Question Paper Preview

Question Paper Name:	Chemical Engineering 4th May 2019 S1
Subject Name:	Chemical Engineering
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Chemical Engineering

Display Number Panel:	Yes
Group All Questions:	No

Question Number : 1 Question Id : 2501071561 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

For what value of p, the system $2x+3y=0, 6x+py=0$ can have non-trivial solution?

Options :

1. 11

2. 9

3. 7

4. 2

Question Number : 2 Question Id : 2501071562 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

The curve $x^2+y^2=3axy$ is _____.

Options :

1. symmetric about x- axis

2. symmetric about y- axis

3. symmetric about the line $x = y$

4. tangential to $x = y = \dfrac{a}{3}$

Question Number : 3 Question Id : 2501071563 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

A velocity vector is given as $\overline{V} = 5xy\overline{i} + 2y^2\overline{j} + 3yz^2\overline{k}$. The divergence of this velocity vector at $(1, 1, 1)$ is _____.

Options :

1. 9

2. 10

3. 14

4. 15

Question Number : 4 Question Id : 2501071564 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

$y = e^{-x}\left[C_1 \cos\sqrt{3}x + C_2 \sin\sqrt{3}x\right] + C_3 e^{2x}$ is the general solution of____.

Options :

1. $y''' + 4y = 0$

2. $y''' - 8y = 0$

3. $y''' + 8y = 0$

4. $y''' - 2y'' + y' - 2y = 0$

Question Number : 5 Question Id : 2501071565 Question Type : MCQ Option Shuffling : Yes Display Ques **Single Line Question Option : No Option Orientation : Vertical**

The partial differential equation $xf_{xx} + f_{yy} = 0$ is elliptic if ____.

Options :

1. $x > 0$

2. $x < 0$

3. $x = 0$

4. $x \leq 0$

Question Number : 6 Question Id : 2501071566 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

If C is the circle $|z| = 1$ then $\int\limits_{C} \bar{z}\,dz = $ ____.

Options :

1. πi

2. $2\pi i$

3. 0

4. $-\pi i$

Question Number : 7 Question Id : 2501071567 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

An unbiased coin is tossed 5 times. The probability of getting atleast one head is

____.

Options :

1. $\dfrac{31}{32}$

2. $\dfrac{13}{32}$

3. $\dfrac{16}{32}$

4. $\dfrac{1}{32}$

Question Number : 8 Question Id : 2501071568 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical

The mode of the binomial distribution with mean 4 and variance 3 is _____.

Options :

1. 1

2. 2

3. 3

4. 4

Question Number : 9 Question Id : 2501071569 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical

The solution of $y' = y + x, y(0) = 1,$ by Euler's method for y at $x = 0.2$ is _____.

Options :

1. 1.2

2. 1.07

3. 1.15

4. 1.48

Question Number : 10 Question Id : 2501071570 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical

The interval in which the root lies for $f(x) = x^3 - 2x - 5 = 0$ *is* ___ .

Options :

1. $(1, 2)$

2. $(3, 5)$

3. $(0, 1)$

4. $(2, 3)$

Question Number : 11 Question Id : 2501071571 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

For an ideal gas, $C_P - C_V =$

Options :

1. Zero

2. R

3. 2R

4. 3R

Question Number : 12 Question Id : 2501071572 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

A wet paper pulp contains 75% water. After 100 kg of water removed in a dryer, it is found that the pulp is now containing 30% water. The weight of the original pulp in kg is

Options :

1. 156

2. 200

3. 250

4. 300

If 55 kg of dry solid containing 9% water is obtained by drying 65 kg of wet material, what was the initial moisture content?

Options :

1. 27.7%

2. 77%

3. 23%

4. 21%

The compressibility of a gas is below unity at STP. Therefore, the molar volume will be

Options :

1. greater than 22.4 L

2. less than 22.4 L

3. equal to 22.4 L

4. 44.8 L

For a fuel gas undergoing combustion, if the air/fuel ratio is increased, the adiabatic flame temperature

Options :

1. increases

2. decreases

depends on the fuel

3.

remains same

4.

A butane isomerization process produces 70 kmol/h of pure isobutane. A purge stream removed continuously contains 85% n-butane and 15% impurity. The feed stream is n-butane containing 1% impurity. The flow rate of the purge stream, in kmol/h, is

Options :

1. 3

2. 4

3. 5

4. 6

1.2 gm atom of carbon and 1.5 gm mole of O_2 are reacted to give 1 gm mole of CO_2. The % excess oxygen supplied is

Options :

1. 20

2. 25

3. 30

4. 40

At total pressure of 725 mm Hg, the steam distillation temperature of aniline is 97°C. If the vapor pressure of H_2O is 648 mm Hg, what is the vapor pressure of aniline?

Options :

1. 77 mm Hg

2. 725 mm Hg

3. 648 mm Hg

4. zero

Question Number : 19 Question Id : 2501071579 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Ethyl benzene at 77°F and 14.7 psi is to be heated to 752°F and 74 psi. The following two options are available: (a) The liquid ethyl benzene is sent through a pump to increase the pressure to the desired value followed by heating it to the required temperature. (b) The liquid ethyl benzene is first vaporized at constant pressure to an intermediate temperature and then compressed to the required pressure. Identify the correct statement:

Options :

1. Enthalpy change in Option (a) is greater than Enthalpy change in Option (b)

2. Enthalpy change in Option (b) is greater than Enthalpy change in Option (a)

3. Heat and work requirements are same for both Option (a) and Option (b)

4. Option (a) is preferable over Option (b)

Question Number : 20 Question Id : 2501071580 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

A saturated liquid at 2000 kPa and 600 K, with an enthalpy of 1000 kJ/kg is throttled to a liquid-vapor mixture at 200 kPa and 300 K. At the exit condition, the enthalpy of the saturated liquid is 500 kJ/kg and that of saturated vapor is 2500 kJ/kg. The percentage of the original liquid, that vaporizes is

Options :

1. 25%

2. 12.5%

3. 75%

4. 87.5%

Question Number : 21 Question Id : 2501071581 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

A thermodynamic system is taken from state A to B along ACB and is brought back to A along BDA as shown below in the P-V diagram.
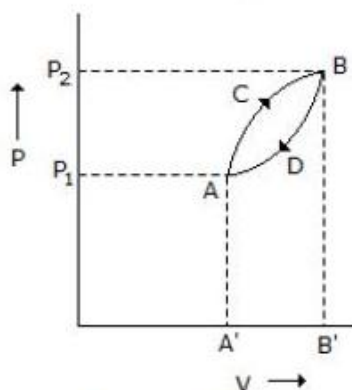
The net work done during the complete cycle is given by the area covered by

Options :

1. $P_1ACBP_2P_1$

2. $ACBB'A'A$

3. $ACBDA$

ADBB'A'A

4.

A gas can be liquefied by pressure alone if the temperature is

Options :

1. higher than its critical temperature

2. equal to critical temperature

3. higher than room temperature

4. less than its critical temperature

The enthalpy of vaporization of a liquid is 30 kJ/mol and entropy of vaporization is 75 J/mol K. The boiling point of the liquid is

Options :

1. 250 K

2. 400 K

3. 450 K

4. 600 K

The fugacity of a component in a homogeneous solution is

Options :

1. a function of temperature only

2. a function of pressure only

3. a function of temperature, pressure and composition

4. a function of temperature and pressure

The vapour pressure of water at 18°C (dew point) is 15 mm Hg and the vapour pressure of water at 29°C is 30 mm Hg. Then the relative humidity of air which is at 29°C and 750 mmHg is _____.

Options :

1. 50%

2. 25%

3. 15%

4. 20%

Which of the following does not fall in the category of variable head meters?

Options :

1. Venturi meter

2. Orifice meter

3. Pitot tube

4. Rotameter

For a duct of square cross section, each side of which is d, the equivalent diameter for pressure drop calculation would be

Options :

1. $2d / \sqrt{\pi}$

2. $\sqrt{2d}$

3. $(1+\sqrt{2})d/2$

4. d

Body A has thrice the submerged weight, thrice the projected area, and thrice the drag coefficient of body B. The ratio of the terminal velocities of the two bodies A and B in the air would be

Options :

1. $\sqrt{3}$

2. $1/\sqrt{3}$

3. 3

4. $1/3$

Which of the following statements are CORRECT?
 (P) For a rheopectic fluid, the apparent viscosity increases with time under a constant applied shear stress
 (Q) For a pseudoplastic fluid, the apparent viscosity decreases with time under a constant applied shear stress
 (R) For a Bingham plastic, the apparent viscosity increases exponentially with the deformation rate
 (S) For a dilatant fluid, the apparent viscosity increases with increasing deformation rate

Options :

1. P and Q only

2. Q and R only

3. R and S only

4. P and S only

Question Number : 30 Question Id : 2501071590 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

What is the critical rotational speed, in revolutions per second, for a ball mill of 1.2 m diameter charged with 70 mm diameter balls?

Options :

1. 0.47

2. 0.58

3. 0.68

4. 0.62

Question Number : 31 Question Id : 2501071591 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

For a particle settling in water at its terminal velocity, choose the correct statement.

Options :

1. Buoyancy = Weight + Drag

2. Buoyancy = Weight - Drag

3. Drag = Weight + Buoyancy

4. Drag = Weight

Question Number : 32 Question Id : 2501071592 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Wall friction for laminar tube flow varies

Options :

1. directly proportionally to viscosity

2. inversely proportionally to viscosity

3. directly proportional to square root of viscosity

4. directly proportional to square of the viscosity

Question Number : 33 Question Id : 2501071593 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Size measurement of ultrafine particles can be best expressed in terms of _____.

Options :

1. cm

2. screen size

micron
3.

surface area per unit mass
4.

Separation factor of the cyclone separator increases_____.

Options :

with decrease in cyclone diameter
1.

with increase in cyclone diameter
2.

with decrease in feed inlet velocity
3.

with decrease in particle size
4.

For a constant pressure filtration, a plot of volume of filtrate collected upto a certain time versus time is

Options :

a straight line passing through the origin.
1.

a straight line having a positive intercept.
2.

a parabola.
3.

depends on the filter cloth and the feed.
4.

Crushing efficiency is the ratio of

Options :

1. surface energy created by the crushing to energy absorbed by the solid.

2. the energy absorbed by the solid to that fed to the machine.

3. the energy fed to the machine to the surface energy created by crushing.

4. the energy absorbed by the solid to the surface energy created by crushing.

The predominant fluid property associated with cavitation phenomena is

Options :

1. density

2. viscosity

3. vapour pressure

4. surface tension

Water is flowing steadily through a horizontal pipe of non-uniform cross section. If the pressure of water is 4×10^4 N/m^2 at a point where cross-section is 0.02 m^2 and velocity of flow is 2 m/s. What is the pressure at a point where cross section reaches to 0.01 m^2 in N/m^2?

Options :

1. 4×10^4

2. 3.4×10^4

3. 3×10^4

4. 2×10^4

Question Number : 39 Question Id : 2501071599 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

The advantage of backward feed multiple effect evaporators over forward feed units is that

Options :

1. heat sensitive materials can be handled.

2. there is no additional cost of pumping.

3. most concentrated liquor is at highest temperature.

4. equal heat transfer coefficients exist in various effects.

Question Number : 40 Question Id : 2501071600 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Crusher with classifier is

Options :

1. Jaw crusher.

2. Pulverize mill.

3. Hundery mill.

4. Hammer mill.

Question Number : 41 Question Id : 2501071601 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Duhring's rule states that the boiling point of a given solution is a linear function of

Options :

1. density of water.

2. viscosity of water.

3. thermal conductivity of water.

4. boiling point of pure water at same pressure.

Question Number : 42 Question Id : 2501071602 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

The Biot number is important in the problems involving

Options :

1. heat transfer by radiation.

2. heat transfer by natural convection.

3. transient heat conduction.

4. heat transfer by forced convection.

Question Number : 43 Question Id : 2501071603 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Two plates of equal thickness and equal heat flow areas with thermal conductivities k_1 and k_2 are joined together to form a single plate of double thickness. What is the equivalent thermal conductivity of the composite plate so formed?

Options :

1. $\dfrac{k_1 k_2}{2(k_1 + k_2)}$

2. $k_1 + k_2$

$$\frac{k_1 k_2}{k_1 + k_2}$$
3.

$$\frac{2k_1 k_2}{k_1 + k_2}$$
4.

Steam economy of a multiple effect evaporator system is defined as

Options :

1. kilogram of steam used per hour.

2. kilogram of steam consumed in all the effects for each kilogram of steam fed.

3. kilogram of steam used in all the effects for each kilogram of water vaporized per hour.

4. kilogram of water vaporized from all the effects for each kilogram of steam fed to the first effect.

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 of that of B. If the temperatures 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

Options :

1. 125

2. 133

3. 150

160
4.

A furnace wall of thickness 1 m and of surface area 2 m^2 is made of a material whose thermal conductivity is 1 kJ/h m°C. The temperature of the inner surface of the wall is 1000°C and the outer surface is 200°C. Heat transfer rate through the wall in kJ/h is

Options :

2000
1.

1600
2.

1200
3.

800
4.

In forced convection, fluid moves under the influence of the

Options :

changes in fluid pressure produced by external work.
1.

buoyant forces arising from changes in density.
2.

elastic forces.
3.

surface tension forces.
4.

Water enters a pipe at 290 K and leaves at 310 K. If hydrocarbon vapors are condensed at 345 K, what is LMTD?

Options :

1. 41.5 K

2. 44.2 K

3. 44.3 K

4. 44.8 K

Question Number : 49 Question Id : 2501071609 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

A cold fluid is heated from 100°C to 150°C by steam at 200°C. The LMTD in counter flow is _____.

Options :

1. equal to the LMTD in parallel flow

2. greater than the LMTD in parallel flow

3. less than the LMTD in parallel flow

4. zero

Question Number : 50 Question Id : 2501071610 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Two liquids A and B are at 30°C and 20°C, respectively. When they are mixed in equal masses, the temperature of the mixture is found to be 26°C. The ratio of their specific heats is

Options :

1. 4:3

2. 3:4

3. 2:3

4. 3:2

The number of ideal plates required for a given separation in a plate column is calculated by

Options :

1. Kremser-Brown-Souders equation

2. Underwood equation

3. Murphree equation

4. Rayleigh equation

If the absorption factor A is less than 1, then

Options :

1. the gas leaving the column will be in equilibrium with the liquid entering.

2. the gas leaving the column can never approach equilibrium with liquid entering.

3. the operating line and the operating curve are straight parallel lines.

4. Kremser equation is not applicable to the system.

Assume that the benzene is insoluble in water. The normal boiling points of benzene and water are 80.1°C and 100°C respectively. At a pressure of 1 atm, the boiling point of a mixture of benzene and water is

Options :

1. 80.1°C

2. less than 80.1°C

3. greater than 80.1°C and less than 100°C

4. 100°C

It is required that the air leaving an adiabatic spray chamber contains 0.02 kg water/kg dry air and is 30% saturated with water vapour. If the ambient air is preheated to 342K before sending into the spray chamber, what is the humidity of ambient air (kg/kg)?

Options :

1. 0.01

2. 0.02

3. 0.015

4. 0.005

In liquid-liquid extraction 10 kg of a solution containing 2 kg of solute C and 8 kg of solvent A is brought into contact with 10 kg of solvent B. Solvents A and B are completely immiscible. The equilibrium relation is $Y = 0.9 X$ where Y is kg C/ kg B and X is kg C/kg A. Choose the correct answer.

Options :

1. The entire amount of C is transferred to solvent B.

2. Less than 2 kg but more than 1 kg of C is transferred to B.

3. Less than 1 kg of C is transferred to B.

4. No amount of C is transferred to B.

Question Number : 56 Question Id : 2501071616 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

The feed to a binary distillation column has 40 mol % vapor and 60 mol % liquid. Then, the slope of the q-line in the McCabe-Thiele plot is

Options :

1. -1.5

2. -0.6

3. 0.6

4. 1.5

Question Number : 57 Question Id : 2501071617 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Minimum reflux ratio in a distillation column results in

Options :

1. optimum number of trays.

2. minimum reboiler size.

3. maximum condenser size.

4. minimum number of trays.

Question Number : 58 Question Id : 2501071618 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

When a multistage tray tower uses a minimum reflux ratio it implies _____.

Options :

1. infinite trays and maximum reboiler heat load

infinite trays and minimum reboiler heat load

2.

minimum trays and minimum reboiler heat load

3.

minimum trays and maximum reboiler heat load

4.

Question Number : 59 Question Id : 2501071619 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Adiabatic saturation process of atmospheric air is a process of constant

Options :

1. wet bulb temperature

2. dew point temperature

3. relative humidity

4. dry bulb temperature

Question Number : 60 Question Id : 2501071620 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

The equilibrium relation for distribution of a solute between a gas and liquid phase is given by the relation $y = mx$. If k_y and k_x are the gas phase and liquid phase individual mass transfer coefficients respectively, the overall gas phase mass transfer coefficient (K_y) is given by

Options :

1. $1/K_y = 1/k_y + m/k_x$

2. $1/K_y = m/k_y + 1/k_x$

3. $1/K_y = 1/mk_y + 1/k_x$

4. $1/K_y = 1/k_y + 1/mk_x$

In a binary gas mixture, the diffusivity of A in B equals the diffusivity of B in A, when

Options :

1. A diffuses through B, but B does not diffuse through A.

2. A and B diffuse by equi-molar counter pattern.

3. the variations in concentrations of A do not cause appreciable change in the volume of A and B in the mixture.

4. the densities of A and B do not change during the diffusion.

If minimum liquid rate is employed in a continuous counter current absorber, the driving force at the bottom of the absorber

Options :

1. is zero.

2. is maximum.

3. is minimum.

4. cannot be decided.

Flooding velocity for regular packing

Options :

1. will be considerably greater than that of random packing.

will be considerably smaller than that of random packing.

2.

will be equal to that of random packing.

3.

will be much smaller than that of random packing.

4.

Question Number : 64 Question Id : 2501071624 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

For a ternary mixture in extraction, a pure component can be represented by

Options :

sides of equilateral coordinates.

1.

apex of an equilateral coordinates.

2.

a point inside the binodal curve in the equilateral triangle.

3.

a point outside the binodal curve in the equilateral triangle.

4.

Question Number : 65 Question Id : 2501071625 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

According to the penetration theory the mass transfer coefficient is directly proportional to

Options :

D

1.

$D^{1.5}$

2.

$D^{0.5}$

3.

D^{0}

4.

The dimensions of rate constant for reaction $3A \rightarrow B$ are (1/gmole)/min. The reaction order is

Options :

1. 0

2. 1

3. 2

4. 3

Stating with pure A, the gas phase reaction $A \rightarrow B + C$ is carried out in an ideal PFR achieving 40% conversion of A. The inlet temperature is 300 K and the outlet temperature is 400 K. The ratio of the outlet to inlet molar concentration of A (assuming ideal gas mixture and uniform pressure) is
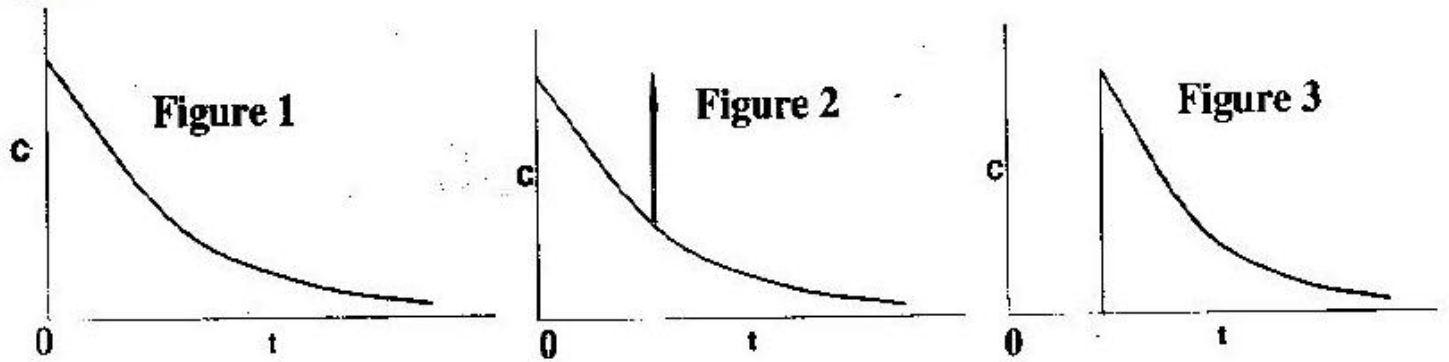
Options :

1. 0.60

2. 0.30

3. 0.47

4. 0.35

The following figures show the outlet tracer concentration profiles (c vs. t) for a pulse input.

Match the figures in Group I with the reactor configurations in Group II.

Group I

P. Figure 1
Q. Figure 2
R. Figure 3

Group II

I.   PFR
II. CSTR
III PFR and CSTR in series
IV   PFR and CSTR in parallel

Options :

1. P –II, Q –IV, R –III

2. P –IV, Q –III, R –I

3. P –III, Q –IV, R –II

4. P –I, Q –III, R –II

Question Number : 69 Question Id : 2501071629 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

For a reaction A → B the rate is first order in A at low concentration of A and zero order at high concentration of A. The possible rate equation is

Options :

1. $-r_A = k_1 C_A{}^2/(1 + k_2 C_A)$

2. $-r_A = k_1 C_A{}^2/(1 + k_2 C_A)^2$

3. $$-r_A = (k_1 C_A/(1 + k_2 C_A))^2$$

4. $$-r_A = k_1 C_A/(1 + k_2 C_A)$$

Question Number : 70 Question Id : 2501071630 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

One liter/min of liquid containing a reactant A at a concentration of 0.2 mol/L flows in a CSTR. The outflow from the reactor is 0.02 mol/L. If the volume of the reactor is 2 L the rate of reaction of A in the reactor is in mol/L min

Options :

1. 0.02

2. 0.09

3. 0.18

4. 0.9

Question Number : 71 Question Id : 2501071631 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

The equilibrium constant of chemical reaction _____ in the presence of catalyst.

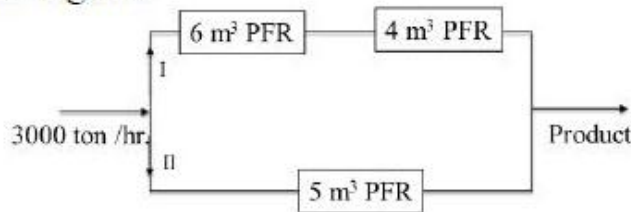**Options :**

1. increases

2. decreases

3. remain unaffected

4. can either increase or decrease

Question Number : 72 Question Id : 2501071632 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Three plug flow reactors (PFRs) of 4, 5 & 6 m³ volumes are arranged in two branches as shown below in the figure.

If the total feed rate is 3000 tons/hr., then for the same conversion in each branch, the feed rate through branch II should be _____ tons/hr.

Options :

1. 1000 ton/hr.

2. 2000 ton/hr.

3. 1500 ton/hr

4. 2500 ton/hr

Question Number : 73 Question Id : 2501071633 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

The rate of reaction varies exponentially with temperature, when the rate controlling step is

Options :

1. internal diffusion or surface reaction

2. internal diffusion or external diffusion

3. external diffusion or surface reaction

4. internal diffusion or external diffusion or surface reaction

Question Number : 74 Question Id : 2501071634 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

If both internal diffusion and external diffusion are to be neglected, the values of internal and overall effectiveness factors respectively are:

Question Number : 75 Question Id : 2501071635 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

For a homogeneous gas- phase reaction A $\rightarrow$ 3B, the fractional change in volume of the system between no conversion and complete conversion of a 50% A and 50% inert feed is

Options :

1. 0.5

2. 1

3. 2

4. 3

Question Number : 76 Question Id : 2501071636 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

For constant density systems, the performance equations are identical for

Options :

1. batch reactor and plug flow reactor.

2. batch reactor and backmix reactor.

3. plug flow reactor and backmix reactor.

batch reactor, plug flow reactor and backmix reactor.

4.

When a catalyst increases the rate of forward reaction, the value of rate constant

Options :

1. increases

2. decreases

3. remains constant

4. becomes infinite

N plug flow reactors in series with a total volume V gives the same conversion as a single plug flow reactor of volume V. The above statement is true for

Options :

1. zero-order reactions only

2. first-order reactions only

3. second-order reactions only

4. any reaction order

When the reaction occurs in the diffusion controlled region, the apparent activation energy as measured is only _____ the true value.

Options :

1. half of

2. twice

3. equal to

4. one and half of

Question Number : 80 Question Id : 2501071640 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

A distillation column with a reboiler is used for separation of a binary mixture. Number of theoretical stages, as determined by McCabe Thiele method are 16. If overall plate efficiency is 75%, what would be the number of actual plates required?

Options :

1. 20

2. 16

3. 22

4. 12

Question Number : 81 Question Id : 2501071641 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Match the process variables (Group – I) given below with the measuring devices (Group – II)

Group – I	Group – II
(P) High Temperature	(1) Orifice meter
(Q) Flow	(2) Chromatograph
(R) Composition	(3) Radiation Pyrometer
	(4) Bi-metallic Thermometer

Options :

1. P-3, Q-2, R-1

2. P-1, Q-3, R-2

3. P-3, Q-1, R-2

4. P-4, Q-2, R-1

Consider 5 CSTRs connected in series. The output concentration from the third CSTR is controlled by manipulating the feed concentration to the first CSTR. The corresponding transfer function is $[0.5/(5s + 1)]5$. If the corresponding PID controller is to be tuned by Ziegler Nichols closed-loop tuning rule, what would be the corresponding configuration (K_c, τ_I, τ_D)?
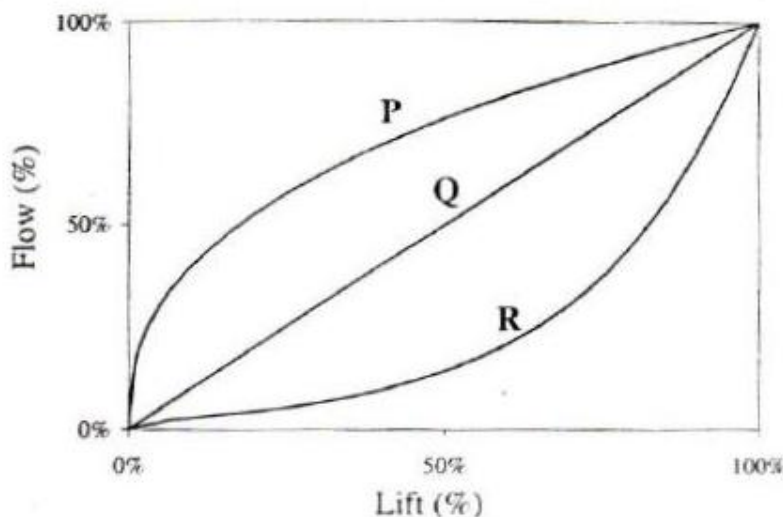
Options :

1. 21.8, 13.2, 3.2

2. 55.4, 21.6, 5.4

3. 42.0, 95.1, 6.9

4. 31.5, 63.2, 8.3

The control valve characteristics for three types of control valves (P, Q and R) are given in the figure below. Match the control valve with its characteristics.

Options :

1. P – Square root   Q – Quick opening   R – Linear

2. P – Quick opening   Q – Linear   R – Equal percentage

3. P – Linear   Q – Square root   R – Equal percentage

4. P – Equal percentage   Q – Linear   R – Quick opening

Question Number : 84 Question Id : 2501071644 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Routh test cannot be used for analyzing stability of a control system containing

Options :

1. controller

2. transportation lag

3. final control element

4. feed forward controller

Question Number : 85 Question Id : 2501071645 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

A system with transfer function $(s - 1)/(s + 1)$ has a magnitude

Options :

1. 0.5

2. 1

3. −0.5

-1

4.

Bode diagram is a plot of

Options :

1. log AR vs ω & log ϕ vs ω

2. AR vs log ω & ϕ vs log ω

3. log AR vs log ω & ϕ vs log ω

4. log AR vs ω & ϕ vs log ω

What is the final value for the function x(t) for which $x(s) = 1/s(s^3 + 3s^2 + 3s + 2)$?

Options :

1. 1

2. 0

3. 0.5

4. 2

A feed-forward and feedback control scheme consists of the transfer functions of the disturbance as process as $Gd(s) = 2/(5s + 1)$ and $Gp(s) = 4/(12s+1)$. The corresponding feed-forward controller is

Options :

1.   −0.5(12s + 1)/(5s + 1)

2.   0.5(12s + 1)/(5s + 1)

3.   −2(5s + 1)/(12s + 1)

4.   2(5s + 1)/(12s + 1)

Question Number : 89 Question Id : 2501071649 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

According to Bode's stability criterion, the closed loop system is unstable if Amplitude Ratio (AR) at the critical frequency of the open loop system is

Options :

1. < 1

2. > 1

3. ≥ 1

4. ≤ 1

Question Number : 90 Question Id : 2501071650 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

The time constant of a unity gain first order plus time delay process is 5 min. If the phase lag at a frequency of 0.2 rad/min is 60°, then the dead time in min is

Options :

1. $5\pi/12$

2. $\pi/6$

3. $\pi/12$

Question Number : 91 Question Id : 2501071651 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

The cost of a distillation column is ₹10,00,000/-. The column has a useful life of 10 years. Its salvage value is ₹1,00,000/-. Assuming straight line depreciation, the book value of the column at the end of 5th year in (₹) is

Options :

1. 1,00,000/-

2. 4,50,000/-

3. 5,50,000/-

4. 9,00,000/-

Question Number : 92 Question Id : 2501071652 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Maximum pressure and minimum pressure azeotropes exhibit _____ & _____ deviation respectively from Raoult's law

Options :

1. positive, negative

2. negative, positive

3. positive, no

4. negative, no

Question Number : 93 Question Id : 2501071653 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

The relation between capital rate of return (CRR), net present value (NPV) and maximum cumulative expenditure (MCE) is:

Options :

1. $CRR = NPV/MCE$

2. $CRR = MCE/NPV$

3. $CRR = NPV * MCE$

4. $CRR = MCE/(NPV + MCE)$

Question Number : 94 Question Id : 2501071654 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Which one of the following heads can withstand the highest pressure?

Options :

1. Flat plate

2. Hemispherical

3. Torispherical

4. Ellipsoidal

Question Number : 95 Question Id : 2501071655 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Discounted cash-flow analysis is used to calculate

Options :

1. the present worth of future earnings.

2. the future worth of present investment.

3. the payback period.

4. the life of the project.

A sale contract signed by a chemical manufacturer is expected to generate a net cash flow of ₹2,50,000 per year at the end of each year for a period of 3 years. The applicable discount rate (interest rate) is 10%. The net present worth of the total cash flow is

Options :

1. ₹ 7,50,000

2. ₹ 6,83,750

3. ₹ 6,21,500

4. ₹ 3,32,750

If P is the investment made on an equipment, S is its salvage value and n is the life of the equipment in years. Then the depreciation for the mth year by the sum of digits method is

Options :

1. $(P - S)/n$

2. $1 - (P/S)^m$

3. $(m/n)(P - S)$

4. $2(P - S) (n - m + 1)/[n(n + 1)]$

'Total capital investment' for a chemical process plant comprises of the fixed capital investment and the

Options :

1. overhead costs.

2. working capital.

3. indirect production costs.

4. direct production costs.

Question Number : 99 Question Id : 2501071659 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Corrosion resistance of steel increases by the addition of

Options :

1. phosphorous and tungsten.

2. nickel and chromium.

3. lead and vanadium.

4. molybdenum and tungsten.

Question Number : 100 Question Id : 2501071660 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Kaolin is

Options :

1. refractory material.

2. synthetic resin.

3. artificial abrasive.

4. blue pigment

Which of the following is desirable in gasoline but undesirable in kerosene?

Options :

1. Aromatics

2. Mercaptants

3. Naphthenic acid

4. Paraffins

Triple superphosphate is chemically represented as

Options :

1. $CaF_2. 3Ca_3(PO_4)_2$

2. $3Ca_3(PO_4)_2$

3. $Ca(PO_3)_2$

4. $Ca(H_2PO_4)_2$

Hydrogenation of edible oils is done to

Options :

1. decrease the number of unsaturated bonds.

2. lower the melting point of oil.

3. increase the thermal conductivity of oil.

4. enable the oil to be packed in tin containers.

Question Number : 104 Question Id : 2501071664 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

The DCDA (Double Contact Double Absorption) process is used for the manufacture of

Options :

1. urea.

2. sulphuric acid.

3. nitric acid.

4. ammonia.

Question Number : 105 Question Id : 2501071665 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Match the raw materials of Groups 1 and 2 with the final products of Group 3

Group 1	Group 2	Group 3
P1: Ethylene	Q1: Ammonia	R1: Synthetic fibre
P2: Propylene	Q2: 1-Butene	R2: Nylon 66
P3: Adipic acid	Q3: Ethylene glycol	R3: LLDPE
P4: Terephthalic acid	Q4: Hexamethylene diamine	R4: Acrylonitrile

Options :

1. P1 + Q2 → R3; P2 + Q1 → R4; P3 + Q4 → R2; P4 + Q3 → R1

2. P1 + Q1 → R3; P2 + Q3 → R4; P3 + Q4 → R4; P4 + Q2 → R2

3. P1 + Q2 → R2; P2 + Q3 → R1; P3 +Q4 → R3; P4 + Q1 → R4

4. P1 + Q1 → R4; P2 + Q2 → R3; P3 +Q4 → R2; P4 + Q3 → R1

Reforming catalysts get deactivated because of coke deposition on the surface. Catalyst regeneration is done by

Options :

1. washing the catalyst with an organic solvent and drying in hot air.

2. grinding the deactivated catalyst, separating carbon from the catalyst and then remaking the catalyst.

3. burning off the coke.

4. passing an inert gas.

In an integrated steel plant, NH_3 present in coke oven gas is normally recovered as

Options :

1. $(NH_4)_2SO_4$

2. NH_4Cl

3. $(NH_4)_2NO_3$

4. liquid NH_3

Dryer widely used in a textile industry is

Options :

1. tray dryer

2. Shelf dryer

3. Festoon dryer

4. rotary dryer

Question Number : 109 Question Id : 2501071669 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

The process involved in converting rubber into a thin sheet or coating it on fabric is called

Options :

1. extrusion

2. mastication

3. calendering

4. vulcanisation

Question Number : 110 Question Id : 2501071670 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

The most widely used coagulant for removing suspended impurities from water is

Options :

1. Bleaching powder

2. Chlorine

3. Calcium sulfate

4. Alum

A mercury in glass thermometer can measure the temperature in the range of

Options :

1. -35 to $600°C$

2. -85 to $1000°C$

3. -100 to $500°C$

4. 0 to $500°C$

For a second order under damped system, the relation between decay ratio (DR) and overshoot (OS) is

Options :

1. $DR = OS^2$

2. $DR = \sqrt{OS}$

3. $DR = OS^3$

4. $DR = OS^{0.3}$

Match the variables in Group-1 with the instruments in Group-2

Group-1	Group-2
P) Temperature	I) Capacitance probe
Q) Liquid level	II) McLeod gauge
R) Vacuum	III) Chromatograph
S) Concentration	IV) Thermistor

Choose the correct set of combinations.

Options :

1. P-IV, Q-III, R-II, S-I

2. P-I, Q-II, R-IV, S-III

3. P-IV, Q-I, R-II, S-III

4. P-III, Q-II, R-I, S-IV

The second order system with the transfer function $\frac{4}{S^2+2S+4}$ has a damping ratio of

Options :

1. 2

2. 0.5

3. 1.5

4. 4

In cascade control generally the controller used in the secondary loop is _____.

Options :

1. P controller

2. PI controller

3. PD controller

4. PID controller

Question Number : 116 Question Id : 2501071676 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

In diffusion of A through non-diffusing B case, the flux of B is zero which implies that the flux of component B due to molecular diffusion is _____ and due to bulk motion is _____ .

Options :

1. zero, positive

2. positive, zero

3. equal, opposite

4. zero, zero

Question Number : 117 Question Id : 2501071677 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

For an ideal leaching stage the tie lines are not vertical if

Options :

1. a solution is completely dissolved in the solvent

2. there is a preferential adsorption on the inert solids

3. no insolubles are carried away by the overflow solution

concentration of solute in the solution is uniform everywhere

4.

Lewis number = 1, signifies that

Options :

1. $N_{Re} = N_{Sc}$

2. $N_{Re} = N_{Pr}$

3. $N_{Pr} = N_{Sc}$

4. $N_{Sc} = N_{Sh}$

Rate of adsorption increases as the

Options :

1. temperature increases

2. temperature decreases

3. pressure decreases

4. size of adsorbent increases

In a azeotropic distillation a third component is added

Options :

to form a minimum boiling azeotrope with one of the feed components

1.

to increase the relative volatility of the feed components

2.

to decrease the relative volatility of the feed components

3.

to form a maximum boiling azeotrope with one of the feed components

4.