T^{-1}}$ b) $\frac{MTL^{-3}}{\theta^{-1}}$ c) $\frac{MLT^{-3}}{\theta^{-1}}$ d) $\frac{\theta LT^{-3}}{M^{-1}}$

Options :

1. 1
2. 2
3. 3
4. 4

The maximum adiabatic flame temperature in air as compared to that in pure oxygen is

a) Much lower
b) Much higher
c) same
d) either lower or higher, depends on the type of fuel

Options :

1. 1
2. 2
3. 3
4. 4

Degree of freedom in a mass balance problem is < 1. This indicates

a) The problem can be solved
b) More unknowns than independent equations
c) Variables are underspecified
d) Flowchart is incompletely labelled

Options :

1. 1
2. 2
3. 3
4. 4

When a flowsheet is scaled, which of the following changes?

a) Density of streams
b) Mass fraction of components in a stream
c) Molar flowrate of components in a stream
d) Temperature of streams

Options :

1. 1
2. 2
3. 3
4. 4

mole % O_2 and 79 mole % N_2) and 100 mol of HCl are supplied into a reactor for the manufacture of chlorine. Amount of air supplied is such that oxygen is in 35 % excess. The degree of freedom for this process is

a) 0
b) 1
c) 2
d) 3

Options :

1. 1
2. 2
3. 3
4. 4

Question Number : 6 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

Number of intensive variables that can be specified independently for a closed system containing a vapour-liquid mixture of benzene-toluene at equilibrium is

a) 3
b) 2
c) 1
d) 0

Options :

1. 1
2. 2
3. 3
4. 4

Question Number : 7 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

200 kg of an aqueous solution of KNO_3 (60 mass %) at 80°C is fed to a crystallizer where the solution is cooled to 40°C. The saturation concentration of KNO_3 at 40°C is 38.6 mass %. The degree of freedom for this process is

a) 0
b) 1
c) 2
d) 3

Options :

1. 1
2. 2
3. 3
4. 4

Question Number : 8 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

ximated equation may be used to estimate the dew-point temperature for known dry bulb temperature and humidity is as,

$$\frac{4030 * (T + 253)}{4030 - (T + 253) * ln(x)} - 253$$

where x is,

a. Absolute humidity
b. Relative humidity
b. Molal humidity
d. Percent humidity

Options :

1. 1
2. 2
3. 3
4. 4

Question Number : 9 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

The concept of wet bulb temperature is based on the equilibrium between the rates of energy transfer to the _____ and the evaporation of _____

a) Water, vapour
b) Bulb, water
c) Bulb, vapour
d) Vapour, water

Options :

1. 1
2. 2
3. 3
4. 4

Question Number : 10 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

Heat transfer coefficient (h) for liquids increases with

a) increasing temperature
b) decreasing temperature
c) decreasing Reynolds number
d) none of these

Options :

1. 1
2. 2
3. 3
4. 4

Question Number : 11 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

d – liquid heat exchanger, for same process temperature, the ratio of the LMTD in parallel flow to the LMTD in counter flow is always

a) < 1 b) > 1

c) 1 d) ∞

Options :

1. 1
2. 2
3. 3
4. 4

Question Number : 12 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

Thermal diffusivity is given by

a) $\frac{K}{\rho c_P}$ b) $\frac{\mu}{hc_P}$

c) $\frac{\mu c_P}{K}$ d) $\frac{\mu}{hc_P}$

Options :

1. 1
2. 2
3. 3
4. 4

Question Number : 13 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

Dittus-Boelter equation as used for the determination of heat transfer coefficient is valid

a) For fluids in laminar flow b) for fluids in turbulent flow

c) when Grashoff number is very important d) for liquid metals

Options :

1. 1
2. 2
3. 3
4. 4

Question Number : 14 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

oiling regime is the most economical and desirable in a boiling equipment?

(a): film boiling
(b): free convective boiling
(c): nucleate boiling
(d): transition boiling

Options :

1. 1
2. 2
3. 3
4. 4

Question Number : 15 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

Heat transfer coefficient (h) in the nucleate boiling varies with temperature difference between the heating element and the liquid (Δt) as:

(a): $h \propto \Delta T^2$

(b): $h \propto \Delta T^{1.25}$

(c): $h \propto \Delta T^1$

(d): $h \propto \Delta T^{0.5}$

Options :

1. 1
2. 2
3. 3
4. 4

Question Number : 16 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

Ina counter current 1-1 shell and tube heat exchanger, the following are the inlet and outlet temperatures:
(a) Hot fluid inlet temperature=120 °C
(b) Hot fluid outlet temperature=100 °C
(c) Cold fluid outlet temperature=70 °C
(d) Cold fluid inlet temperature=50 °C

The mean temperature difference to be used is.....

Options :

1. 1
2. 2
3. 3
4. 4

Question Number : 17 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

correct option:

A. The log mean temperature difference (LMTD) for counter flow and parallel flow can be same when any one of the fluids passes through the heat exchanger at a constant temperature

B. Shell side pressure drop in a shell and tube heat exchanger does not depend upon the shell diameter

(a) Both the statements are true
(b) Both the statements are false
(c) Only statement in (A) is true
(d) Only statement in (B) is true

Options :

1. 1
2. 2
3. 3
4. 4

Question Number : 18 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

Increasing the liquor level in the evaporator results in

a) Decreased capacity
b) Increase in liquor film coefficient
c) Decreased effect of hydrostatic head
d) Increased true temperature drop

Options :

1. 1
2. 2
3. 3
4. 4

Question Number : 19 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

Economy of an evaporator is influenced by

a) Steam pressure
b) Temperature of the feed
c) Number of effect
d) Both b and c

Options :

1. 1
2. 2
3. 3
4. 4

Question Number : 20 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

ing line for an absorber is curved when plotted in terms of

a) Mole ratio

b) Mole fraction

c) Mass ratio

d) None of the above.

Options :

1. 1
2. 2
3. 3
4. 4

Question Number : 21 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

In case of a stripper

a) The operating line will always lie above the equilibrium curve

b) The operating line will always lie below the equilibrium curve

c) There is no fixed rule for relative position of operating line and equilibrium curve

d) None of these

Options :

1. 1
2. 2
3. 3
4. 4

Question Number : 22 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

What is the physical significance of the absorption factor A?

a) It is the ratio of the slopes of the equilibrium line and the operating line.

b) It is ratio of the slopes of the operating line and the equilibrium line.

c) It is fractional absorption of the feed.

d) None of these

Options :

1. 1
2. 2
3. 3
4. 4

Question Number : 23 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

um liquid rate to be used in an absorber corresponds to an operating line

a) Of slope = 1

b) Of slope = 0.1

c) Tangential to the equilibrium curve

d) None of these

Options :

1. 1
2. 2
3. 3
4. 4

Question Number : 24 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

If the gas phases composition of a component A is 0.65 and its relative volatility is 2. Find the liquid phase composition.

a) 0.48 b) 0.58 c) 0.68 d) 0.78

Options :

1. 1
2. 2
3. 3
4. 4

Question Number : 25 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

The column used for differential distillation is_____

a) Still

b) Differential column

c) Batch column

d) None of the mentioned

Options :

1. 1
2. 2
3. 3
4. 4

Question Number : 26 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

If the feed enters the distillation column at its dew point, then the slope of the Flash vaporization operating line is,

a) Zero

b) Infinity

c) 1

d) Between 0 and 1

Options :

1. 1
2. 2

4. 4

Question Number : 27 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical
Correct Marks : 1 Wrong Marks : 0

If there is no reflux to a fractionating column then
a) Large condenser size is needed
b) Less reboiler size needed
c) Minimum number of trays
d) None of the mentioned

Options :
1. 1
2. 2
3. 3
4. 4

Question Number : 28 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical
Correct Marks : 1 Wrong Marks : 0

McCabe –Thiele method excludes _____ information.
a) Enthalpy
b) Entropy
c) Flow rate
d) Number of theoretical stages

Options :
1. 1
2. 2
3. 3
4. 4

Question Number : 29 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical
Correct Marks : 1 Wrong Marks : 0

If the feed is saturated vapor, the slope of q-line is,
a) 1
b) infinity
c) Zero
d) None

Options :
1. 1
2. 2
3. 3
4. 4

Question Number : 30 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical
Correct Marks : 1 Wrong Marks : 0

osition of substances in the extraction are represented by _____

a) Rectangle
b) Isosceles triangle
c) Equilateral triangle
d) None of the mentioned

Options :

1. 1
2. 2
3. 3
4. 4

Question Number : 31 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

Number of possible operating points in a nonisothermal CSTR is,

(a) 1
(b) 2
(c) 3
(d) Any one of the above options

Options :

1. 1
2. 2
3. 3
4. 4

Question Number : 32 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

The nature of the heat removal curve in a nonisothermal CSTR is

a) Nearly Linear
b) Hyperbolic
c) Sigmoidal
d) None of the above options

Options :

1. 1
2. 2
3. 3
4. 4

Question Number : 33 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

For stability in anonisothermal CSTREigen values of the Jacobianfor coefficient matrix of the conservations equations must have

(a) Positive real parts
(b) Negative real parts
(c) Negative imaginary parts
(d) Positive imaginary parts

Options :

1. 1
2. 2

4. 4

Question Number : 34 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical
Correct Marks : 1 Wrong Marks : 0

Ignition temperature in anonisothermal CSTR is defined as:
(a) The reactor temperature at which the reactor steady state shoots from the lower steady state to upper steady state
(b) The heating/cooling medium temperature at which the reactor steady state shoots from the lower steady state to upper steady state
(c) The feed temperature at which the reactor steady state shoots from the lower steady state to upper steady state
(d) None of the aboveoptions

Options :
1. 1
2. 2
3. 3
4. 4

Question Number : 35 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical
Correct Marks : 1 Wrong Marks : 0

Unreacted shrinking core model is more appropriate for application when
(a) Both the solid reactant and solid reactant are impervious
(b) The solid reactant is porous and solid product is impervious
(c) The solid reactant is impervious and solid product is porous
(d) None of the above options

Options :
1. 1
2. 2
3. 3
4. 4

Question Number : 36 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical
Correct Marks : 1 Wrong Marks : 0

In random pore model for gas-solid noncatalytic reactions
(a) The pore structure evolution is incorporated as a known function of time
(b) The pore structure evolution is incorporated as constant
(c) The pore structure evolution is incorporated as a function of conversion
(d) None of the above

Options :
1. 1
2. 2
3. 3
4. 4

Question Number : 37 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical
Correct Marks : 1 Wrong Marks : 0

...as-solid noncatalytic reaction following unreacted shrinking core models controlled by product layer diffusion resistance, the reaction completion time?

(a) $\tau \alpha R^{1.5}$

(b) $\tau \alpha R^{2}$

(c) $\tau \alpha R$

(d) None of the above options

Options :

1. 1
2. 2
3. 3
4. 4

Question Number : 38 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

In a gas-solid noncatalytic reactor if the solid particles are of different but unchanging size and in plug flow and the reaction is controlled by chemical reaction resistance, the design equation is

(a) $1-\overline{X_B}=\sum_{R(tp=\tau)}^{R_m}\left[1-\frac{t_p}{\tau(R_i)}\right]^2\frac{F(R_i)}{F}$

(b) $1-\overline{X_B}=\sum_{R(tp=\tau)}^{R_m}\left[1-\frac{t_p}{\tau(R_i)}\right]\frac{F(R_i)}{F}$

(c) $1-\overline{X_B}=\sum_{R(tp=\tau)}^{R_m}\left[1-\frac{t_p}{\tau(R_i)}\right]^{1/3}\frac{F(R_i)}{F}$

(d) None of the above options

Options :

1. 1
2. 2
3. 3
4. 4

Question Number : 39 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

Thrust on a pipe bend is obtained using

a) Microscopic mass balance
b) Microscopic linear momentum balance
c) Macroscopic linear momentum balance
d) Macroscopic kinetic energy balance

Options :

1. 1
2. 2
3. 3

Question Number : 40 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

Choose the odd-man out

a) Mass balance
b) Energy balance
c) Momentum balance
d) Entropy balance

Options :

1. 1
2. 2
3. 3
4. 4

Question Number : 41 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

Concentration profile is obtained by solving

a) Differential linear momentum balance
b) Differential energy balance
c) Differential species mass balance
d) Differential total mass balance

Options :

1. 1
2. 2
3. 3
4. 4

Question Number : 42 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

Viscous stress can also be interpreted as

a) Potential energy
b) Kinetic energy
c) Momentum flux
d) Pressure

Options :

1. 1
2. 2
3. 3
4. 4

Question Number : 43 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

counter diffusion between A and B assumes

a) A and B must react
b) A and B must not react
c) A and B must repeal each other
d) Diameter of A and B must be equal

Options :

1. 1
2. 2
3. 3
4. 4

Question Number : 44 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

Species continuity equation is applicable only for

a) Constant density fluid
b) Only kind of fluid
c) Gaseous fluid
d) Gases under very high vacuum

Options :

1. 1
2. 2
3. 3
4. 4

Question Number : 45 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

In a mixture of n number of species, number of species continuity equation expressed in terms of mole fraction is

a) n+1
b) n^2
c) n-1
d) 2n

Options :

1. 1
2. 2
3. 3
4. 4

Question Number : 46 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

okes equation contains following term

a) Accumulation and convection terms

b) Convection and diffusion terms

c) Convection, diffusion, accumulation terms

d) Convection, diffusion, accumulation and source terms

Options :

1. 1

2. 2

3. 3

4. 4

Question Number : 47 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

Consider flow of a binary gas mixture in a cylindrical tube. The tube walls are selectively permeable to only one species. The Pecklet number and Schmidt number are Pe and Sc, respectively. Axial diffusion can be neglected in modeling of concentration profile in the tube when:

a. Pe>> 1
b. Pe<< 1
c. Sc>> 1
d. Sc<<1

Options :

1. 1

2. 2

3. 3

4. 4

Question Number : 48 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

The total molecular energy flux for a multicomponent mixture consists of heat transport by conduction and an additional term resulting on account of:

a. difference in partial specific entropy of constituent species
b. difference in density of constituent species
c. difference in partial specific enthalpy of constituent species
d. difference in viscosity of constituent species

Options :

1. 1

2. 2

3. 3

4. 4

Question Number : 49 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

a multicomponent mixture, for which diffusion-thermo effect is not important, i.e., it can be ignored. Pick the correct statement:

a. The total molecular energy flux for given multicomponent mixture will be equal to heat flux by conduction when all diffusional mass fluxes are zero.
b. The total molecular energy flux for given multicomponent mixture will be always equal to heat flux by conduction.
c. The total molecular energy flux for given multicomponent mixture will be equal to heat flux by conduction when the mixture can be modeled as an ideal solution.
d. The total molecular energy flux for given multicomponent mixture will be equal to heat flux by conduction when the diffusional mass fluxes can be modeled by Maxwell-Stefan equations.

Options :

1. 1
2. 2
3. 3
4. 4

Question Number : 50 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

The representative volume element (RVE) is the size-scale over which the transport processes (mass, momentum, energy) can be modeled by the continuum approximation. Pick the correct option for relationship of RVE with molecular volume (V_m) and volume of system being modeled (V):

a. RVE $>> V_m, V$
b. RVE $<< V_m, V$
c. $V_m <<$ RVE $<< V$
d. RVE $= V_m$

Options :

1. 1
2. 2
3. 3
4. 4

Sub-Section Number: 2
Sub-Section Id: 489994270
Question Shuffling Allowed : Yes

Question Number : 51 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 2 Wrong Marks : 0

Grashoff number (G) is defined as

a) (Inertia force x buoyancy force)/(viscous force)^2
b) (Inertia force x viscous force)/(buoyancy force)^2
c) (Buoyancy force x viscous force)/(inertia force)^2
d) None of the above

Options :

1. 1

3. 3
4. 4

Question Number : 52 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical
Correct Marks : 2 Wrong Marks : 0

Fresh air (4 mole % water vapour) is mixed with recycled dehumidified air and passed into an air cooler in which 1 molof water vapour condenses out as liquid. Part of the dehumidified air leaving the cooler is recycled and the balance is delivered to a room. 100 mol of dehumidified air (1.7 mole % water vapour) is delivered to the room. The degree of freedom for this process is

a) -1
b) 0
c) 1
d) 2

Options :
1. 1
2. 2
3. 3
4. 4

Question Number : 53 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical
Correct Marks : 2 Wrong Marks : 0

100 kmol of equimolar mixture containing ethylene and oxygen is fed to a reactor in which ethylene oxide is formed. The fractional conversion of ethylene is 30%. The moles of O_2 leaving the reactor is

a) 42.5
b) 35
c) 15
d) 25

Options :
1. 1
2. 2
3. 3
4. 4

Question Number : 54 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical
Correct Marks : 2 Wrong Marks : 0

Calculate the heat transfer to the atmosphere per second from a circular 5cm in diameter and 100 m long carrying steam at an average temperature of 120°C if surroundings are at 20°C. The heat transfer can be estimated from the relation $Q = h.A.\Delta T$, where A is the surface area of the pipe and ΔT is temperature difference between surface of the pipe and ambient condition.

(a) 7854 J/s (b) 5800 J/s
(c) 4800 J/s (d) 9700 J/s.

2. 2
3. 3
4. 4

Question Number : 55 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical
Correct Marks : 2 Wrong Marks : 0

Calculate $\Delta\hat{H}_R^0$ for the following reaction:

C_2H_5OH (l) + CH_3COOH (l) → $C_2H_5COOCH_3$ (l) + H_2O (l)

Heat of combustion data are:

C_2H_5OH $\Delta\hat{H}_C^0$ = - 326.700 kcal/gmol

CH_3COOH $\Delta\hat{H}_C^0$ = - 208.340 kcal/gmole

$C_2H_5COOCH_3\Delta\hat{H}_C^0$ = - 538.760 kcal/gmole

The following reactions occur:

$C_2H_5OOCH_3 + 5O_2 \rightarrow 4CO_2 + 4H_2O$

$C_2H_5OH + 3O_2 \rightarrow 2CO_2 + 3H_2O$

$CH_3COOH + 2O_2 \rightarrow 2CO_2 + 2H_2O$

(a) 420.4 kcal (b) 657.12 kcal (c) 3.720 kcal (d) 212.06 kcal

Options :
1. 1
2. 2
3. 3
4. 4

Question Number : 56 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical
Correct Marks : 2 Wrong Marks : 0

Calculate the standard heat of reaction for the following reaction:

CaC_2 (s) + $2H_2O$ (l) → $Ca(OH)_2$ (s) + C_2H_2 (g)

Standard heat of formation data is:

CaC_2 (s), $\Delta\hat{H}_F = -15{,}000$ cal

H_2O (l), $\Delta\hat{H}_F = -68{,}317.4$ cal

$Ca(OH)_2$ (g), $\Delta\hat{H}_F = -235{,}800$ cal

C_2H_2 (g), $\Delta\hat{H}_F = 54{,}194$ cal

(a)–333.24 kcal/gmole (b) – 98.289 kcal/gmole

(c) – 181.606 kcal/gmole (d) – 29.971 kcal/gmole

Options :
1. 1
2. 2
3. 3
4. 4

Question Number : 57 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical
Correct Marks : 2 Wrong Marks : 0

the heat of formation of chloroform, if the standard heat of combustion of chloroform is $\Delta H_C^0 = -121,800$ cal/mole as per the following reaction:

$CHCl_3 (g) + ½ O_2 (g) + H_2O (aq) \rightarrow CO_2 (g) + 3 HCl (aq)$

Data provided: $H2 (g) + ½ O_2 (g) \rightarrow H_2O (l)$ $\Delta\hat{H}^0_{f_{H_2O}} = -68317.4$ cal

$C + O_2(g) \rightarrow CO_2 (g)$ $\Delta\hat{H}^0_{f_{CO_2}} = -94051.8$ cal

$½ H_2 (g) + ½ Cl_2 (g) \rightarrow HCl (aq)$ $\Delta\hat{H}^0_{f_{HCl}} = -40023$ cal

(a)– 24 kcal/gmole
(b) – 24 cal/gmole
(c) – 79.5 kcal/gmole
(d) – 160.6337 cal/gmole

Options :

1. 1
2. 2
3. 3
4. 4

Question Number : 58 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 2 Wrong Marks : 0

For a steel pipe heated to 373 K and kept in 300 K atmosphere, Biot number is the ratio of

(a) Convection heat transfer at the boundary of steel pipe/conduction inside the steel pipe
(b) Convection heat transfer in the steel pipe/conduction inside the steel pipe
(c) Convection heat transfer in the steel pipe/conduction at the boundary of steel pipe
(d) Convection heat transfer at the boundary of steel pipe/ conduction at the boundary of steel pipe

Options :

1. 1
2. 2
3. 3
4. 4

Question Number : 59 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 2 Wrong Marks : 0

The bottom of a metal pan, 0.3 m in diameter, is kept at 118 °C by an electric heating system. What is the evaporation rate of water (in kg/hr) if the heat flux is 836 kW/m^2 and the latent heat of water is 2257 kJ/kg?

(A): 1333

(B): 94

(C): 0.37

(D): 0.026

Options :

1. 1
2. 2
3. 3
4. 4

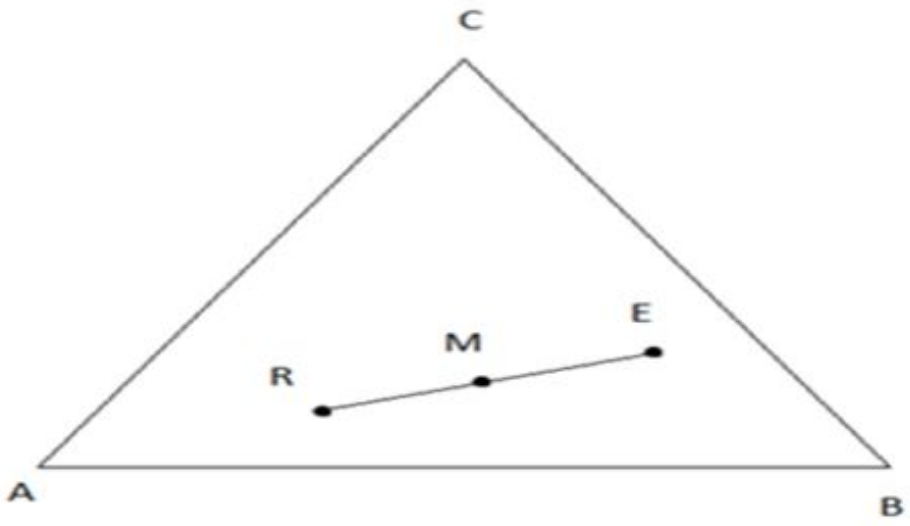
In a film boiling experiment, a horizontal cylindrical heating element is used. How does the heat transfer coefficient changes when the diameter of the cylinder is doubled with other variable being held unchanged?

(a): h increases by a factor of 2
(b): h increases by a factor of $21^{/4}$
(c): h increases by a factor of $23^{/4}$
(d): h does not change

Options :

1. 1
2. 2
3. 3
4. 4

10 kg Raffinate(R) of 20% solute concentration is mixed with 4 kg fresh extracting solvent (E) to separate the solute from raffinate. The solute concentration in mixture (x_M) will be,



a) 1.43 b) 0.14 c) 0.2 d) none

Options :

1. 1
2. 2
3. 3
4. 4

h adsorption process, 5 g of fresh adsorbent is used to treat 1 liter of an aqueous phenol solution. The initial phenol concentration is 100 mg/liter. The equilibrium relation is given by $q^* = 1.3\ C$ where q^* is the amount of phenol adsorbed in mg of phenolper gram of adsorbent; and C is the concentration of phenol in mg/liter in the aqueous solution. When equilibrium is attained between the adsorbent and the solution, the concentration of phenol in the solution, rounded to 1 decimal place, in mg/liter is

[a] 130 -132 [b] 13.0-13.5
[c] 0.1-0.2 [d] 5.1-5.3

Options :
1. 1
2. 2
3. 3
4. 4

Question Number : 63 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical
Correct Marks : 2 Wrong Marks : 0

The relationship between average velocity and maximum velocity in case of flow between two parallel plates is

(a) $U_{max} = U_{av}$ (b) $U_{max} = 0.5\ U_{av}$
(c) $U_{max} = 0.75\ U_{av}$ (d) $U_{max} = 1.5\ U_{av}$

Options :
1. 1
2. 2
3. 3
4. 4

Question Number : 64 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical
Correct Marks : 2 Wrong Marks : 0

Oil flows between two parallel plates, one of which is at rest and the other moves at a velocity, U.If the pressure is decreasing in the direction of the flow at the rate of 5 Pa/m, dynamic viscosity is 0.05 kg/ms, the spacing of the horizontal plate is 0.04 m and the volumetric flow Q per unit width is 0.02 m^2/s, the value of U is

(a) 10.067 m/s (b) 1.027 m/s
(c) 0.097 m/s (d) 0.97 m/s

Options :
1. 1
2. 2
3. 3
4. 4

Correct Marks : 2 Wrong Marks : 0

Consider a catalytic tubular reactor where an irreversible reaction $A \rightarrow B$ takes place under isothermal conditions. A feed stream containing species A enters the reactor and a stream containing both A, B is obtained at the outlet. The viscosity of fluid stream is dependent on concentration of species B. Pick the correct statement regarding governing equations for steady-state concentration profiles, $C_i(r, z)$, and velocity profile, $v(r, z)$, in the reactor:

a. Solution for C_i can be obtained independently from v, however, equation for v is coupled to C_i.
b. Solution for v can be obtained independently from C_i, however, equation for C_i is coupled to v.
c. Equations for C_i and v can be solved independently from each-other.
d. Equations for C_i and v are coupled to each-other and need to be solved simultaneously.

Options :

1. 1
2. 2
3. 3
4. 4

Question Number : 66 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 2 Wrong Marks : 0

Consider 1D energy transport (by conduction only) in x-direction across a long, thin slab of thickness W. The time dependence of temperature at the upstream yz-surface of slab is given by $T_0 \exp(-k_T t)$ while the temperature at the downstream surface is held constant. The thermal diffusion coefficient in the slab is given by α_T. Pick the condition at which a pseudo steady-state analysis can be used to model the temperature profile in the slab:

a. $1/k_T >> W^2/\alpha_T$
b. $1/k_T >> \alpha_T/W^2$
c. $1/k_T << W^2/\alpha_T$
d. $1/k_T << \alpha_T/W^2$

Options :

1. 1
2. 2
3. 3
4. 4

Sub-Section Number: 3
Sub-Section Id: 489994271
Question Shuffling Allowed : Yes

Question Number : 67 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 3 Wrong Marks : 0

...pillary rise 'h' is found to be influenced by the tube diameter D, density ρ, gravitational acceleration 'g' and surface tension σ. The dimensional groups predicted can be

a) $\frac{g}{\sigma^2 D\rho}, \frac{h}{D}$

b) $\frac{D}{\sigma^2 g\rho} \frac{D}{h}$

C) $\frac{\sigma}{D^2 g\rho} \frac{h}{D}$

d) None of the above

Options :

1. 1
2. 2
3. 3
4. 4

Question Number : 68 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 3 Wrong Marks : 0

2000 lph of a benzene-toluene mixture (density 872 kg/m^3) of 45 mass % benzene enters a distillation column. The top product is 95 mole % benzene and 8 % of benzene in the feed is in the bottom product. Mass flowrate of toluene (kg/h) leaving through the bottom product is

a) 915
b) 716
c) 630
d) 744

Options :

1. 1
2. 2
3. 3
4. 4

Question Number : 69 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 3 Wrong Marks : 0

Dehydrogenation of propane takes place in a reactor fed with propane and propylene. Moles of propane, propylene and hydrogen leaving the reactor are 900, 99.75 and 95. The single pass conversion of propane is

a) 9.5%
b) 12.8%
c) 6.3%
d) 18.9%

Options :

1. 1
2. 2
3. 3
4. 4

Question Number : 70 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 3 Wrong Marks : 0

Air (21 mole % O_2 and 79 mole % N_2) and 100 mol of HCl are supplied into a reactor for the manufacture of chlorine. Amount of air supplied is such that oxygen is in 35 % excess and 85 % conversion of HCl is achieved. The moles of O_2 leaving the reactor is

a) 12.5
b) 42.5
c) 15
d) 30

Options :

1. 1
2. 2
3. 3
4. 4

Question Number : 71 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 3 Wrong Marks : 0

A solution is ultrafiltered with feed concentration c_0 and permeates concentration c_p. If k is the mass transfer coefficient and v_w is the permeate flux, using film theory, obtain an expression of observed retention in terms of real retention (Rr), v_w and k.

(a) $\ln\left(\frac{R_0}{1-R_0}\right)=\ln\left(\frac{R_r}{1-R_r}\right)-\frac{v_w}{k}$

(b) $\ln\left(\frac{R_0}{1+R_0}\right)=\ln\left(\frac{R_r}{1+R_r}\right)-\frac{v_w}{k}$

(c) $\ln\left(\frac{R_0}{1+R_0}\right)=\ln\left(\frac{R_r}{1-R_r}\right)+\frac{v_w}{k}$

(d) $\ln\left(\frac{R_0}{1-R_0}\right)=\ln\left(\frac{R_r}{1+R_r}\right)+\frac{v_w}{k}$

Options :

1. 1
2. 2
3. 3
4. 4

Question Number : 72 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 3 Wrong Marks : 0

For a perfectly mixed CSTR of volume 6 m^3 operating with steady state (liquid) feed rate of 0.4m^3/min, what fraction of exit stream of age less than 10 min is,

[a] 0.564 [b] 0.487 [c] 0.923 [d] 0.645

Options :

1. 1

3. 3

4. 4