

# National Testing Agency

|                       |                                                                  |
|-----------------------|------------------------------------------------------------------|
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| Display Marks:        | Yes                                                              |

## Chemical thermal and Polymer Engineering

|                          |          |
|--------------------------|----------|
| Group Number :           | 1        |
| Group Id :               | 30169844 |
| Group Maximum Duration : | 0        |
| Group Minimum Duration : | 90       |
| Show Attended Group? :   | No       |
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| Break time :             | 0        |
| Group Marks :            | 300      |

## Chemical thermal and Polymer Engineering

|                                       |           |
|---------------------------------------|-----------|
| Section Id :                          | 30169844  |
| Section Number :                      | 1         |
| Section type :                        | Online    |
| Mandatory or Optional :               | Mandatory |
| Number of Questions :                 | 75        |
| Number of Questions to be attempted : | 75        |
| Section Marks :                       | 300       |
| Maximum Instruction Time :            | 0         |
| Sub-Section Number :                  | 1         |
| Sub-Section Id :                      | 30169864  |
| Question Shuffling Allowed :          | Yes       |

Question Number : 1 Question Id : 3016983244 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

The eigen value corresponding to the eigen vector  $\begin{bmatrix} 1 \\ 1 \end{bmatrix}$  for the matrix  $\begin{bmatrix} 4 & 2 \\ 2 & 4 \end{bmatrix}$ , is

1. 2

2. 4

3. 6

4. 8

Options :

30169812901. 1

30169812902. 2

30169812903. 3

30169812904. 4

**Question Number : 2 Question Id : 3016983245 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

For the function  $f(x) = 2x^3 - 15x^2 + 36x + 10$ , the local maxima and local minima occurs respectively at:

1.  $x = 3$  and  $x = 2$

2.  $x = 1$  and  $x = 3$

3.  $x = 2$  and  $x = 3$

4.  $x = 3$  and  $x = 4$

**Options :**

30169812905. 1

30169812906. 2

30169812907. 3

30169812908. 4

**Question Number : 3 Question Id : 3016983246 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

For an ordinary differential equation  $y'' + y' = x^2 + 2x + 4$ , the particular integral is given by:

1.  $\frac{x^2}{3} + 4x$

2.  $\frac{x^3}{3} + 4x$

3.  $\frac{x^3}{3} + 4$

4.  $\frac{x^3}{3} + 2x$

**Options :**

30169812909. 1

30169812910. 2

30169812911. 3

30169812912. 4

**Question Number : 4 Question Id : 3016983247 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

Bag I contains 4 red and 3 green balls and Bag II contains 3 blue and 4 green balls. One ball is drawn at random from each bag, then the probability that one of the drawn ball is red and other is blue, is:

1.  $\frac{1}{7}$

2.  $\frac{9}{49}$

3.  $\frac{12}{49}$

4.  $\frac{3}{7}$

**Options :**

30169812913. 1

30169812914. 2

30169812915. 3

30169812916. 4

**Question Number : 5 Question Id : 3016983248 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

**Match the LIST-I with LIST-II**

| LIST-I |                       | LIST-II |                                  |
|--------|-----------------------|---------|----------------------------------|
| A.     | Gauss Seidel method   | I.      | Interpolation                    |
| B.     | Forward Newton method | II.     | Non-linear Differential equation |
| C.     | Runge Kutta method    | III.    | Numerical Integration            |
| D.     | Trapezoidal rule      | IV.     | Linear algebraic equations       |

Choose the **correct** answer from the options given below:

1. A - I, B - II, C - III, D - IV

2. A - II, B - III, C - IV, D - I

3. A - III, B - IV, C - II, D - I

4. A - IV, B - I, C - II, D - III

**Options :**

30169812917. 1

30169812918. 2

30169812919. 3

30169812920. 4

**Question Number : 6 Question Id : 3016983249 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

In a constant pressure cake filtration with an incompressible cake layer, the volume of filtrate ( $V$ ) is measured as a function of time,  $t$ . The plot of  $t/V$  versus  $V$  gives a straight line with slope  $10^4 \text{ s m}^{-3}$ . Filter area is  $0.005 \text{ m}^2$ , viscosity of filtrate is  $10^{-3} \text{ Pa s}$ , and the overall pressure drop across filter is  $200 \text{ kPa}$ . What is the value of filter medium resistance in  $\text{m}^{-1}$ ?

1.  $1 \times 10^9$
2.  $1 \times 10^{10}$
3.  $1 \times 10^{11}$
4.  $1 \times 10^{12}$

**Options :**

30169812921. 1  
30169812922. 2  
30169812923. 3  
30169812924. 4

**Question Number : 7 Question Id : 3016983250 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

A rigid spherical particle is undergoing free settling in a liquid of density  $750 \text{ kg m}^{-3}$ , viscosity  $9.81 \times 10^{-3} \text{ Pa s}$ . Particle density is four times the liquid density. Taking the acceleration due to gravity as  $9.81$  and assuming Stoke's law is valid, the terminal settling velocity of the particle in  $\text{ms}^{-1}$  is:

1.  $2 \times 10^{-3}$
2.  $3 \times 10^{-3}$
3.  $4 \times 10^{-3}$
4.  $5 \times 10^{-3}$

**Options :**

30169812925. 1  
30169812926. 2  
30169812927. 3  
30169812928. 4

**Question Number : 8 Question Id : 3016983251 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

In the laminar boundary layer over a flat plate, the ratio of  $\delta/x$  varies as  $Re^k$  (Where,  $Re$  is Reynolds number) . The value of  $k$  is:

1. 1
2.  $1/2$
3.  $-1$
4.  $-1/2$

**Options :**

30169812929. 1  
30169812930. 2  
30169812931. 3  
30169812932. 4

**Question Number : 9 Question Id : 3016983252 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

The best purpose served by the baffles used in agitated vessels is to

1. create flow patterns
2. form the suspension of fine drops
3. form the emulsions of fine drops
4. suppress vortex formation

**Options :**

30169812933. 1  
30169812934. 2  
30169812935. 3  
30169812936. 4

**Question Number : 10 Question Id : 3016983253 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

A pipe with diameter 25 cm at the entrance, carries oil with specific gravity 0.9 at a velocity of 3 m/s. At the exit section the diameter of pipe is 20 cm. The velocity at exit section is:

1. 4.5 m/s
2. 4.68 m/s
3. 4.8 m/s
4. 4.9 m/s

**Options :**

30169812937. 1  
30169812938. 2  
30169812939. 3

Question Number : 11 Question Id : 3016983254 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Match **LIST-I** with **LIST-II** and select the correct answer using the codes given below the lists.

| LIST-I<br>(Dimensionless quantity) |                | LIST-II<br>(Application) |                                            |
|------------------------------------|----------------|--------------------------|--------------------------------------------|
| A.                                 | Stanton number | 1.                       | Natural convection for ideal gases         |
| B.                                 | Grashof number | 2.                       | Mass Transfer                              |
| C.                                 | Peclet number  | 3.                       | Forced convection                          |
| D.                                 | Schmidt number | 4.                       | Forced convection for small Prandtl number |

Choose the **most appropriate** answer from the options given below:

1. A - 2, B - 4, C - 3, D - 1

2. A - 3, B - 1, C - 4, D - 2

3. A - 3, B - 4, C - 1, D - 2

4. A - 2, B - 1, C - 3, D - 4

Options :

30169812941. 1

30169812942. 2

30169812943. 3

30169812944. 4

Question Number : 12 Question Id : 3016983255 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Two rods, one of length  $L$  and the other of length  $2L$ , are made of the same material and have the same diameter. The two ends of the longer rod are maintained at  $100^\circ\text{C}$ . One end of the shorter rod is maintained at  $100^\circ\text{C}$  while the other end is insulated. Both the rods are exposed to the same environment at  $40^\circ\text{C}$ . The temperature at the insulated end of the shorter rod is measured to be  $55^\circ\text{C}$ . Temperature at the mid point of the longer rod would be

1.  $40^\circ\text{C}$

2.  $50^\circ\text{C}$

3.  $55^\circ\text{C}$

4.  $100^\circ\text{C}$

Options :

30169812945. 1

30169812946. 2

30169812947. 3

30169812948. 4

**Question Number : 13 Question Id : 3016983256 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

For steady flow and constant value of conductivity, the temperature distribution for a plane wall is:

1. parabolic
2. linear
3. logarithmic
4. cubic

**Options :**

30169812949. 1

30169812950. 2

30169812951. 3

30169812952. 4

**Question Number : 14 Question Id : 3016983257 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

Baffles are provided in heat Exchangers to

1. decrease heat transfer area
2. decrease pressure drop
3. increase rate of heat transfer
4. decrease vibrations

**Options :**

30169812953. 1

30169812954. 2

30169812955. 3

30169812956. 4

**Question Number : 15 Question Id : 3016983258 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

A furnace wall of thickness 1m and surface area  $2 \text{ m}^2$  is made of a material whose thermal conductivity is  $1 \text{ kJ/hr.m}^\circ\text{C}$ . The temperature of inner surface of the wall is  $1000^\circ\text{C}$  and of outer surface is  $200^\circ\text{C}$ . Heat flow through the wall in  $\text{kJ/hr}$  will be

1. 2000
2. 1600
3. 1200
4. 800

**Options :**

30169812957. 1  
 30169812958. 2  
 30169812959. 3  
 30169812960. 4

**Question Number : 16 Question Id : 3016983259 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

Match **LIST-I** with **LIST-II** and select the correct answer from the codes given below the lists.

| LIST-I |                     | LIST-II |                          |
|--------|---------------------|---------|--------------------------|
| A.     | Rotary atomizer     | 1.      | Kinetic energy           |
| B.     | Relative volatility | 2.      | Centrifugal energy       |
| C.     | Pneumatic nozzle    | 3.      | Distillation             |
| D.     | Selectivity         | 4.      | Liquid-liquid extraction |

Choose the **correct** answer from the options given below:

1. A - 2, B - 3, C - 1, D - 4
2. A - 2, B - 1, C - 3, D - 4
3. A - 1, B - 2, C - 3, D - 4
4. A - 4, B - 3, C - 1, D - 2

**Options :**

30169812961. 1  
 30169812962. 2  
 30169812963. 3  
 30169812964. 4

**Question Number : 17 Question Id : 3016983260 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

The McCabe-Thiele method used to find the number of theoretical stages required in a distillation operation is based on the assumption(s) that

1. liquid/vapour loading in each section of the tower remains constant
2. Trouton's rule is applicable
3. sensible heat differences are small because the temperature change from tray to tray is small
4. liquid mixture forms an azeotrope

**Options :**

- 30169812965. 1
- 30169812966. 2
- 30169812967. 3
- 30169812968. 4

**Question Number : 18 Question Id : 3016983261 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

Steady state temperature reached by a small amount of liquid evaporating into a large amount of unsaturated vapour-gas mixture is:

1. dry-bulb temperature
2. wet-bulb temperature
3. dew point
4. boiling point

**Options :**

- 30169812969. 1
- 30169812970. 2
- 30169812971. 3
- 30169812972. 4

**Question Number : 19 Question Id : 3016983262 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

For economical operation in gas absorption, the operating line approximately

1. lies parallel above the equilibrium line
2. lies parallel to the equilibrium line
3. is coincides with the equilibrium curve
4. is tangential to the equilibrium curve

**Options :**

- 30169812973. 1
- 30169812974. 2
- 30169812975. 3

**Question Number : 20 Question Id : 3016983263 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

Which of the following is used as an 'entrainer' in the separation of acetic acid-water mixture by distillation?

1. Furfural
2. Benzol
3. Butyl acetate
4. Hexane

**Options :**

30169812977. 1

30169812978. 2

30169812979. 3

30169812980. 4

**Question Number : 21 Question Id : 3016983264 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

Compared to saturated oils, unsaturated oils have

1. lower melting point and higher reactivity to oxygen
2. higher melting point and higher reactivity to oxygen
3. lower melting point and lower reactivity to oxygen
4. higher melting point dn lower reactivity to oxygen

**Options :**

30169812981. 1

30169812982. 2

30169812983. 3

30169812984. 4

**Question Number : 22 Question Id : 3016983265 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

A production equipment costs ₹. 200000. Its salvage value is ₹. 25000. The expected return is ₹. 50000 per annum. The corporate taxes are taken as 30%. The payback period will be

1. 2 years
2. 5 years
3. 3 years
4. 10 years

**Options :**

30169812985. 1  
30169812986. 2  
30169812987. 3  
30169812988. 4

**Question Number : 23 Question Id : 3016983266 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

For a typical project, the cumulative cash flow is zero at the

1. end of the project life
2. break even point
3. start-up
4. end of the design stage

**Options :**

30169812989. 1  
30169812990. 2  
30169812991. 3  
30169812992. 4

**Question Number : 24 Question Id : 3016983267 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

When the interest is compounded monthly, the effective interest rate will be

1. 26.8%
2. 24.8%
3. 12.6%
4. 40.8%

**Options :**

30169812993. 1  
30169812994. 2  
30169812995. 3  
30169812996. 4

Question Number : 25 Question Id : 3016983268 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

For a shell and tube heat Exchanger, the clean overall heat transfer coefficient is calculated as  $250 \text{ Wm}^{-2}\text{K}^{-1}$  for a specific process condition. It is expected that the heat Exchanger may be fouled during the operation and a fouling resistance of  $0.001 \text{ m}^2\text{KW}^{-1}$  is prescribed. The dirt overall heat transfer coefficient is ----- $\text{Wm}^{-2}\text{K}^{-1}$

1. 300

2. 200

3. 100

4. 50

Options :

30169812997. 1

30169812998. 2

30169812999. 3

30169813000. 4

Question Number : 26 Question Id : 3016983269 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

In the industrial production of nitric acid, oxidation of ammonia with air in the presence of 90% platinum, 10% rhodium catalyst in the converter constitutes the first step, the feed gas to the converter contains around

1. 1 to 2% ammonia in air

2. 10 to 12% ammonia in air

3. 40 to 50 % ammonia in air

4. 70 to 80% ammonia in air

Options :

30169813001. 1

30169813002. 2

30169813003. 3

30169813004. 4

Question Number : 27 Question Id : 3016983270 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

In forced convection, the Nusselt Number (Nu) is a function of

1. Re and Pr
2. Re and Gr
3. Pr and Gr
4. Re and Sc

**Options :**

- 30169813005. 1
- 30169813006. 2
- 30169813007. 3
- 30169813008. 4

**Question Number : 28 Question Id : 3016983271 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

If a mass of solid particles is packed by tapping, the bulk density of the mass

1. decreases
2. increases
3. remains unchanged
4. can not be predicted, more information is required

**Options :**

- 30169813009. 1
- 30169813010. 2
- 30169813011. 3
- 30169813012. 4

**Question Number : 29 Question Id : 3016983272 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

Consider separation of dust particles from gases in a cyclone separator. For a given particle size, the terminal velocity is maximum

1. at a location near the wall of the cyclone
2. at an intermediate location between the centre and the wall of the cyclone
3. at a location near the center of the cyclone
4. at the wall of the cyclone

**Options :**

- 30169813013. 1
- 30169813014. 2
- 30169813015. 3
- 30169813016. 4

**Question Number : 30 Question Id : 3016983273 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

When a ball mill rotates at a speed higher than the critical speed, its efficiency is

1. minimum
2. maximum
3. optimum
4. hundred percent

**Options :**

30169813017. 1  
30169813018. 2  
30169813019. 3  
30169813020. 4

**Question Number : 31 Question Id : 3016983274 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

Which of the following is a coarse crusher?

1. Dire crusher
2. Conical crusher
3. Single roll crusher
4. Jaw crusher

**Options :**

30169813021. 1  
30169813022. 2  
30169813023. 3  
30169813024. 4

**Question Number : 32 Question Id : 3016983275 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

Separation of particles of various sizes, shapes and densities by allowing them to settle in a fluid is called

1. classification
2. froth floatation
3. thickening
4. sedimentation

**Options :**

30169813025. 1

30169813026. 2

30169813027. 3

30169813028. 4

**Question Number : 33 Question Id : 3016983276 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

Break-even point increases with

1. decrease in fixed cost
2. decrease in variable cost for a given value of price
3. decrease in unit contribution
4. decrease in manufacturing cost

**Options :**

30169813029. 1

30169813030. 2

30169813031. 3

30169813032. 4

**Question Number : 34 Question Id : 3016983277 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

Cost of instrumentation in a modern chemical plant as compared to the total plant cost, ranges from

1. 5 to 10%
2. 20 to 30%
3. 40 to 50%
4. 60 to 70%

**Options :**

30169813033. 1

30169813034. 2

30169813035. 3

30169813036. 4

**Question Number : 35 Question Id : 3016983278 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

The rate of corrosion of mild steel by sulphuric acid is unacceptably high for

1. dilute acid
2. acid at concentrations above 70%
3. acid of intermediate concentrations
4. for both dilute as well as concentrated acid (>70%)

**Options :**

30169813037. 1  
30169813038. 2  
30169813039. 3  
30169813040. 4

**Question Number : 36 Question Id : 3016983279 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

Karbate is

1. an alloy of copper and nickel
2. chemically impregnated carbon
3. high silicon iron
4. an alloy of copper, tin, and zinc

**Options :**

30169813041. 1  
30169813042. 2  
30169813043. 3  
30169813044. 4

**Question Number : 37 Question Id : 3016983280 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

Bracket supports are most suitable for

1. thick walled vertical vessels
2. horizontal vessels
3. thin spherical vessels
4. thin walled vertical vessels

**Options :**

30169813045. 1  
30169813046. 2  
30169813047. 3  
30169813048. 4

**Question Number : 38 Question Id : 3016983281 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

Consider a piston-cylinder arrangement containing a gas. This system is heated by placing it on the top of a burner. The system undergoes

1. a constant pressure process
2. a constant volume process
3. an adiabatic process
4. an isothermal process

**Options :**

30169813049. 1  
30169813050. 2  
30169813051. 3  
30169813052. 4

**Question Number : 39 Question Id : 3016983282 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

Consider the manufacturing of Linear Alkyl Benzene Sulphonates (LABS). The alkylbenzenes are sulphonated with

1. 50% sulphuric acid
2. 98% sulphuric acid
3. 20% oleum
4. sulphur trioxide gas

**Options :**

30169813053. 1  
30169813054. 2  
30169813055. 3  
30169813056. 4

**Question Number : 40 Question Id : 3016983283 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

In petrochemical industry, any petroleum fraction having an approximate boiling point range between 20 °C and 200 °C which is used as a feed stock is called

1. kerosene
2. gas oil
3. naphtha
4. LPG

**Options :**

- 30169813057. 1
- 30169813058. 2
- 30169813059. 3
- 30169813060. 4

**Question Number : 41 Question Id : 3016983284 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

As pressure approaches zero, the ratio of fugacity to pressure ( $f/P$ ) for a gas approaches

- 1. zero
- 2. unity
- 3. infinity
- 4. an indeterminate value

**Options :**

- 30169813061. 1
- 30169813062. 2
- 30169813063. 3
- 30169813064. 4

**Question Number : 42 Question Id : 3016983285 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

Secondary nutrients in fertilizers are

- 1. boron, copper, manganese
- 2. calcium, molybdenum, zinc
- 3. iron, sulphur, molybdenum
- 4. calcium, magnesium, sulphur

**Options :**

- 30169813065. 1
- 30169813066. 2
- 30169813067. 3
- 30169813068. 4

**Question Number : 43 Question Id : 3016983286 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

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

1. extrusion
2. mastication
3. calendering
4. vulcanisation

**Options :**

30169813069. 1  
30169813070. 2  
30169813071. 3  
30169813072. 4

**Question Number : 44 Question Id : 3016983287 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

Mixed fertilizer having its grade designated by 5-25-10, means

1. the fertilizer contains 5% by weight elemental nitrogen, 25% by weight  $P_2O_5$ , and 10% by weight  $K_2O$
2. the fertilizer contains 5% by weight ammonia, 25% by weight phosphoric acid, and 10% by weight potassium chloride
3. the fertilizer contains 5% by weight  $K_2O$ , 25% by weight  $NH_3$ , and 10% by weight  $P_2O_5$
4. the fertilizer contains 5% by weight  $P_2O_5$ , 25% by weight  $NH_4Cl$ , and 10% by weight  $K_2O$

**Options :**

30169813073. 1  
30169813074. 2  
30169813075. 3  
30169813076. 4

**Question Number : 45 Question Id : 3016983288 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

Sulfa drugs are derivatives of

1. benzoic acid
2. sulphanilic acid
3. sulphanilamide
4. *p*-aminobenzoic acid

**Options :**

30169813077. 1  
30169813078. 2

30169813079. 3

30169813080. 4

**Question Number : 46 Question Id : 3016983289 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

A multiple effect evaporator has a capacity to process 4000 kg of solid caustic soda per day when it is concentrating from 10% to 35% solids. The water evaporated in kg per day is:

1. 28571

2. 24571

3. 16000

4. 48571

**Options :**

30169813081. 1

30169813082. 2

30169813083. 3

30169813084. 4

**Question Number : 47 Question Id : 3016983290 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

**Match LIST-I with LIST-II**

| LIST-I<br>(Physical Quantity) |             | LIST-II<br>(Instrument) |                       |
|-------------------------------|-------------|-------------------------|-----------------------|
| A.                            | Pressure    | I.                      | Hot wire anemometer   |
| B.                            | Temperature | II.                     | Piezoelectric element |
| C.                            | Velocity    | III.                    | Rheometer             |
| D.                            | Viscosity   | IV.                     | Pyrometer             |

Choose the **correct** answer from the options given below:

1. A - IV, B - III, C - I, D - II

2. A - II, B - IV, C - I, D - III

3. A - III, B - II, C - I, D - IV

4. A - III, B - IV, C - I, D - II

**Options :**

30169813085. 1

30169813086. 2

30169813087. 3

30169813088. 4

Question Number : 48 Question Id : 3016983291 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No  
Correct Marks : 4 Wrong Marks : 1  
ABS is a

1. Homopolymer
2. Copolymer
3. Thermo setting polymer
4. Liquid crystal polymer

Options :

30169813089. 1  
30169813090. 2  
30169813091. 3  
30169813092. 4

Question Number : 49 Question Id : 3016983292 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No  
Correct Marks : 4 Wrong Marks : 1

The unit step response of the transfer function

$$G(s) = 1/(s^2 + 2s + 3)$$

1. has a damped oscillatory characteristics
2. is overdamped
3. has a non zero slope at the origin
4. is unstable

Options :

30169813093. 1  
30169813094. 2  
30169813095. 3  
30169813096. 4

Question Number : 50 Question Id : 3016983293 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No  
Correct Marks : 4 Wrong Marks : 1

10 ml of 0.5 M HCl is mixed with 30 ml of 0.3 M HCl, the molarity of the solution is:

1. 0.40 M
2. 0.25 M
3. 0.35 M
4. 0.68 M

Options :

30169813097. 1

30169813098. 2

30169813099. 3

30169813100. 4

**Question Number : 51 Question Id : 3016983294 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

A first order system with unity gain and time constant ( $\tau$ ) is subjected to sinusoidal input having a frequency ( $\omega$ ) of  $1/\tau$ . The amplitude ratio for such system is:

1. 0.25

2.  $1/\sqrt{2}$

3.  $1/2$

4. 1

**Options :**

30169813101. 1

30169813102. 2

30169813103. 3

30169813104. 4

**Question Number : 52 Question Id : 3016983295 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

Carothers equation may define gel formation for the

1. condensation polymerization

2. free radical polymerization

3. co-ordination polymerization

4. ionic polymerization

**Options :**

30169813105. 1

30169813106. 2

30169813107. 3

30169813108. 4

**Question Number : 53 Question Id : 3016983296 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

A step change of magnitude is introduced to a system having the following transfer function:

$$G(s) = 2/(s^2 + 2s + 4)$$

The percent overshoot is:

1. 50
2. 33.6
3. 16.3
4. 0

**Options :**

30169813109. 1  
30169813110. 2  
30169813111. 3  
30169813112. 4

**Question Number : 54 Question Id : 3016983297 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

The Bode diagram stability criterion is applicable when

1. gain and phase curves both decrease with frequency
2. gain curve increases and phase curve decreases with frequency.
3. gain curve decreases and phase curve increases with frequency.
4. gain and phase curves both increase with frequency.

**Options :**

30169813113. 1  
30169813114. 2  
30169813115. 3  
30169813116. 4

**Question Number : 55 Question Id : 3016983298 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

In an internal combustion engine, during the compression strokes, the heat rejected to the cooling water is 75 J/g and the work input is 120 J/g. The change in internal energy of the working fluid is:

1. - 45 J/g
2. + 45 J/g
3. - 195 J/g
4. + 195 J/g

**Options :**

30169813117. 1

30169813118. 2

30169813119. 3

30169813120. 4

**Question Number : 56 Question Id : 3016983299 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

The functionality of the Phenol in the preparation of phenol-formaldehyde resin is :

1. 1

2. 2

3. 3

4. 4

**Options :**

30169813121. 1

30169813122. 2

30169813123. 3

30169813124. 4

**Question Number : 57 Question Id : 3016983300 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

The characteristic equation for the system is

$$s^3 + 9s^2 + 26s + 12(2 + K_c) = 0$$

Using Routh test, the value of  $K_c$  that will keep the system stable is:

1. 17.5

2. 15.3

3. 18.4

4. 13.5

**Options :**

30169813125. 1

30169813126. 2

30169813127. 3

30169813128. 4

**Question Number : 58 Question Id : 3016983301 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

Which one is an example of branched polymer?

1. HDPE
2. LDPE
3. Nylon - 66
4. PET

**Options :**

30169813129. 1  
30169813130. 2  
30169813131. 3  
30169813132. 4

**Question Number : 59 Question Id : 3016983302 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

The transfer function of a PID controller is:

1.  $K_c(1 + \tau_I s + \tau_d s)$
2.  $K_c(1 + 1/\tau_I s + \tau_d s)$
3.  $K_c(1 + \tau_I s + 1/\tau_d s)$
4.  $K_c(1 + 1/(\tau_I s + 1/\tau_d s))$

**Options :**

30169813133. 1  
30169813134. 2  
30169813135. 3  
30169813136. 4

**Question Number : 60 Question Id : 3016983303 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

The liquid used in hydraulic transmission is:

1. oil
2. water
3. steam
4. any volatile liquid

**Options :**

30169813137. 1  
30169813138. 2  
30169813139. 3  
30169813140. 4

Question Number : 61 Question Id : 3016983304 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Bode diagram is a plot of (AR is amplitude ratio;  $\omega$  is frequency factor and  $\phi$  is phase angle)

1.  $\log AR$  vs  $\log \omega$  and  $\phi$  vs  $\log \omega$
2.  $\log AR$  vs  $\omega$  and  $\log \phi$  vs  $\log \omega$
3.  $AR$  vs  $\log \omega$  and  $\log \phi$  vs  $\log \omega$
4.  $AR$  vs  $\omega$  and  $\phi$  vs  $\omega$

Options :

- 30169813141. 1
- 30169813142. 2
- 30169813143. 3
- 30169813144. 4

Question Number : 62 Question Id : 3016983305 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Which one is appropriate for the poly-ethyleneterephthalate?

1. Softening temperature in the range of  $30^{\circ}\text{C}$  -  $45^{\circ}\text{C}$
2.  $T_g$  is about  $80^{\circ}\text{C}$
3. Melting point is in the range of  $400^{\circ}\text{C}$  -  $450^{\circ}\text{C}$
4.  $T_g$  of the crystalline zone is  $80^{\circ}\text{C}$

Options :

- 30169813145. 1
- 30169813146. 2
- 30169813147. 3
- 30169813148. 4

Question Number : 63 Question Id : 3016983306 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Match the **LIST-I** with **LIST-II**

| LIST-I |                          | LIST-II |                   |
|--------|--------------------------|---------|-------------------|
| A.     | Lag                      | I.      | Speed of response |
| B.     | Static and dynamic error | II.     | Fidelity          |
| C.     | Drift                    | III.    | Reproducibility   |
| D.     | Sensitivity              | IV.     | Precision         |

Choose the **correct** answer from the options given below:

1. A - I, B - II, C - III, D - IV

2. A - I, B - III, C - IV, D - II

3. A - II, B - IV, C - III, D - I

4. A - III, B - IV, C - I, D - II

**Options :**

30169813149. 1

30169813150. 2

30169813151. 3

30169813152. 4

**Question Number : 64 Question Id : 3016983307 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

Unit of rate constant for a zero order reaction is:

1.  $\text{mol/m}^2 \text{ s}^{-1}$

2.  $\text{mol-s/m}^2$

3.  $\text{s}^{-1}$

4.  $\text{mol/m}^3 \text{ s}^{-1}$

**Options :**

30169813153. 1

30169813154. 2

30169813155. 3

30169813156. 4

**Question Number : 65 Question Id : 3016983308 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

If the temperature of a saturated water is increased infinitesimally at constant entropy, the resulting state of water is :

1. Liquid
2. Liquid - vapor co-existence
3. saturated vapor
4. solid

**Options :**

30169813157. 1  
30169813158. 2  
30169813159. 3  
30169813160. 4

**Question Number : 66 Question Id : 3016983309 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

Buna-S is a polymer of

1. iso-butadiene
2. styrene and butane
3. butadiene and styrene
4. acrylonitrile, butadiene and styrene

**Options :**

30169813161. 1  
30169813162. 2  
30169813163. 3  
30169813164. 4

**Question Number : 67 Question Id : 3016983310 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

Accuracy is specified as 0.5% of the true value. At 5% of full scale, error of the instrument will be

1.  $\pm 0.025\%$
2.  $\pm 0.5\%$
3.  $\pm 0.05\%$
4.  $\pm 2.5\%$

**Options :**

30169813165. 1  
30169813166. 2  
30169813167. 3

**Question Number : 68 Question Id : 3016983311 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

Water enters a storage tank at a temperature,  $T_0$  and flow rate,  $Q_0$  and leaving at a flow rate,  $Q$  and temperature,  $T$ . There are negligible heat losses in the tank. The area of cross-section of the tank is  $A_c$ . The model equation that describes the water temperature variation in the tank is given by

1.  $Q_0(T_0 - T) = A_c h \, dT/dt$

2.  $Q_0 T_0 - Q T = A_c h \, dT/dt$

3.  $Q(T_0 - T) = A_c h \, dT/dt$

4.  $Q(T_0 - T) = A_c h \, d(T_h)/dt$

**Options :**

30169813169. 1

30169813170. 2

30169813171. 3

30169813172. 4

**Question Number : 69 Question Id : 3016983312 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

HDPE water storage tank is an example of

1. extrusion process

2. injection moulding

3. rotational moulding

4. thermoforming

**Options :**

30169813173. 1

30169813174. 2

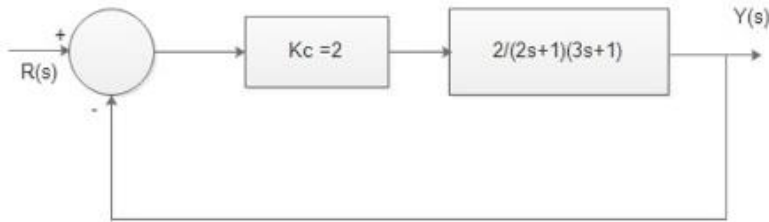
30169813175. 3

30169813176. 4

**Question Number : 70 Question Id : 3016983313 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

The Block diagram for a control system is shown below:



For a unit step change in the set point  $R(s)$ , the steady state offset in the output  $Y(s)$  is:

1. 0.2

2. 0.3

3. 0.4

4. 0.5

**Options :**

30169813177. 1

30169813178. 2

30169813179. 3

30169813180. 4

**Question Number : 71 Question Id : 3016983314 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

A gaseous system contain HI,  $H_2$  and  $I_2$  which participate in the gas phase reaction  
 $2HI \rightleftharpoons H_2 + I_2$

At a state of reaction equilibrium, the number of thermodynamic degrees of freedom is:

1. 2

2. 3

3. 4

4. 5

**Options :**

30169813181. 1

30169813182. 2

30169813183. 3

30169813184. 4

**Question Number : 72 Question Id : 3016983315 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

From the following list, identify the properties which are equal in both vapor and liquid phases at equilibrium

- A. Temperature
- B. Density
- C. Enthalpy
- D. Chemical potential

Choose the **correct** answer from the options given below:

- 1. A and B
- 2. A and C
- 3. C and D
- 4. A and D

**Options :**

- 30169813185. 1
- 30169813186. 2
- 30169813187. 3
- 30169813188. 4

**Question Number : 73 Question Id : 3016983316 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

For a pure substance, the Maxwell's relation obtained from the fundamental property relation  $dU = TdS - PdV$

- 1.  $(\partial T / \partial V)_S = -(\partial P / \partial S)_V$
- 2.  $(\partial P / \partial T)_V = (\partial S / \partial V)_T$
- 3.  $(\partial T / \partial P)_S = (\partial V / \partial S)_P$
- 4.  $(\partial V / \partial T)_P = (\partial S / \partial P)_T$

**Options :**

- 30169813189. 1
- 30169813190. 2
- 30169813191. 3
- 30169813192. 4

**Question Number : 74 Question Id : 3016983317 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

For a pure substance, which of the followings does not change during condensation?

1. Specific volume
2. Specific enthalpy
3. Specific internal energy
4. Specific Gibbs energy

**Options :**

30169813193. 1  
30169813194. 2  
30169813195. 3  
30169813196. 4

**Question Number : 75 Question Id : 3016983318 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

Which of the following conditions is not satisfied by an ideal solution?

1.  $\Delta H_{\text{mixing}} = 0$
2.  $\Delta V_{\text{mixing}} = 0$
3.  $\Delta S_{\text{mixing}} = 0$
4. Raoult's Law is obeyed

**Options :**

30169813197. 1  
30169813198. 2  
30169813199. 3  
30169813200. 4

