# Andhra Pradesh State Council of Higher Education

**Notations :**

1.Options shown in green color and with ✔ icon are correct.

2.Options shown in red color and with ✖ icon are incorrect.

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|---|---|
| **Question Paper Name :** | Chemical Engineering 29th Sep 2021 Shift1 |
| **Duration :** | 120 |
| **Total Marks :** | 120 |
| **Display Marks:** | No |
| **Share Answer Key With Delivery Engine :** | Yes |
| **Calculator :** | None |
| **Magnifying Glass Required? :** | No |
| **Ruler Required? :** | No |
| **Eraser Required? :** | No |
| **Scratch Pad Required? :** | No |
| **Rough Sketch/Notepad Required? :** | No |
| **Protractor Required? :** | No |
| **Show Watermark on Console? :** | Yes |
| **Highlighter :** | No |
| **Auto Save on Console? ( SA type of questions will be always auto saved ) :** | Yes |
| **Is this Group for Examiner? :** | No |

## Chemical Engineering

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|---|---|
| **Section Id :** | 8737181 |
| **Section Number :** | 1 |
| **Mandatory or Optional :** | Mandatory |
| **Number of Questions :** | 120 |
| **Section Marks :** | 120 |
| **Enable Mark as Answered Mark for Review and Clear Response :** | Yes |

**Question Number : 1 Question Id : 8737181 Display Question Number : Yes Is Question Mandatory : No**

A ternary mixture of A, B & C has 4.76 of A and 71.43 % of C by weight. Molecular weights of A and C are 20 and 60 respectively. If the molar percentage of B in the mixture is 33.33, what is the molecular weight of B

**Options :**

1. ✖ 23.81

2. ✔ 40.0

3. ✖ 55.56

4. ✖ 71.93

**Question Number : 2 Question Id : 8737182 Display Question Number : Yes Is Question Mandatory : No**

In retrograde condensation of mixtures, which one of the following happens

**Options :**

1. ✖ Condensation of Vapor on increasing the pressure at constant temperature

2. ✖ Condensation of vapor on increasing the temperature at constant pressure

3. ✔ Condensation of vapor on lowering of pressure at constant temperature

4. ✖ Condensation of vapor by the addition of a new component at constant T & P

**Question Number : 3 Question Id : 8737183 Display Question Number : Yes Is Question Mandatory : No**

In equimolar counter diffusion of gases, total pressure on either side of the 75 cm long diffusion path are 100 and 30 kPa. What is the total pressure, 45 cm from the high pressure end

**Options :**

1. ✔ 58 kPa

2. ✖ 65 kPa

3. ✖ 60 kPa

4. ✖ 72 kPa

**Question Number : 4 Question Id : 8737184 Display Question Number : Yes Is Question Mandatory : No**

The ratio of inertial forces to gravitational forces is better known as

**Options :**

1. ✖ Reynolds number

2. ✖ Weber number

3. ✖ Euler number

4. ✔ Froude number

**Question Number : 5 Question Id : 8737185 Display Question Number : Yes Is Question Mandatory : No**

What is the maximum amount of salt that can be dissolved if 100 Kg of a saturated solution of a salt is heated from 35°C to 80°C ? Solubilities of salt are 4.8 and 7.2 (mol / Kg solvent) at 35°C and 80°C, respectively. Molecular weights of salt and solvent are 50 and 30 .

**Options :**

1. ✔ 9.68 Kg

2. ✖ 16.65 Kg

3. ✖ 13.59 Kg

4. ✖ 29.03 Kg

**Question Number : 6 Question Id : 8737186 Display Question Number : Yes Is Question Mandatory : No**

Weight of liquid that rises in a capillary tube is supported by

**Options :**

1. ✖ horizontal component of surface tension

2. ✖ the Drag force

3. ✔ vertical component of surface tension

4. ✖ the viscous force

**Question Number : 7 Question Id : 8737187 Display Question Number : Yes Is Question Mandatory : No**

A cube will have a sphericity of

**Options :**

1. ✖ $(2\prod /3)^{0.33}$

2. ✖ $(\prod / 6)^{0.66}$

3. ✖ $(\prod / 3)^{0.33}$

4. ✔ $(\prod / 6)^{0.33}$

**Question Number : 8 Question Id : 8737188 Display Question Number : Yes Is Question Mandatory : No**

An engine is operating at an efficiency of 0.29, which is 75 % of the efficiency of an ideal heat engine. If the ideal heat engine receives heat at 225°C, What is its heat rejection temperature?

**Options :**

1. ✖ 138 °C

2. ✔ 32 °C

3. ✖ 144 °C

4. ✖ 116 °C

**Question Number : 9 Question Id : 8737189 Display Question Number : Yes Is Question Mandatory : No**

Number of forces acting on an airplane on cruise is

**Options :**

1. ✖ 2

2. ✖ 3

3. ✔ 4

4. ✖ 5

**Question Number : 10 Question Id : 87371810 Display Question Number : Yes Is Question Mandatory : No**

Condensate film builds up from top to bottom in film condensation of liquid along a vertical tube. The local heat transfer coefficient

**Options :**

1. ✖ first decreases and then increases

2. ✖ remains constant

3. ✖ increases from top to bottom

4. ✔ decreases from top to bottom

**Question Number : 11 Question Id : 87371811 Display Question Number : Yes Is Question**

**Mandatory : No**

The ratio of point velocity to the maximum velocity in laminar flow through a pipe is

**Options :**

1. ✔ $1 - (r/R)^2$

2. ✖ $1 - (r/R)$

3. ✖ $(r/R)^2$

4. ✖ $(r/R)$

**Question Number : 12 Question Id : 87371812 Display Question Number : Yes Is Question Mandatory : No**

Navier-Stokes equation is useful for

**Options :**

1. ✖ non-viscous flow

2. ✔ Viscous flow

3. ✖ turbulent flow

4. ✖ in viscid flow

**Question Number : 13 Question Id : 87371813 Display Question Number : Yes Is Question Mandatory : No**

A stagnation point is where

**Options :**

1. ✖ the pressure is zero

2. ✔ the flow velocity is zero

3. ✖ the total energy is zero

4. ✖ the flow resistance is the maximum

**Question Number : 14 Question Id : 87371814 Display Question Number : Yes Is Question Mandatory : No**

A foot valve is a

**Options :**

1. ✔ direction control valve

2. ✖ relief valve

3. ✖ pressure reducing valve

4. ✖ back pressure valve

**Question Number : 15 Question Id : 87371815 Display Question Number : Yes Is Question Mandatory : No**

The equivalent diameter of a 6 cm x 12 cm conduit is,

**Options :**

1. ✖ 2 cm

2. ✔ 8 cm

3. ✖ 72 cm

4. ✖ 6 cm

**Question Number : 16 Question Id : 87371816 Display Question Number : Yes Is Question Mandatory : No**

For an existing plate distillation column, reflux condition is changed from saturated liquid to unsaturated liquid (cold reflux). Its impact will be

**Options :**

1. ✔ Product purity improves

2. ✖ Mass flow rate of distillate increases

3. ✖ Side stream withdrawal will become easier

4. ✖ More feed can be processed

**Question Number : 17 Question Id : 87371817 Display Question Number : Yes Is Question Mandatory : No**

The mechanism of size reduction in Ultra fine grinders is primarily

**Options :**

1. ✖ cutting

2. ✔ attrition

3. ✖ impact

4. ✖ compression

**Question Number : 18 Question Id : 87371818 Display Question Number : Yes Is Question Mandatory : No**

A filter aid in the slurry will

**Options :**

1. ✔ increase the cake porosity

2. ✖ Decrease cake porosity

3. ✖ increase cake compressibility

4. ✖ Decrease cake compressibility

**Question Number : 19 Question Id : 87371819 Display Question Number : Yes Is Question Mandatory : No**

During constant pressure filtration, the flow rate of the filtrate

**Options :**

1. ✖ is constant

2. ✖ increases

3. ✖ is steady

4. ✔ decreases

**Question Number : 20 Question Id : 87371820 Display Question Number : Yes Is Question Mandatory : No**

If a plot of time vs. filtrate volume is prepared, it will be a

**Options :**

1. ✔ parabola

2. ✖ straight line

3. ✖ hyperbola

4. ✖ exponential curve

**Question Number : 21 Question Id : 87371821 Display Question Number : Yes Is Question Mandatory : No**

Net positive suction head (NPSH) of a centrifugal pump is defined as

**Options :**

1. ✖ velocity head + pressure head, at suction

2. ✖ velocity head + pressure head, at discharge

3. ✔ velocity head + pressure head, at suction - vapor pressure of liquid

4. ✖ velocity head + pressure head, at discharge – vapor pressure of liquid

**Question Number : 22 Question Id : 87371822 Display Question Number : Yes Is Question Mandatory : No**

A pump normally preferred for pumping slurries

**Options :**

1. ✔ Centrifugal pump

2. ✖ Gear pump

3. ✖ Screw pump

4. ✖ Lobe pump

**Question Number : 23 Question Id : 87371823 Display Question Number : Yes Is Question Mandatory : No**

Increase in temperature improved the rate of gas-liquid mass transfer. This could be due to

**Options :**

1. ✖ Decrease in interfacial resistance

2. ✖ Decrease in both the resistances

3. ✖ Decrease in gas phase resistance

4. ✔ Decrease in liquid phase resistance

**Question Number : 24 Question Id : 87371824 Display Question Number : Yes Is Question Mandatory : No**

In a rotary drum filter, the controlling resistance is

**Options :**

1. ✔ the cake resistance

2. ✖ the filter medium resistance

3. ✖ the piping resistance

4. ✖ All the above options

**Question Number : 25 Question Id : 87371825 Display Question Number : Yes Is Question Mandatory : No**

Differential settling methods depend on

**Options :**

1. ✖ Difference in densities

2. ✔ Difference in terminal velocities

3. ✖ Difference in particle sizes

4. ✖ Difference in liquid-solid density

**Question Number : 26 Question Id : 87371826 Display Question Number : Yes Is Question Mandatory : No**

Temperature and pressure levels recommended for the gas phase reaction, $SO_2 + ½\ O_2 \rightarrow SO_3$

**Options :**

1. ✖ Low temperature, low pressure

2. ✔ Low temperature, high pressure

3. ✖ High temperature, high pressure

4. ✖ High temperature, low pressure

**Question Number : 27 Question Id : 87371827 Display Question Number : Yes Is Question Mandatory : No**

Teflon is a polymeric product of

**Options :**

1. ✖ $CF_4$

2. ✖ $CH_2 = CHF$

3. ✖ $C_2F_2$

4. ✔ $C_2F_4$

**Question Number : 28 Question Id : 87371828 Display Question Number : Yes Is Question Mandatory : No**

Pasteurization of milk involves

**Options :**

1. ✖ Heating to boiling

2. ✖ Cooling followed by moderate heating

3. ✖ Cooling to $0^oC$

4. ✔ Moderate heating followed by cooling

**Question Number : 29 Question Id : 87371829 Display Question Number : Yes Is Question Mandatory : No**

A synthetic detergent constituent, that prevents re-deposition of dirt on the fabric, is

**Options :**

1. ✔ Sodium carboxy methyl cellulose

2. ✖ Sodium silicate

3. ✖ Sodium tripolyphosphate

4. ✖ Sodium sulfate

**Question Number : 30 Question Id : 87371830 Display Question Number : Yes Is Question Mandatory : No**

The major constituents of coke oven gas are

**Options :**

1. ✖ $CH_4$, $CO_2$ and $H_2O$

2. ✔ $CH_4$, CO and $H_2$

3. ✖ $CH_4$, CO and $N_2$

4. ✖ $CO_2$, CO and $H_2$

**Question Number : 31 Question Id : 87371831 Display Question Number : Yes Is Question Mandatory : No**

Fourier number is associated with

**Options :**

1. ✖ Convection

2. ✔ Conduction

3. ✖ Radiation

4. ✖ Combination of convection and radiation

**Question Number : 32 Question Id : 87371832 Display Question Number : Yes Is Question Mandatory : No**

A sphere, a cube and a thin circular plate, all made of the same material and having the same mass, are available at a temperature of $250^0$C. When they are exposed to the ambient air, which object will provide the lowest heat transfer rate?

**Options :**

1. ✖ circular plate

2. ✖ cube

3. ✔ sphere

4. ✖ all will cool at the same rate

**Question Number : 33 Question Id : 87371833 Display Question Number : Yes Is Question Mandatory : No**

Usually, the thermal conductivity of a non-homogeneous material

**Options :**

1. ✖ decreases with increasing temperature

2. ✖ decreases with increasing apparent bulk density

3. ✖

increases with increasing temperature but decreases with increasing apparent bulk density

4. ✔ increases both with increasing temperature and increasing apparent bulk density

**Question Number : 34 Question Id : 87371834 Display Question Number : Yes Is Question Mandatory : No**

The maximum heat loss from a pipe occurs when the radius of insulation equals

**Options :**

1. ✔ the ratio of thermal conductivity to heat transfer coefficient

2. ✖ the ratio of heat transfer coefficient to thermal conductivity

3. ✖ the radius of the pipe

4. ✖ the product of thermal conductivity and heat transfer coefficient

**Question Number : 35 Question Id : 87371835 Display Question Number : Yes Is Question Mandatory : No**

The ratio of Buoyant forces to viscous forces is better known as

**Options :**

1. ✖ Prandtl number

2. ✖ Rayleigh number

3. ✖ Stanton number

4. ✔ Grashof number

**Question Number : 36 Question Id : 87371836 Display Question Number : Yes Is Question Mandatory : No**

In natural convection, fluid moves under the influence of

**Options :**

1. ✖ surface tension forces

2. ✔ buoyant forces arising from changes in density

3. ✖ viscous forces

4. ✖ gravitational forces

**Question Number : 37 Question Id : 87371837 Display Question Number : Yes Is Question Mandatory : No**

When Prandtl number is greater than unity, the thermal boundary layer

**Options :**

1. ✖ and hydrodynamic boundary layer are of equal thickness

2. ✖ is thicker than the hydrodynamic boundary layer

3. ✔ is thinner than the hydrodynamic boundary layer

4. ✖ disappears

**Question Number : 38 Question Id : 87371838 Display Question Number : Yes Is Question**

**Mandatory : No**

The distribution of shear stress in a stream of fluid in a circular tube is

**Options :**

1. ✖ parabolic with radius for both laminar and turbulent flows

2. ✔ linear with radius for both laminar and turbulent flows

3. ✖ parabolic with radius for turbulent flow

4. ✖ linear with radius for laminar flow

**Question Number : 39 Question Id : 87371839 Display Question Number : Yes Is Question Mandatory : No**

Film wise condensation

**Options :**

1. ✖ is less common than drop wise condensation

2. ✖ occurs on non-wettable surfaces

3. ✖ is characterized by high heat transfer coefficients than that for drop wise condensation

4. ✔ is characterized by a thin liquid film forming over the entire surface

**Question Number : 40 Question Id : 87371840 Display Question Number : Yes Is Question Mandatory : No**

The average heat transfer coefficient for drop wise condensation is

**Options :**

1. ✖ less than that of film wise condensation

2. ✔ greater than that of drop wise condensation

3. ✖ equal to that of film wise condensation

4. ✖ cannot be compared

**Question Number : 41 Question Id : 87371841 Display Question Number : Yes Is Question Mandatory : No**

The total emissive power (E) of a gray body at a surface temperature of T is given by

**Options :**

1. ✔ $E = \varepsilon\sigma T^4$

2. ✖ $E = (1-\varepsilon)\sigma T^4$

3. ✖ $E = (\varepsilon-1)\sigma T^4$

4. ✖ $E = \sigma T^4$

**Question Number : 42 Question Id : 87371842 Display Question Number : Yes Is Question Mandatory : No**

For the same process temperatures, the ratio of LMTD in parallel flow to the LMTD in counter flow in liquid-liquid heat exchanger is always

**Options :**

1. ✔ $<1$

2. ✖ $=1$

3. ✖ >1

4. ✖ ∞

**Question Number : 43 Question Id : 87371843 Display Question Number : Yes Is Question Mandatory : No**

If some of the tubes in a heat exchanger are sealed, the effective heat transfer area will

**Options :**

1. ✖ increase

2. ✖ remain same

3. ✔ decrease

4. ✖ be doubled

**Question Number : 44 Question Id : 87371844 Display Question Number : Yes Is Question Mandatory : No**

When wet steam is throttled to a low pressure, its temperature

**Options :**

1. ✖ increases

2. ✖ does not change

3. ✖ gets halved

4. ✔ decreases

**Question Number : 45 Question Id : 87371845 Display Question Number : Yes Is Question Mandatory : No**

Identify the correct set of approximations made in the thermodynamic analysis of internal combustion engines

P. the combustion process is replaced by an equivalent energy addition process

Q. the working fluid is a mixture of carbon dioxide and water vapor

R. the exhaust process is replaced by an equivalent energy rejection process

S. the working fluids have constant heat capacities

**Options :**

1. ✔ P,R,S

2. ✖ P,R

3. ✖ R,S

4. ✖ P,Q,R

**Question Number : 46 Question Id : 87371846 Display Question Number : Yes Is Question Mandatory : No**

A 1-ton air conditioning unit, with a seasonal energy efficiency rate of 10 is used for 1000 hours per year. If the cost of electricity is Rs.5 per kW-h, the annual cost of power consumption by the air conditioner is

**Options :**

1. ✖ Rs. 10000

2. ✖ Rs. 5000

3. ✔ Rs. 6000

4. ✖ Rs. 12000

**Question Number : 47 Question Id : 87371847 Display Question Number : Yes Is Question Mandatory : No**

A system, going from P to Q, absorbs 100 KJ of heat and does 30 KJ of work. In the return direction if the system does 30 KJ of work, what is the heat effect?

**Options :**

1. ✖ -70 KJ

2. ✖ - 100 KJ

3. ✔ - 40 KJ

4. ✖ - 130 KJ

**Question Number : 48 Question Id : 87371848 Display Question Number : Yes Is Question Mandatory : No**

Second law of thermodynamics indicates that

**Options :**

1. ✖ Work conversion to heat is impossible

2. ✖ Heat conversion to work is impossible

3. ✖ Work conversion to heat is partial

4. ✔ Heat conversion to work is partial

**Question Number : 49 Question Id : 87371849 Display Question Number : Yes Is Question Mandatory : No**

What is the mass of CO contained in a cylinder of volume 44.8 $m^3$ at STP

**Options :**

1. ✖ 28 Kg

2. ✔ 56 Kg

3. ✖ 14 Kg

4. ✖ 44 Kg

**Question Number : 50 Question Id : 87371850 Display Question Number : Yes Is Question Mandatory : No**

Which of the following will have the dimensions of length/time

**Options :**

1. ✖ Film thickness

2. ✖ Diffusion coefficient

3. ✖ Volumetric mass transfer coefficient

4. ✔ mass transfer coefficient

**Question Number : 51 Question Id : 87371851 Display Question Number : Yes Is Question Mandatory : No**

Gas Permeability (P) is defined as

**Options :**

1. ✔ P = Volume/ pressure gradient

2. ✖ P = 1/ Diffusivity

3. ✖ P = volume x pressure gradient

4. ✖ P = Diffusivity / Solubility

**Question Number : 52 Question Id : 87371852 Display Question Number : Yes Is Question Mandatory : No**

According to Chilton-Colburn analogy for mass transfer

**Options :**

1. ✖ $N_{St}\, N_{Sc}^{2/3} = f/8$

2. ✖ $N_{St}\, N_{Sc}^{1/3} = f/2$

3. ✔ $N_{St}\, N_{Sc}^{2/3} = f/2$

4. ✖ $N_{St}\, N_{Sc}^{1/3} = f/8$

**Question Number : 53 Question Id : 87371853 Display Question Number : Yes Is Question Mandatory : No**

If the activity coefficient crosses unity as mole fraction of more volatile component in a binary mixture changes, the indication is that

**Options :**

1. ✔ an azeotrope is formed

2. ✖ the separation is easier

3. ✖ the separation is difficult

4. ✖ the system is ideal

**Question Number : 54 Question Id : 87371854 Display Question Number : Yes Is Question Mandatory : No**

Absorption factor is

**Options :**

1. ✖ Slope of the driving force line/ slope of the operating line

2. ✖ Number of transfer units/ number of theoretical plates

3. ✖ Slope of the equilibrium curve / slope of the operating line

4. ✔ Slope of the operating line / slope of the equilibrium curve

**Question Number : 55 Question Id : 87371855 Display Question Number : Yes Is Question Mandatory : No**

If the vapor pressure of water retained by a solid is less than the vapor pressure of pure water, then the water content is known as

**Options :**

1. ✖ Critical moisture content

2. ✖ Free moisture content

3. ✔ Bound Moisture

4. ✖ Equilibrium Moisture content

**Question Number : 56 Question Id : 87371856 Display Question Number : Yes Is Question Mandatory : No**

The equation that facilitates the estimation of minimum stages for a specified separation by fractionation is

**Options :**

1. ✖ Rayleigh equation

2. ✖ Kremser equation

3. ✖ McCabe equation

4. ✔ Fenske equation

**Question Number : 57 Question Id : 87371857 Display Question Number : Yes Is Question Mandatory : No**

In flashing, the final pressure is

**Options :**

1. ✖ the bubble pressure

2. ✖ the dew pressure

3. ✔ Between bubble and dew pressures

4. ✖ above dew pressure

**Question Number : 58 Question Id : 87371858 Display Question Number : Yes Is Question Mandatory : No**

Liquid A decomposes by an irreversible first order reaction and the half-life of this reaction is 20 min. The time required for 75 % conversion is

**Options :**

1. ✖ 30 min

2. ✖ 35 min

3. ✔ 40 min

4. ✖ 25 min

**Question Number : 59 Question Id : 87371859 Display Question Number : Yes Is Question Mandatory : No**

In a chemical reaction, it is observed that the rate increases 4-fold, as the concentration is doubled. What is the order of the reaction?

**Options :**

1. ✖ 1

2. ✔ 2

3. ✖ 1.5

4. ✖ 4

**Question Number : 60 Question Id : 87371860 Display Question Number : Yes Is Question Mandatory : No**

Higher activation energy of a reaction indicates that the reaction is

**Options :**

1. ✔ Temperature sensitive

2. ✖ temperature insensitive

3. ✖ More Complete

4. ✖ Higher temperatures are preferable

**Question Number : 61 Question Id : 87371861 Display Question Number : Yes Is Question Mandatory : No**

A reaction, $2A \rightarrow$ products exhibit second order kinetics. A plot of t vs. $X_A/(1-X_1)$ will then have a slope of

**Options :**

1. ✔ $KC_{AO}$

2. ✖ $KC_{AO}^2$

3. ✖ $1/(KC_{AO})$

4. ✖ $C_{AO}$

**Question Number : 62 Question Id : 87371862 Display Question Number : Yes Is Question Mandatory : No**

For an isothermal gas phase reaction, A →2B +C, with a feed of 50 % A – 50 % inert, the fractional change in volume of the system between complete and no conversion is

**Options :**

1. ✖ 3

2. ✖ 1

3. ✖ 4

4. ✔ 2

**Question Number : 63 Question Id : 87371863 Display Question Number : Yes Is Question Mandatory : No**

N plug flow reactors in series, each with a volume of V/N will give the same conversion as a single plug flow reactor of volume V, all else remaining the same. This is valid for

**Options :**

1. ✖ first order reactions

2. ✖ second order reactions

3. ✔ all reaction orders

4. ✖ Zero order reactions

**Question Number : 64 Question Id : 87371864 Display Question Number : Yes Is Question Mandatory : No**

Exit age distribution of fluid leaving a vessel is useful to

**Options :**

1. ✔ study the flow pattern in the reactor

2. ✖ study the reaction mechanism and progress

3. ✖ study the reaction kinetics

4. ✖ determine the flow rates

**Question Number : 65 Question Id : 87371865 Display Question Number : Yes Is Question Mandatory : No**

The action of a catalyst is due to its ability to change the

**Options :**

1. ✔ Activation Energy

2. ✖ Heat of reaction

3. ✖ Equilibrium constant

4. ✖ temperature & pressure dependence

**Question Number : 66 Question Id : 87371866 Display Question Number : Yes Is Question Mandatory : No**

For large values of the Thiele modulus $(L(k/D)^{1/2})$, in case of solid catalyzed first order reaction, effectiveness factor ($\varepsilon$) is given by

**Options :**

1. ✖ $\varepsilon = 1$

2. ✖ $1 / L(k/D)$

3. ✔ $\varepsilon = 1 / L(k/D)^{1/2}$

4. ✖ $L(k/D)^{1/2}$

**Question Number : 67 Question Id : 87371867 Display Question Number : Yes Is Question Mandatory : No**

Which one of the following is a dynamic characteristic of a measuring instrument

**Options :**

1. ✖ Reproducibility

2. ✔ Speed of response

3. ✖ Sensitivity

4. ✖ Range and span

**Question Number : 68 Question Id : 87371868 Display Question Number : Yes Is Question Mandatory : No**

As temperature is increased, refractive index of a liquid

**Options :**

1. ✔ decreases

2. ✖ increases

3. ✖ not affected

4. ✖ varies with square of temperature

**Question Number : 69 Question Id : 87371869 Display Question Number : Yes Is Question Mandatory : No**

An example for a natural second order system is

**Options :**

1. ✖ thermometer

2. ✖ two capacity liquid level system

3. ✖ Thermometer in a thermo well

4. ✔ U-tube manometer

**Question Number : 70 Question Id : 87371870 Display Question Number : Yes Is Question Mandatory : No**

When a first order system (time constant T) is subjected to a ramp input (At) , the dynamic error is

**Options :**

1. ✖ $(AT)^{0.5}$

2. ✔ AT

3. ✖ 0.5 AT

4. ✖ 2 AT

**Question Number : 71 Question Id : 87371871 Display Question Number : Yes Is Question Mandatory : No**

Phase angle of a second order system to a sinusoidal input is

**Options :**

1. ✖ between 0 and +90

2. ✔ between 0 and -180

3. ✖ between 0 and +180

4. ✖ between -90 and +90

**Question Number : 72 Question Id : 87371872 Display Question Number : Yes Is Question Mandatory : No**

A decrease in proportional band of a controller

**Options :**

1. ✖ decreases decay ratio

2. ✖ improves the stability of a system

3. ✔ increases decay ratio

4. ✖ decreases offset

**Question Number : 73 Question Id : 87371873 Display Question Number : Yes Is Question Mandatory : No**

For a stable system, as per Bode stability criterion, the amplitude ratio at a phase angle of $(-180^0)$

**Options :**

1. ✖ shall be greater than unity

2. ✖ shall be equal to zero

3. ✔ shall be less than unity

4. ✖ shall be equal to unity

**Question Number : 74 Question Id : 87371874 Display Question Number : Yes Is Question Mandatory : No**

An equal percentage valve is of

**Options :**

1. ✔ increasing sensitivity type

2. ✖ decreasing sensitivity type

3. ✖ constant sensitivity type

4. ✖ insensitive type

**Question Number : 75 Question Id : 87371875 Display Question Number : Yes Is Question Mandatory : No**

Biochemical digestion of an effluent is basically a process of

**Options :**

1. ✖ Reduction

2. ✖ Hydration

3. ✖ Dehydration

4. ✔ Oxidation

**Question Number : 76 Question Id : 87371876 Display Question Number : Yes Is Question Mandatory : No**

A piece of equipment has an initial value of Rs. 25000, a service life of 8 years and finally a salvage value of Rs.1000. What is the annual depreciation cost as per straight line method

**Options :**

1. ✔ Rs.2400

2. ✖ Rs.2500

3. ✖ Rs.2600

4. ✖ Rs.3000

**Question Number : 77 Question Id : 87371877 Display Question Number : Yes Is Question Mandatory : No**

Which of the following hydrocarbon series is almost absent in crude petroleum

**Options :**

1. ✖ Naphthenes

2. ✖ Aromatics

3. ✖ Paraffins

4. ✔ Olefins

**Question Number : 78 Question Id : 87371878 Display Question Number : Yes Is Question Mandatory : No**

The emission of a β- particle causes the resultant nucleus to have

**Options :**

1. ✖ less atomic weight

2. ✖ less atomic number

3. ✖ more atomic weight

4. ✔ more atomic number

**Question Number : 79 Question Id : 87371879 Display Question Number : Yes Is Question Mandatory : No**

Which method of depreciation computation will provide the lowest book value at all times

**Options :**

1. ✖ Straight line method

2. ✔ Diminishing balance method

3. ✖ Sinking fund method

4. ✖ Sum of the years digit methods

**Question Number : 80 Question Id : 87371880 Display Question Number : Yes Is Question Mandatory : No**

Increase in the weir height of a plate in a sieve plate column could lead to

**Options :**

1. ✖ Entrainment

2. ✖ Weeping

3. ✔ Flooding

4. ✖ Foaming

**Question Number : 81 Question Id : 87371881 Display Question Number : Yes Is Question Mandatory : No**

A cylindrical vessel needs to be designed to store a highly volatile liquid, under high pressure. Which closure head do you recommend?

**Options :**

1. ✖ Hemi spherical

2. ✖ Torispherical

3. ✔ Ellipsoidal

4. ✖ Flat end

**Question Number : 82 Question Id : 87371882 Display Question Number : Yes Is Question Mandatory : No**

In a particular temperature range, slope of temperature versus vapor pressure plot is 0.08 atm/ K. Given the boiling point of the liquid at 330 K is 2 atm., what is the normal boiling point of the liquid?

**Options :**

1. ✖ 342.5 K

2. ✖ 292.5 K

3. ✖ 165 .0 K

4. ✔ 317.5 K

**Question Number : 83 Question Id : 87371883 Display Question Number : Yes Is Question Mandatory : No**

100 kmol of an equimolar mixture of A and B is subjected to flash distillation to yield a vapor product containing 80 mole percent A. If the relative volatility of the system is 6, how many moles of liquid remain in the still?

**Options :**

1. ✖ 90

2. ✖ 55

3. ✖ 80

4. ✔ 75

**Question Number : 84 Question Id : 87371884 Display Question Number : Yes Is Question Mandatory : No**

A 3- micron size bacterium is moving in water at 1 mm/sec . Kinematic viscosity be taken as 1 x10 $^{-6}$ m$^2$/s. What will be the drag coefficient

**Options :**

1. ✖ 800

2. ✖ 24000

3. ✔ 8000

4. ✖ 2400

**Question Number : 85 Question Id : 87371885 Display Question Number : Yes Is Question Mandatory : No**

If air at 35 $^{o}$C and 100 kPa pressure has percentage humidity of 65 %, find its molal humidity and relative humidity? Equilibrium vapor pressure of water at 35$^{O}$C is 8.8 kPa

**Options :**

1. ✖ 0.039, 40

2. ✖ 0.039, 67

3. ✖ 0.063, 71

4. ✔ 0.063, 67

**Question Number : 86 Question Id : 87371886 Display Question Number : Yes Is Question Mandatory : No**

66 kg of $C_3H_8$ are burnt in 1522.5 kg of air to yield carbon dioxide and water. Find the percentage excess of air used for the combustion

**Options :**

1. ✖ 31

2. ✔ 47

3. ✖ 33

4. ✖ 49

**Question Number : 87 Question Id : 87371887 Display Question Number : Yes Is Question Mandatory : No**

A reactor produces 80 kmol/h of net product. A purge stream with 95 % of product and 5 % of an impurity is continuously is removed. If the feed to the reactor contains 1 % impurity, how many moles of purge are removed per hour

**Options :**

1. ✖ 5 kmol

2. ✖ 15 kmol

3. ✔ 20 kmol

4. ✖ 25 kmol

**Question Number : 88 Question Id : 87371888 Display Question Number : Yes Is Question Mandatory : No**

Indicate which of the following statements is correct

**Options :**

1. ✔ For a pure capacity system, amplitude ratio decreases as frequency increases

2. ✖ For a time delay system, phase lag decreases with increasing frequency

3. ✖ For a time delay system, amplitude ratio increases with increasing frequency

4. ✖ For a pure capacity system, the frequency increases continuously

**Question Number : 89 Question Id : 87371889 Display Question Number : Yes Is Question Mandatory : No**

A 75 mm diameter metallic ball is allowed to cool from 125°C through contact with air at 25°C. Temperature drop is noted as 4°C per minute. Assume uniform temperature with in the ball. Value of heat transfer coefficient in $W/m^2$-C is

**Options :**

1. ✖ 2.034

2. ✖ 202.2

3. ✖ 81.4

4. ✔ 20.25

**Question Number : 90 Question Id : 87371890 Display Question Number : Yes Is Question Mandatory : No**

For a second order system of transfer function $2/(2s^2+3s+4)$, response to a unit step function will be

**Options :**

1. ✖ of low settling time

2. ✖ unstable

3. ✖ sluggish

4. ✔ oscillatory

**Question Number : 91 Question Id : 87371891 Display Question Number : Yes Is Question Mandatory : No**

For a system of transfer function, $2/(3s+2)^3$, crossover frequency is

**Options :**

1. ✖ 0.58

2. ✖ 1.73

3. ✔ 1.15

4. ✖ zero

**Question Number : 92 Question Id : 87371892 Display Question Number : Yes Is Question Mandatory : No**

In a cylindrical shell subjected to internal pressure, what is the relationship between circumferential and longitudinal stresses

**Options :**

1. ✔ circumferential stress = 2 x longitudinal stress

2. ✖ circumferential stress = 0.5 x longitudinal stress

3. ✖ circumferential stress = longitudinal stress

4. ✖ Two are unrelated

**Question Number : 93 Question Id : 87371893 Display Question Number : Yes Is Question Mandatory : No**

A loan is repaid in three equal yearly repayments of INR 25000 per year. If the annual interest rate is 10 %, How much money is taken as loan?

**Options :**

1. ✖ 69602

2. ✖ 66275

3. ✖ 63275

4. ✔ 62175

**Question Number : 94 Question Id : 87371894 Display Question Number : Yes Is Question Mandatory : No**

Pay back period of a plant increased to 1.5 times the initial estimate, because of 20 % drop in the product selling price. All others remain constant. Find the ratio of production cost to new selling price

**Options :**

1. ✖ 0.6

2. ✖ 0.5

3. ✖ 0.2

4. ✔ 0.4

**Question Number : 95 Question Id : 87371895 Display Question Number : Yes Is Question Mandatory : No**

Pump A costs INR 4000 and will have a salvage of 390. Pump B costs INR 5000 and its salvage value is 2000. Assume an interest rate of 10 %. What should be the common life of the pumps for both to be equivalent economically

**Options :**

1. ✔ 5 years

2. ✖ 3 years

3. ✖ 6 years

4. ✖ 4 years

**Question Number : 96 Question Id : 87371896 Display Question Number : Yes Is Question Mandatory : No**

A fixed capital investment for a plant is INR 400 000 and salvage value after 6 years of operation is INR 40 000. In the first year of operation, sales income is INR 200 000 and manufacturing expenses are 50 000. Applicable tax is 25 % on taxable income. Assuming an interest rate of 15 % and straight line depreciation practice, what will be the effective present worth at the end of 1$^{st}$ year?

**Options :**

1. ✖ INR 289 000

2. ✔ INR 127 500

3. ✖ INR 350 000

4. ✖ INR 297 500

**Question Number : 97 Question Id : 87371897 Display Question Number : Yes Is Question Mandatory : No**

A CSTR with a mean residence time of T is given a pulse tracer input. Find the time , t needed for the exit concentration of the tracer to reach half of its initial value

**Options :**

1. ✖ $t = 0.693/T$

2. ✖ $t = 0.623\ T$

3. ✔ $t = 0.693\ T$

4. ✖ $t = 0.5\ T$

**Question Number : 98 Question Id : 87371898 Display Question Number : Yes Is Question Mandatory : No**

If the half-life of a reaction is half the full lifetime of the reaction, the reaction will be

**Options :**

1. ✖ second order

2. ✖ first order

3. ✖ half order

4. ✔ zero order

**Question Number : 99 Question Id : 87371899 Display Question Number : Yes Is Question Mandatory : No**

A first order liquid phase reaction will be 50 % complete in a CSTR. If another CSTR with the same volume is added in series, the overall percentage conversion will be

**Options :**

1. ✖ 100

2. ✔ 75

3. ✖ 62.5

4. ✖ 87.5

**Question Number : 100 Question Id : 873718100 Display Question Number : Yes Is Question Mandatory : No**

An aqueous phase, reversible reaction, R = S is conducted with pure R as the feed. The reaction rate (kmol/$m^3$-hr) is described by $r = 0.5\ C_R - 0.125\ C_S$. Estimate the residence time necessary for 60 % conversion of R

**Options :**

1. ✔ 144 minutes

2. ✖ 96 minutes

3. ✖ 180 minutes

4. ✖ 120 minutes

**Question Number : 101 Question Id : 873718101 Display Question Number : Yes Is Question Mandatory : No**

A first order reaction is 50 % complete in a packed bed reactor operated under strong pore diffusion regime. What will be the conversion, if the packings are replaced by packings of double the original size

**Options :**

1. ✔ 0.293

2. ✖ 0.707

3. ✖ 0.500

4. ✖ 0.250

**Question Number : 102 Question Id : 873718102 Display Question Number : Yes Is Question Mandatory : No**

A first order liquid phase reaction, A→B, is carried out at constant temperature in a plug flow reactor of 5 L volume. Inlet volumetric flow rate and inlet concentration of A is 1 L/min and 2 mol/L, respectively. Considering a 75 % conversion, find the rate constant in $min^{-1}$

**Options :**

1. ✖ 0.42

2. ✖ 0.72

3. ✔ 0.28

4. ✖ 0.66

**Question Number : 103 Question Id : 873718103 Display Question Number : Yes Is Question Mandatory : No**

In gas absorption, if the gas phase and liquid phase transfer coefficients are nearly equal and the equilibrium curve is nearly flat, then the controlling resistance lies in

**Options :**

1. ✖ the liquid phase

2. ✔ the gas phase

3. ✖ equally in gas and liquid phases

4. ✖ at the interface

**Question Number : 104 Question Id : 873718104 Display Question Number : Yes Is Question Mandatory : No**

15 Kg of pure solvent are used to extract A from a 40 Kg feed containing 25 mass percent A, in a single stage operation. If the A concentration in extract and raffinate streams are 50 and 5 mass percent, what is the mass of the raffinate phase.

**Options :**

1. ✖ 35.01 Kg

2. ✖ 39.93 Kg

3. ✖ 30.55 Kg

4. ✔ 38.89 Kg

**Question Number : 105 Question Id : 873718105 Display Question Number : Yes Is Question Mandatory : No**

Consider steady state molecular diffusion from the surface of a sphere into a stagnant fluid. If the flux at a distance, d from the center of the sphere is N, what is the flux at a distance 3d from the center of sphere

**Options :**

1. ✖ 3N

2. ✖ N

3. ✖ 9N

4. ✔ N/3

**Question Number : 106 Question Id : 873718106 Display Question Number : Yes Is Question Mandatory : No**

Vane pumps

**Options :**

1. ✖ operate at low efficiencies

2. ✔ can have large discharge under high pressures

3. ✖ do not depend on centrifugal force for their operation

4. ✖ cannot provide variable displacement

**Question Number : 107 Question Id : 873718107 Display Question Number : Yes Is Question Mandatory : No**

For compressing and moving gases, the pressure difference produced is the maximum for

**Options :**

1. ✖ Fans

2. ✖ Vacuum Pumps

3. ✖ Blowers

4. ✔ Compressors

**Question Number : 108 Question Id : 873718108 Display Question Number : Yes Is Question Mandatory : No**

A first order system, which is initially at 50, is subjected to a 25 unit magnitude step change. After 60 seconds, system response showed a change of 15. What would be the time constant of the system

**Options :**

1. ✔ 65 seconds

2. ✖ 75 seconds

3. ✖ 80 seconds

4. ✖ 110 seconds

**Question Number : 109 Question Id : 873718109 Display Question Number : Yes Is Question Mandatory : No**

Which of the following will improve the equilibrium conversion of the following gas phase reaction, $2A + B = R + 2S$

**Options :**

1. ✖ Increase in temperature

2. ✖ increase in pressure

3. ✔ Presence of Inert in the feed

4. ✖ Use of a catalyst

**Question Number : 110 Question Id : 873718110 Display Question Number : Yes Is Question Mandatory : No**

Dynamic similarity is

**Options :**

1. ✖ the similarity of discharge

2. ✔ the similarity of forces

3. ✖ the similarity of stream line patterns

4. ✖ the similarity of location

**Question Number : 111 Question Id : 873718111 Display Question Number : Yes Is Question Mandatory : No**

For what value of $\beta$, the rank of the matrix $\begin{bmatrix} 1 & 4 & 5 & 2 \\ 2 & 1 & 3 & 0 \\ -1 & 3 & 2 & \beta \end{bmatrix}$ is 2

**Options :**

1. ✖ $\beta = 4$

2. ✔ $\beta = 2$

3. ✖ $\beta = -2$

4. ✖ $\beta = 1$

**Question Number : 112 Question Id : 873718112 Display Question Number : Yes Is Question Mandatory : No**

Which of the following statement is true

**Options :**

1. ✖ $rank(A)$ need not be equal to $rank(A^T)$

2. ✖ $A_{n\times n}$ is invertible $\rightarrow rank(A) < n$

3. ✖ $A_{n\times n}$ is not invertible $\rightarrow$ $Ax = 0$ has trivial solution

4. ✔ $A_{n\times n}$, $(A_{n\times n})^T$ have the same eigenvalues

**Question Number : 113 Question Id : 873718113 Display Question Number : Yes Is Question Mandatory : No**

The derivative of $f(x, y) = x^2 \sin 2y$ at $(1, \frac{\pi}{2})$ in the direction of $3i - 4j$ is

**Options :**

1. ✔ $\frac{8}{5}$

2. ✖ $\frac{6}{5}$

3. ✖ 1

4. ✖ -1

**Question Number : 114 Question Id : 873718114 Display Question Number : Yes Is Question Mandatory : No**

$\int_0^1 \int_1^{e^y} f(x,y)\,dx\;dy$ is equal to

**Options :**

1. ✖ $\int_1^e \int_x^1 f(x,y)\,dy\;dx$

2. ✖ $\int_1^e \int_{e^x}^1 f(x,y)\,dy\;dx$

3. ✖ $\int_1^e \int_1^{\ln x} f(x,y)\,dy\;dx$

4. ✔ $\int_1^e \int_{\ln x}^1 f(x,y)\,dy\;dx$

**Question Number : 115 Question Id : 873718115 Display Question Number : Yes Is Question Mandatory : No**

The value of $n$ such that $(xy^2 + nx^2y)\,dx + (x^3 + x^2y)\,dy = 0$ is exact is

**Options :**

1. ✖ $n = 4$

2. ✔ $n = 3$

3. ✖ $n = 2$

4. ✖ $n = 5$

**Question Number : 116 Question Id : 873718116 Display Question Number : Yes Is Question Mandatory : No**

The solution of the initial value problem $\frac{dy}{dx} + e^x y = -2e^x; y(0) = e^{-1} - 2$ is

**Options :**

1. ✔ $e^{-e^x} - 2$

2. ✖ $e^{e^x} - 2e^{-e^x}$

3. ✖ $e^{-e^x} + 2e^{-x}$

4. ✖ $2e^{-e^x} + e^{-x}$

**Question Number : 117 Question Id : 873718117 Display Question Number : Yes Is Question Mandatory : No**

Let $X$ be a discrete random variable such that $P\{X = -1\} = P\{X = 1\} = p = \frac{1-P\{X=0\}}{2}$.

Suppose $C$ is a real number such that $E(CX^2) = 1$. Then $E(CX^{48})$ is

**Options :**

1. ✖ $0$

2. ✖ $p$

3. ✔ $1$

4. ✖ $1+p$

**Question Number : 118 Question Id : 873718118 Display Question Number : Yes Is Question Mandatory : No**

Suppose that $X$ is a continuous random variable whose probability density function is given by

$f(x)=\begin{cases} C(4x-2x^2) & 0<x<2 \\ 0 & otherwise \end{cases}$. The value of $C$ which makes $f(x)$ a density is

**Options :**

1. ✔ $\frac{3}{8}$

2. ✖ $\frac{1}{2}$

3. ✖ $\frac{1}{3}$

4. ✖ $\frac{3}{4}$

**Question Number : 119 Question Id : 873718119 Display Question Number : Yes Is Question Mandatory : No**

The value of $\int_{OA} f(z)\,dz$, where $f(z)=y-x-i\,3x^2$ and $OA$ is a straight line joining $i$ and $1+i$ is

**Options :**

1. ✖ $\frac{i}{2}$

2. ✔

$\frac{1}{2} - i$

3. ✖ $\frac{1+i}{2}$

4. ✖ $\frac{1-i}{2}$

**Question Number : 120 Question Id : 873718120 Display Question Number : Yes Is Question Mandatory : No**

Let $f(x) = x^2 - 2 = 0$. Consider the initial guess $x_0 = \frac{1}{2}$ then the value of $x_1$ in Newton-Raphson method to find out the root of $f(x) = 0$ is

**Options :**

1. ✖ 2.0

2. ✖ 2.15

3. ✔ 2.25

4. ✖ 2.75