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Section : **Chemical Engineering ME and M Tech**

Q.1 Molar flow rate of liquid NH_3, when it is flowing at 112 lit/min through a non-reacting continuous reactor is ….. moles/min.

A. 5
B. 10
C. 0.5
D. 1

Ans ✔ 1. A
✗ 2. B
✗ 3. C
✗ 4. D

Question ID : **5834933959**

Q.2 In a shell and tube heat exchanger, the height of 25 percent cut baffles is equal to (where, D= inside diameter of shell)?

A. 0.25 D
B. 0.75 D
C. 0.50 D
D. 0.01 D

Ans ✗ 1. A
✔ 2. B
✗ 3. C
✗ 4. D

Question ID : **5834933923**

Q.3 Which one of the following defines velocity potential, φ?

A. Φ, such that $u_x = \partial\Phi/\partial x$
B. Φ, such that $u_x = \partial\Phi/\partial t$
C. Φ, such that $u_x = \partial\Phi/(\partial t \partial x)$
D. Φ, such that $u_x = \partial\Phi/(\partial t \partial x)$ x $\partial\Phi/(\partial t)$

Ans ✔ 1. A
✗ 2. B
✗ 3. C
✗ 4. D

Question ID : **5834933939**

Q.4 The fluid flow rates and specific heats and heat capacities of the two fluids are equal. A hot fluid enters the counter flow heat exchanger at 100 ^{0}C and leaves at 60 ^{0}C. The cold fluid enters the heat exchanger at 40 ^{0}C and leaves at 80 ^{0}C. The mean temperature difference between the two fluids is

A. 40

B. 60

C. 45

D. 20

Ans
✗ 1. A
✗ 2. B
✗ 3. C
✓ 4. D

Question ID : **5834933926**

Q.5 A cylindrical vessel is subjected for internal pressure, the longitudinal stress σ_l and the circumferential stress σ_h are related by

A. $\sigma_h = \sigma_l / 2$

B. $\sigma_h = 2\ \sigma_l$

C. $\sigma_h = \sigma_l$

D. $\sigma_h = \sigma_l / 3$

Ans
✗ 1. A
✓ 2. B
✗ 3. C
✗ 4. D

Question ID : **5834933969**

Q.6 Cu2+ ions react with Fe2+ions according to the following reaction

$Cu^{2+} + 2\ Fe^{2+} \rightleftharpoons Cu + 2\ Fe^{3+}$

At equilibrium, the concentration of Cu^{2+} ions are not changed by the addition of

A. Cu^{2+}

B. Fe^{2+}

C. Cu

D. Fe^{3+}

Ans
✗ 1. A
✗ 2. B
✓ 3. C
✗ 4. D

Question ID : **5834933930**

Q.7 Water is flowing through a reducer in a horizontal pipe. The pressure and velocity at the inlet are 130 kPa and 2 m/s. Find the velocity at outlet for a pressure of 100 kPa

A. 30 m/s

B. 60 m/s

C. 8 m/s

D. 2 m/s

Ans
✗ 1. A
✗ 2. B
✓ 3. C
✗ 4. D

Question ID : **5834933940**

Q.8 To maximize the formation of R in the simultaneous reactions

$A+B \rightarrow R$; $r_R=2C_A^{0.5}C_B^2$

$A+B \rightarrow S$; $r_S=1.4C_AC_B$

We should have

A. Low C_A, low C_B

B. Low C_A, high C_B

C. high C_A, low C_B

D. high C_A, high C_B

Ans
✗ 1. A
✓ 2. B
✗ 3. C
✗ 4. D

Question ID : **5834933954**

Q.9 A Carnot engine operates between 27 °C and 327 °C. If the engine produces 300 kJ of work, what is the entropy change during heat addition?

A. 0.5 kJ/K

B. 1.0 kJ/K

C. 1.5 kJ/K

D. 2.0 kJ/K

Ans
✗ 1. A
✓ 2. B
✗ 3. C
✗ 4. D

Question ID : **5834933967**

Q.10 A solution of specific gravity 1.0 consists of 30% A by weight and the remaining B. If the specific gravity of A is 0.6, the specific gravity of B is

A. 1.1

B. 1.2

C. 1.3

D. 1.4

Ans

✗ 1. A

✗ 2. B

✗ 3. C

✓ 4. D

Question ID : **5834933968**

Q.11 The phase rule applicable to non-reacting system

A. F=2+n+N

B. F=2-n+N

C. F=2-n-N

D. F=2+n-N

Ans

✗ 1. A

✓ 2. B

✗ 3. C

✗ 4. D

Question ID : **5834933928**

Q.12 In the following reaction

$A+B \xrightarrow{k_1} R$ (undesirable)

$A+B \xrightarrow{k_2} S$ (undesirable)

Selectivity is defined as

A. Number of mol of A converted into R/ number of mol of A reacted

B. Number of mol of A converted into R/ (number of mol of A+number of mol of B)

C. Number of mol of A converted into S/ number of mol of A reacted

D. Number of mol of A converted into S/ number of mol of A converted into R

Ans

✗ 1. A

✗ 2. B

✗ 3. C

✓ 4. D

Question ID : **5834933957**

Q.13 In which of the following processes, in a closed system the thermal energy transferred to a gas is completely converted to internal energy resulting in an increase in gas temperature

A. Isochronic process
B. Adiabatic process
C. Isothermal process
D. Free expansion

Ans ✔ 1. A
✘ 2. B
✘ 3. C
✘ 4. D

Question ID : **5834933929**

Q.14 Carboxymethyl cellulose (CMC) is added in detergents to acts as a/an

A. Surfactant
B. Emulsifier
C. Optical brightening agent
D. Anti-soil redeposition agent

Ans ✘ 1. A
✘ 2. B
✘ 3. C
✔ 4. D

Question ID : **5834933960**

Q.15 Which of the following stainless-steel variety has the highest corrosion resistance?

A. Type 304
B. Type 304 L
C. Type 321
D. Type 316

Ans ✘ 1. A
✘ 2. B
✘ 3. C
✔ 4. D

Question ID : **5834933963**

Q.16 Pure carbon is completely burnt in oxygen. The flue gas analysis is 70% CO_2, 20% CO and 10% O_2. The percent excess oxygen used is

A. 0
B. 5
C. 15
D. 20

Ans ✔ 1. A
✘ 2. B
✘ 3. C
✘ 4. D

Question ID : **5834933966**

Q.17 A Carnot heat engine cycle is working with an ideal gas. The work performed by the gas during the adiabatic expansion and compression steps W_1 and W_2 respectively

A. $|W_1| > |W_2|$

B. $|W_1| < |W_2|$

C. $W_1 = W_2$

D. $W_1 = -W_2$

Ans

✗ 1. A

✗ 2. B

✗ 3. C

✓ 4. D

Question ID : **5834933931**

Q.18 The flooding velocity in a plate column operating at 1 atm pressure is 3 m/sec. if the column is operated at 2 atm pressure, under otherwise identical conditions, the flooding velocity will be

A. $3/\sqrt{2}$

B. 3/2

C. 1

D. 3/4

Ans

✓ 1. A

✗ 2. B

✗ 3. C

✗ 4. D

Question ID : **5834933971**

Q.19 What does a constant underflow in leaching imply?

A. The ratio of insolubles to solution varies from 1 to 2

B. The ratio of insolubles to solution less than 1

C. The ratio of insolubles to solution greater than 2

D. The ratio of insolubles to solution remains constant

Ans

✗ 1. A

✗ 2. B

✗ 3. C

✓ 4. D

Question ID : **5834933947**

Q.20 Which one of the term gives the thermal boundary layer thickness on a laminar flow over a flat plate?

A. $\delta = 5x/\sqrt{Re_x}$

B. $\delta = 5x/\sqrt{Pr}$

C. $\delta = 5x/(\sqrt{(Re^{1/2}\ pr^{1/2})}$

D. $\delta = 5x/(Re^{1/2}Pr^{1/3})$

Ans ✗ 1. A

✗ 2. B

✗ 3. C

✓ 4. D

Question ID : **5834933938**

Q.21 A supersaturated solution of a sparingly soluble solute, at a concentration of C_o is being fed to a crystallizer at a volumetric flow rate F. The solubility of solute is C_s. The output rate of solids from an efficient crystallizer is

A. F C_s

B. F C_o

C. F C_o /C_s

D. F C_s / C_o

Ans ✗ 1. A

✓ 2. B

✗ 3. C

✗ 4. D

Question ID : **5834933949**

Q.22 Hot water (1 m^3/min) enters the tube side of a co-current shell and tube heat exchanger at 70 ^{0}C and leaves at 50 ^{0}C. Cold oil (2 m^3/min) with same density of water and specific heat of 2 KJ/kg K enters at 20 ^{0}C. What is the outlet temperature of oil?

A. 5 ^{0}C

B. 25 ^{0}C

C. 20 ^{0}C

D. 50 ^{0}C

Ans ✗ 1. A

✓ 2. B

✗ 3. C

✗ 4. D

Question ID : **5834933925**

Q.23 The critical speed of a trommel (N) is related to its diameter (D) as

A. $N\alpha (1/\sqrt{D})$

B. $N\alpha \sqrt{D}$

C. $N\alpha D$

D. $N\alpha 1/D$

Ans ✔ 1. A

✗ 2. B

✗ 3. C

✗ 4. D

Question ID : **5834933945**

Q.24 When the relationship between Reynold's number and friction factor is represented by a straight line, the flow is said to be

A. Isotropic

B. Laminar

C. Turbulent

D. Vortex

Ans ✗ 1. A

✔ 2. B

✗ 3. C

✗ 4. D

Question ID : **5834933935**

Q.25 The heat transfer by radiation from a mild steel surface is to be reduced by reducing the emissivity of the surface. This can be best achieved by

A. Painting the surface black

B. Painting the surface white

C. Giving the surface a mirror finish

D. Roughening the surface

Ans ✗ 1. A

✗ 2. B

✔ 3. C

✗ 4. D

Question ID : **5834933924**

Q.26 As pressure approaches zero, the ratio of fugacity to pressure (f/p) for a gas approach to

A. zero

B. unity

C. infinity

D. an intermittent value

Ans ✗ 1. A

✔ 2. B

✗ 3. C

✗ 4. D

Question ID : **5834933927**

Q.27 A piece of wood having a weight 5 kg floats in water with 60% of volume under the liquid. The specific gravity of wood is

A. 0.83

B. 0.6

C. 0.4

D. 0.9

Ans ✗ 1. A

✓ 2. B

✗ 3. C

✗ 4. D

Question ID : **5834933941**

Q.28 For the n^{th} tray (counted from the bottom of a distillation column), the Murphree tray efficiency is given by

A. $\frac{Y_n - Y_{n-1}}{Y_n^* - Y_{n-1}}$

B. $\frac{Y_n^* - Y_{n-1}}{Y_n - Y_{n-1}}$

C. $\frac{Y_{n-1} - Y_n}{Y_{n+1} - Y_n}$

D. $\frac{Y_{n+1} - Y_n}{Y_n^* - Y_{n-1}}$

Ans ✓ 1. A

✗ 2. B

✗ 3. C

✗ 4. D

Question ID : **5834933946**

Q.29 For reaction system given below, volume is suddenly reduced to half of its value by increasing the pressure on it. If the reaction is of first order with respect to O_2 and second order with respect to NO, what will be the change in the rate of reaction?

$2\ NO_{(g)} + O_{2\ (g)} \rightarrow 2\ NO_{2\ (g)}$

A. diminish to one-fourth of its initial value

B. diminish to one-eigth of its initial value

C. Increase to eight times of its initial value

D. Increase to four times of its initial value

Ans ✗ 1. A

✗ 2. B

✓ 3. C

✗ 4. D

Question ID : **5834933956**

Q.30 The heat evolved in the combustion of benzene is given by the equation.

$C_6H_6 + 7.5\ O_2 \rightarrow 6\ CO_2 + 3H_2O$; ΔH= -3264.6 kJ/kmol

The heat energy change, when 39 g of C_6H_6 is burnt in an open container, will be ….kJ.

A. -816.15

B. -1623.3

C. +816.15

D. -2448.4

Ans ✗ 1. A

✓ 2. B

✗ 3. C

✗ 4. D

Question ID : **5834933965**

Q.31 The flooding velocity in a plate column, operating at 1 atm pressure is 4 m/s. if the column is operated at 4 atm pressure under otherwise identical conditions, the flooding velocity will be

A. 1

B. 2

C. 3

D. 4

Ans ✗ 1. A

✓ 2. B

✗ 3. C

✗ 4. D

Question ID : **5834933952**

Q.32 Losses for flow through valves and fittings are expressed in terms of

A. Drag co-efficient

B. Equivalent length of a straight pipe

C. Shape factor

D. Roughness factor

Ans ✗ 1. A

✓ 2. B

✗ 3. C

✗ 4. D

Question ID : **5834933936**

Q.33 A gaseous reaction A→2B+C takes place isothermally in a constant pressure reactor. Starting with a gaseous mixture containing 50% A (rest inerts), the ratio of final to initial volume is found to be 1.6. The percentage conversion of A is

A. 30

B. 50

C. 60

D. 70

Ans
✗ 1. A
✗ 2. B
✓ 3. C
✗ 4. D

Question ID : **5834933958**

Q.34 Which of the following in the transfer function of a CSTR, conducting a first order reaction? F= volumetric flow rate, v= volume of a reactor at steady state

A. $\tau = \frac{v}{F+kv}$

B. $\tau = \frac{F}{F+kv}$

C. $\tau = \frac{k}{F+kv}$

D. $\tau = \frac{F+kv}{k}$

Ans
✓ 1. A
✗ 2. B
✗ 3. C
✗ 4. D

Question ID : **5834933933**

Q.35 The time constant of a first order system with resistance R and Capacitance C is

A. R+C

B. R-C

C. R.C

D. 1/ (R.C)

Ans
✗ 1. A
✗ 2. B
✓ 3. C
✗ 4. D

Question ID : **5834933932**

Q.36 In a laminar flow, Power(P) is proportional to (ρ=density, μ =viscosity, D=Impeller dia, N = RPM)

A. ρN^2D^5

B. μN^2D^3

C. μN^2D^5

D. ρN^2D^2

Ans ✗ 1. A

✓ 2. B

✗ 3. C

✗ 4. D

Question ID : **5834933944**

Q.37 Glycerin is a by-product of the _____Industry

A. Paint

B. Detergent

C. Oil hydrogenation

D. Soap

Ans ✗ 1. A

✗ 2. B

✗ 3. C

✓ 4. D

Question ID : **5834933961**

Q.38 DDT stands for

A. Diethyl-Diphenyl-Trichloro methane

B. Dichloro-Diphenyl-Trichloro ethane

C. Dichloro-Diphenyl-Trichloro methane

D. Diphenyl-Dichloro-Trichloro ethane

Ans ✗ 1. A

✓ 2. B

✗ 3. C

✗ 4. D

Question ID : **5834933964**

Q.39 In a 1-1 pass floating head type shell and tube heat exchanger, the tubes (OD-25 mm, ID-21 mm) are arranged in a square pitch. The tube pitch is 32 mm. The equivalent diameter (D_{eq}) is

A. $\frac{1024-(\pi 625)}{25\pi}$

B. $\frac{1024-(\pi/4)625}{25\pi}$

C. $\frac{4(1024-(\frac{\pi}{4})625)}{32\pi}$

D. $\frac{4(1024-(\frac{\pi}{4})625)}{25\pi}$

Ans ✗ 1. A

✗ 2. B

✗ 3. C

✓ 4. D

Question ID : **5834933970**

Q.40 The transfer function of a process is $1/(16s^2+8s+4)$. If a step change is introduced into the system, then the response will be

A. Underdamped

B. Overdamped

C. Critically damped

D. None of the above

Ans ✓ 1. A

✗ 2. B

✗ 3. C

✗ 4. D

Question ID : **5834933934**

Q.41 For a first order isothermal chemical reaction in a porous catalyst, the effectiveness factor is 0.3. The effectiveness factor will increase if the

A. Catalyst size is reduced or the catalyst diffusivity is increased

B. Catalyst size is reduced or the catalyst diffusivity is reduced

C. Catalyst size is increased or the catalyst diffusivity is increased

D. Catalyst size is increased or the catalyst diffusivity is reduced

Ans ✓ 1. A

✗ 2. B

✗ 3. C

✗ 4. D

Question ID : **5834933955**

Q.42 Which of the following crushing laws is most accurately applicable to the fine grinding of materials?

A. Bonds crushing law

B. Kicks law

C. Rittingers law

D. Ficks law

Ans

✗ 1. A

✗ 2. B

✓ 3. C

✗ 4. D

Question ID : **5834933943**

Q.43 An equimolar saturated vapour mixture of A (more volatile) and B at 1 atm is subjected to equilibrium condensation to yield 50 mol% of the feed as liquid. If the relative volatility (α) is constant, the mole fraction of A in the equilibrium vapour phase is equal to

A. $\frac{\sqrt{\alpha}}{1+\sqrt{\alpha}}$

B. $\frac{1}{\sqrt{\alpha}}$

C. $\frac{1}{1+\sqrt{\alpha}}$

D. $\frac{1+\sqrt{\alpha}}{\sqrt{\alpha}}$

Ans

✓ 1. A

✗ 2. B

✗ 3. C

✗ 4. D

Question ID : **5834933948**

Q.44 For a zero-order reaction, the slope of $t_{0.5}$ and C_{AO} is

A. 0

B. 1

C. 2

D. 3

Ans

✗ 1. A

✓ 2. B

✗ 3. C

✗ 4. D

Question ID : **5834933953**

Q.45 In the layout plan for a vacuum distillation unit, operating at 200 mm Hg, supported by a barometric condenser, the appropriate place for the location of vacuum drum for collecting the distillate will be

A. At ground level

B. 4 m above ground

C. 8 m above ground

D. 6 m above ground

Ans
✗ 1. A
✗ 2. B
✓ 3. C
✗ 4. D

Question ID : **5834933950**

Q.46 Fermentation of molasses to produce ethyl alcohol is done at ___^{O}C

A. 20-30

B. < -5

C. 250-300

D. 100-150

Ans
✓ 1. A
✗ 2. B
✗ 3. C
✗ 4. D

Question ID : **5834933962**

Q.47 What is the geometric mean of two heat transfer areas A1 and A2?

A. $\sqrt{A1\ X\ A2}$

B. $\sqrt{A1 + A2}$

C. $\frac{1}{2}\sqrt{A1\ X\ A2}$

D. $2\sqrt{A1\ X\ A2}$

Ans
✓ 1. A
✗ 2. B
✗ 3. C
✗ 4. D

Question ID : **5834933922**

Q.48 The solubility of Ba $(NO_3)_2$ is 34 g/100 g of H_2O at 100 °C and 5 g/100 g of H_2O at 0 °C. In an experiment, 100 g of Ba $(NO_3)_2$ is dissolved to form saturated solution, how much it precipitates out at 0 °C

A. 55 g
B. 65 g
C. 75 g
D. 85 g

Ans
✗ 1. A
✗ 2. B
✗ 3. C
✓ 4. D

Question ID : **5834933951**

Q.49 Dispersion of a gas through liquid is done by using a

A. Sparger
B. Kneader
C. Masticator
D. paddle

Ans
✓ 1. A
✗ 2. B
✗ 3. C
✗ 4. D

Question ID : **5834933942**

Q.50 For a flow between two stationary parallel plates, if the velocity distribution is parabolic, the mean velocity is equal to

A. Maximum velocity
B. Half the maximum velocity
C. One-third of maximum velocity
D. Two-third of maximum velocity

Ans
✗ 1. A
✗ 2. B
✗ 3. C
✓ 4. D

Question ID : **5834933937**