1. The least important reason to have a FPP (Fire Prevention Plan) is to

(A) Prevent loss of life
(B) Comply with OSHA
(C) Prevent loss of property by fire
(D) Eliminate the causes of fire
(E) Answer not known

2. Compliance audits calls for employers to certify that they have evaluated compliance with process safety requirements atleast every _____ years.

(A) 5
(B) 3
(C) 4
(D) 2
(E) Answer not known

3. Safety _____ behavior refers to the extent to which workers follow the safety rules and regulations.

(A) Motivational
(B) Knowledge
(C) Participation
(D) Compliance
(E) Answer not known

4. According the industrial safety hazards a confined space is

(A) A space that is difficult to access
(B) A space that is used for storage
(C) A space with limited entry and exit points
(D) A space with limited lighting
(E) Answer not known

5. Identify the respiratory personal protective equipment which is under "Air Purifying type" from the given options.

(A) Chemical cartridge type respirator
(B) Air line respirator
(C) SCBA (Self Contained Breathing Apparatus)
(D) Short distance fresh air apparatus
(E) Answer not known

6. Identify the disease that occurs due to disturbance in balancing apparatus in ear which gives a sensation of rotation in head.

(A) Convulsions
(B) Carpal tunnel syndrome
(C) White finger
(D) Vertigo
(E) Answer not known

7. Prolonged exposure to _____ radiation, which is non-ionizing, may cause cataracts.

(A) Alpha
(B) Gamma
(C) Microwaves
(D) Infrared
(E) Answer not known

8. Identify the chemical from the given options which is classified as "Irritants"

(A) Sulphur dioxide
(B) Arsenic
(C) Argon
(D) Hydrogen cyanide
(E) Answer not known

9. Which safety signs are triangular in shape with a yellow background and black borders, symbols and text?

(A) Prohibition signs
(B) Warning signs
(C) Mandatory signs
(D) Safe condition signs
(E) Answer not known

10. Permissible limit of BOD in discharge of effluent into inland surface water is

(A) 30 mg/L
(B) 250 mg/L
(C) 150 mg/L
(D) 100 mg/L
(E) Answer not known

11. In the chemical process industries, the term BOD is normally associated with the

(A) Characterisation of solid wastes
(B) Organic concentration in Gaseous effluents
(C) Characterisation of liquid effluent
(D) Characterisation of Hazardous waste
(E) Answer not known

12. Identify the most common and economic method of solid waste disposal in India

(A) Composting
(B) Sanitary Land filling
(C) Activated sludge process
(D) Trickling filters
(E) Answer not known

13. Identify the gas cleaning devices that utilize the centrifugal force created by a spinning gas stream to separate particles from a gas

(A) Electrostatic precipitators
(B) Fabric filters
(C) Cyclone separators
(D) Settling chambers
(E) Answer not known

14. A crippling deformity called _____ disease due to consumption of fish from _____ contaminated areas.

(A) Fluorosis, mercury
(B) Tai-tai, mercury
(C) Minameta, cadmium
(D) Minameta, mercury
(E) Answer not known

15. For an aquifier of sand, having characteristics are porosity. 34% specific yield 25% volume of water 0.68 m^3 stored in a saturated column with cross sectional area equal to 1.0 m^3 and a depth 2.0 m. How much water could be extracted from that volume?

(A) 0.5 m^3
(B) 0.4 m^3
(C) 0.6 m^3
(D) 0.68 m^3
(E) Answer not known

16. Match the following material that gives an idea about visual observation of the colour and luster of material.

(a)	Mildsteel	1.	is a silvery white metal
(b)	Cast iron	2.	has a distinctive brownish red colour
(c)	Copper	3.	has a smooth scale with blue/black sheen
(d)	Aluminium	4.	grey and sandy, on rubbing a finger gets blackens

	(a)	(b)	(c)	(d)
(A)	3	4	2	1
(B)	1	4	3	2
(C)	4	3	1	2
(D)	4	1	3	2

(E) Answer not known

17. Wrought iron is a suitable material of construction for handling

(A) Dilute acidic
(B) Concentrated acidic
(C) Alkalis and Alkaline
(D) None of these
(E) Answer not known

18. The key to good oxidation resistance of an oxide film is

(A) Low electrical conductivity
(B) Low electrical resistivity
(C) High electrical conductivity
(D) High electrical resistivity
(E) Answer not known

19. In solids which atoms, ions or molecules have random, non-repetitive three dimensional arrangements are termed as

(A) Crystal
(B) Glasses
(C) Alloys
(D) Amalgams
(E) Answer not known

20. A grid of parallel metal bars set in an increased stationary frame is

(A) Gyratory screens
(B) Vibrating screens
(C) Grizzles
(D) Ideal screen
(E) Answer not known

21. Mesh indicates the number of holes per

(A) Square inch
(B) Linear inch
(C) Square foot
(D) Linear foot
(E) Answer not known

22. The energy required per unit mass to grind gypsum particles of very large size to 100 μm is 12.7 kWh/ton. An estimate (using Bond's law) of the energy to grind the particles from a very large size to 50 μm is

(A) 6.35 kWh/ton
(B) 18 kWh/ton
(C) 25.4 kWh/ton
(D) 9.0 kWh/ton
(E) Answer not known

23. The main raw material for the manufacture of caprolactam is

(A) Hexane
(B) Benzene
(C) Methane
(D) Naphthalene
(E) Answer not known

24. Match the following examples

(a)	Anodic inhibitors	1.	Magnesium salts
(b)	Cathodic inhibitors	2.	Mercaptans
(c)	Inorganic inhibitors	3.	Phosphates
(d)	Organic inhibitors	4.	Silicates and hydroxides

	(a)	(b)	(c)	(d)
(A)	3	1	4	2
(B)	4	3	1	2
(C)	1	2	3	4
(D)	4	3	2	1

(E) Answer not known

25. Which type of corrosion is avoided either by reducing carbon to a low value or by the addition of titanium or columbium?

(A) Pitting corrosion
(B) Crevice corrosion
(C) Intergranular corrosion
(D) Cavitation corrosion
(E) Answer not known

26. By Alloying, corrosion can be greatly decreased by

(I) Increase in Homogeneity of the metal

(II) Oxides films are formed on the surface of metals

(A) Statement I only true
(B) Statement II only true
(C) Statement I and II true
(D) Statement I and II false
(E) Answer not known

27. A suitable material for audio and TV transformers is

(A) Nickel – Zinc ferrite
(B) Fe – 4% Si
(C) Fe – 30% Ni
(D) Very pure Fe
(E) Answer not known

28. The carbon nanotubes are formed in the range of _____ in diameter.

(A) 0.1 to 1 nm
(B) 1 to 2 nm
(C) 2 to 10 nm
(D) 10 to 20 nm
(E) Answer not known

29. The Nano size range is

(A) 10 Å
(B) 100 Å
(C) 1 Å
(D) 1000 Å
(E) Answer not known

30. The capacity of a belt conveyor depends upon

(A) Rotational speed of the screw
(B) Degree of troughing
(C) Double pitch of its diameter
(D) Intermediate bearings supported on the bridges
(E) Answer not known

31. An alum and copperas are used as a coagulant in filtration and sedimentation namely

(A) Aluminium sulphate and ferrous sulphate

(B) Filter alum and aspetus oxide

(C) Aluminium Sulphate and copper sulphate

(D) Alum oxide and bismuth sulphate

(E) Answer not known

32. For a Newton's law region, the value of the drag coefficient will be

(A) 0.44

(B) 0.1

(C) $24/N_{RC}$

(D) $\frac{24}{N_{RC}} + 0.44$

(E) Answer not known

33. The angle between the two hollow cylindrical shells of the V-Blender is

(A) 30 – 45°

(B) 45 – 60°

(C) 60 – 75°

(D) 70 – 90°

(E) Answer not known

34. Sorting classifier uses a sink and float method to separate particles of differing densities. The separation

(A) Depends on the particle size

(B) Depends on the difference in the terminal velocities

(C) Depends on the difference in the densities of the particle

(D) Depends on the centrifugal force

(E) Answer not known

35. The size of dust particles that can be effectively handled in cyclones varies from

(A) 10 to 50 microns
(B) 5 to 10 microns
(C) 50 to 100 microns
(D) 100 to 200 microns
(E) Answer not known

36. Two vectors in an inner product space are said to be orthogonal if their inner product is

(A) Three
(B) Two
(C) Zero
(D) One
(E) Answer not known

37. If $A = \begin{bmatrix} 0 & 1 & 2 \\ 1 & 2 & 3 \\ 2 & 3 & 4 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 3 \\ 2 & 4 \\ 3 & 5 \end{bmatrix}$ the product of BA is

(A) 2×3 Matrix
(B) 3×2 Matrix
(C) 3×3 Matrix
(D) Not defined
(E) Answer not known

38. Evaluate 3A – 4B, where $A = \begin{bmatrix} 3 & -4 & 6 \\ 5 & 1 & 7 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 0 & 1 \\ 2 & 0 & 3 \end{bmatrix}$

(A) $\begin{bmatrix} 5 & -12 & 14 \\ 7 & 3 & 9 \end{bmatrix}$
(B) $\begin{bmatrix} -12 & 14 & 5 \\ 3 & 9 & 7 \end{bmatrix}$
(C) $\begin{bmatrix} 14 & 5 & -12 \\ 9 & 7 & 3 \end{bmatrix}$
(D) $\begin{bmatrix} 5 & 14 & -12 \\ 7 & 9 & 3 \end{bmatrix}$
(E) Answer not known

39. _____ are the vectors (non-zero) that do not change the direction when any linear transformation.

(A) Eigen vector
(B) Rectangular vector
(C) Square vector
(D) Equal vector
(E) Answer not known

40. The solution of the differential equation $\frac{dy}{dx} = e^{3x-2y}$ is

(A) $\ln(3x - 2y) = C$
(B) $\frac{e^{3x-2y}}{6} = C$
(C) $\frac{e^{2y}}{2} = \frac{e^{3x}}{3} + C$
(D) $2\,e^{2y} = 3\,e^{3x} + C$
(E) Answer not known

41. The relationship between two variables x and y is linear and the form of equation

(A) $y = ax + b$
(B) $y = e^{-ax}$
(C) $\log y = a \log x + b$
(D) $\ln y = a \log x$
(E) Answer not known

42. $y = \frac{x}{ax + b}$ in linear form as $Y = a + bX$ where

Y = _____

X = _____

(A) $X = \frac{1}{x}, Y = \frac{1}{y}$

(B) $X = \frac{1}{x^2}, Y = \frac{1}{y^2}$

(C) $X = x, Y = y$

(D) $X = \frac{x}{1 - x}$, $Y = \frac{y}{1 - y}$

(E) Answer not known

43. The gas equation $pv^{\gamma} = k$ can be reduced to $y = a + bx$ where

a = _____

b = _____

(A) $a = \frac{1}{\gamma} \log k, b = -\frac{1}{\gamma}$

(B) $a = \frac{1}{\gamma} \log k,\ b = \frac{1}{\gamma}$

(C) $a = \gamma \log k,\ b = \gamma$

(D) $a = -\gamma \log k,\ b = \gamma$

(E) Answer not known

44. _____ method is the best method of finding approximate values of both rational and irrational roots of a numerical equation.

(A) Horner's method

(B) Bisection method

(C) Rational method

(D) Irrational method

(E) Answer not known

45. A differential equation is said to be linear if the dependent variable and its differential coefficients occur only in the _____ and not multiplied together.

(A) First degree
(B) Second degree
(C) Third degree
(D) None of the above
(E) Answer not known

46. The convergence of Gauss-Seidal method is _____ than that in Jacobi's method.

(A) More fast
(B) More slow
(C) Slow
(D) Equal
(E) Answer not known

47. Which of the following equations is parabolic?

(A) $f_{xy} - f_x = 0$
(B) $f_{xx} + 2f_{xy} + f_{yy} = 0$
(C) $f_{xx} + 2f_{xy} + 4f_{yy} = 0$
(D) $f_{xx} + 3f_{xy} + 2f_{yy} = 0$
(E) Answer not known

48. The inverse of Matrix A is written as A^{-1}. The formula for A^{-1} is

(A) $A^{-1} = Adj\ A \times |A|$
(B) $A^{-1} = \frac{Adj\ A}{|A|}$
(C) $A^{-1} = \frac{|A|}{Adj\ A}$
(D) None of the above
(E) Answer not known

49. Find the inverse of $A = \begin{bmatrix} 1 & 1 & 3 \\ 1 & 3 & -3 \\ -2 & 4 & -4 \end{bmatrix}$

(A) $\begin{bmatrix} -24 & -8 & -12 \\ 10 & 2 & 6 \\ -2 & -2 & -2 \end{bmatrix}$

(B) $\begin{bmatrix} 24 & 8 & 12 \\ 10 & 2 & 6 \\ -2 & -2 & -2 \end{bmatrix}$

(C) $\begin{bmatrix} 24 & 8 & 12 \\ -10 & -2 & -6 \\ 2 & 2 & 2 \end{bmatrix}$

(D) $\begin{bmatrix} -24 & -8 & -12 \\ 10 & 2 & 6 \\ 2 & 2 & 2 \end{bmatrix}$

(E) Answer not known

50. The sum of the diagonal elements of a square matrix is called

(A) Non-singular matrix
(B) Singular matrix
(C) Rank of matrix
(D) Trace of matrix
(E) Answer not known

51. The relationship between hydrodynamic and thermal boundary layer at a given point along the flat plate depends on which of the dimensionless number.

(A) Schmidt number
(B) Grashoff number
(C) Reynolds number
(D) Prandtl number
(E) Answer not known

52. The Reynolds Analogy for tube flow states that Stanton number (st) is equal to the ($f \rightarrow$ friction factor)

(A) $\frac{f}{2}$ (B) $\frac{f}{4}$

(C) $\frac{f}{6}$ (D) $\frac{f}{8}$

(E) Answer not known

53. The expression for logarithmic mean temperature difference $\left(\overline{\Delta T}_L\right)$ is given by

(A) $\frac{\ln(\Delta T_2 - \Delta T_1)}{\Delta T_2 - \Delta T_1}$ (B) $\ln \Delta T_2 - \ln \Delta T_1$

(C) $\Delta T_2 - \Delta T_1$ (D) $\frac{\Delta T_2 - \Delta T_1}{\ln\left(\frac{\Delta T_2}{\Delta T_1}\right)}$

(E) Answer not known

54. Hot air at 80°C flows over a surface of area 0.2 m^2 at 60°C, the convection coefficient being 25 W/m^2K. The heat flow is

(A) 1000 W (B) 400 W

(C) 100 W (D) 200 W

(E) Answer not known

55. A square matrix 'A' is called an orthogonal matrix if

Where

A^{-1} = Inverse of A

A^{T} = Transpose of A

I = Identity matrix

(A) $A = A^{-1}$ (B) $A = A^{T}$

(C) $\frac{A}{A'} = I$ (D) $A \cdot A' = I$

(E) Answer not known

56. A counter current flow heat exchanger m_h = 3000 kg/hr, c_{ph} = 2,300 J/kg.c, m_c = 2400 kg/hr, c_{pc} = 4,180 J/kg.c. Find out R =

(A) 0.502 (B) 0.212

(C) 0.700 (D) 0.688

(E) Answer not known

57. Nusselt number (Nu) is

(A) hD/K (B) h/DK

(C) $K/\delta C_P$ (D) V/α

(E) Answer not known

58. 2-4 shell and tube heat exchanger means _____.

(A) 2 shell side pass and 4 tube side pass

(B) 4 shell side pass and 2 tube side pass

(C) 2 shell side pass and 2 tube side pass

(D) 4 shell side pass and 4 tube side pass

(E) Answer not known

59. Identify the correct statement for compact heat exchangers.

(A) the heat exchangers having large surface area per unit weight

(B) the heat exchanger having small surface area per unit weight

(C) the heat exchanger having large surface area per unit volume

(D) the heat exchanger having small surface area per unit volume

(E) Answer not known

60. Rate of heat flow through a thick walled cylinder is given by equation

(A) $Q = \dfrac{(2\pi L)K(T_1 - T_2)}{\ln(r_2/r_1)}$

(B) $Q = (2\pi L)K(T_2 - T_1)\ln(r_1/r_2)$

(C) $Q = (2\pi L)K(T_1 - T_2)(r_1 - r_2)$

(D) $Q = \dfrac{2\pi L \ln\left(\dfrac{r_2}{r_1}\right)}{K(T_1 - T_2)}$

(E) Answer not known

61. In natural convection, fluid movement is due to

(A) changes in fluid pressure produced by external work

(B) density differences which provide the body force required to move the fluid

(C) elastic forces

(D) surface tension forces

(E) Answer not known

62. Stefan-Boltzmann law is applicable for heat transfer by

(A) Conduction
(B) Convection
(C) Radiation
(D) Combined conduction and convection
(E) Answer not known

63. Choose the unit in SI system for the dirt flow or fouling factor in the given options

(A) W/m^2K
(B) Wm^2K^{-1}
(C) $\frac{WK}{m^2}$
(D) $\left(\frac{m^2K}{W}\right)$
(E) Answer not known

64. Which law states that, at temperature equilibrium, the ratio of the total radiating power of any body to its absorptivity depends only upon the temperature of the body?

(A) Planck's Law
(B) Kirchoff's Law
(C) Stefan Boltzmann Law
(D) Newton's Law
(E) Answer not known

65. Select the correct option that represent the compression ratio range of compressors.

(A) Compression ratio is below 2
(B) Compression ratio is around 1.2-1.6
(C) Compression ratio is 10 or more
(D) Compression ratio is around 1.8-1.9
(E) Answer not known

66. The maximum efficiency of reciprocating compressor is

(A) 80% to 85%
(B) 70% to 80%
(C) 85% to 90%
(D) 90% to 95%
(E) Answer not known

67. The empirical relation that can be used for estimating the function factor from the Reynolds number for turbulent flow is

(A) $f = 0.099/(N_{Re})^{2.15}.N_{Pr}$
(B) $f = \frac{0.078}{(N_{Re})^{0.25}}$
(C) $f = 0.127/(N_{Re})^{1.25}$
(D) $f = 0.927/(N_{Re})^{2.12}$
(E) Answer not known

68. Reynolds number is the ratio between

(A) Pressure to the inertia force
(B) Inertia force to the gravitational force
(C) Inertia force to the surface tension
(D) Inertia force to the viscous force
(E) Answer not known

69. The reciprocating pump is generally employed for

(A) Pressure system
(B) Pneumatic pressure system
(C) Hydrolytic
(D) Non-Hydrolytic
(E) Answer not known

70. Reynold's number is defined as the ratio of

(A) Inertia force/pressure force

(B) Inertia force/viscous force

(C) Viscous force/gravity force

(D) Inertia force/surface tension force

(E) Answer not known

71. Conservation of mass equation for a steady flow compressible fluid is represented by

where

ρ = density

A = Area

V = Velocity

(A) $\rho_1 A_1 = \rho_2 A_2$

(B) $A_1 V_1 = A_2 V_2$

(C) $\rho_1 A_1 / V_1 = \rho_2 A_2 / V_2$

(D) $\rho_1 A_1 V_1 = \rho_2 A_2 V_2$

(E) Answer not known

72. What is the CGS unit of viscosity?

(A) Pascal

(B) Dyne S/cm^2

(C) $Dyne^2\ S^2/cm^2$

(D) Poise

(E) Answer not known

73. Dynamic similarity is the

(A) Similarity of motion

(B) Similarity of length

(C) Similarity of forces

(D) Similarity of shape

(E) Answer not known

74. Relation between skin friction and wall shear is given by equation

(A) $h_{fs} = \frac{4D}{S\Delta L}\tau_w$

(B) $h_{fs} = \frac{4\tau_w}{SD}\Delta L$

(C) $h_{fs} = \frac{2\tau_w r_w}{S}\Delta L$

(D) $h_{fs} = \frac{3}{4}\frac{SD}{\tau_w}\Delta L$

(E) Answer not known

75. The Bernoulli's equation expresses the relationship between

(A) Static pressure . Potential energy

(B) Static pressure . Kinetic energy

(C) Vacuum pressure . Internal energy

(D) Vacuum pressure . Kinetic energy

(E) Answer not known

76. The two principal disturbances that are measured for feed forward control of a heat exchanger are

(A) Liquid composition and flow rate of feed water

(B) Liquid composition and liquid inlet temperature

(C) Liquid flow rate and liquid inlet temperature

(D) Liquid flow rate and liquid outlet temperature

(E) Answer not known

77. Which type of control is used to accelerate the response of a controlled process?

(A) Proportional

(B) Integral

(C) Derivative

(D) None of the above

(E) Answer not known

78. In a feedback controlled system the controller gets its input from the

(A) Load variable
(B) Manipulate variable
(C) Controlled variable
(D) Inferred variable
(E) Answer not known

79. A first order system with unity gain and time constant 'T' is subjected to a sinusoidal inputs of frequency $\omega = 1/T$. The amplitude ratio for this system is

(A) 1
(B) 0.5
(C) $1/\sqrt{2}$
(D) 0.25
(E) Answer not known

80. Select the temperature sensor which can be used to measure the high temperature of about 2500°C

(A) Thermo couple
(B) Resistance thermometer
(C) Optical pyrometer
(D) Bimetallic thermometer
(E) Answer not known

81. Select the pressure sensor which can be used to determine vacuum pressure.

(A) Bourdon gauge
(B) Pirani gauge
(C) Thermocouple
(D) Thermistor
(E) Answer not known

82. A 600 V voltmeter is specified to be accurate with in ±2% at full scale calculate the limiting error when the instrument is used to measure a voltage is 250 V.

(A) 6% (B) 4.8%

(C) 8% (D) 6.2%

(E) Answer not known

83. Select the temperature sensor which can be used to detect the temperature of the moving object.

(A) Thermocouple (B) Resistance thermometer

(C) Bimetallic thermometer (D) Radiation pyrometer

(E) Answer not known

84. In a closed loop system the measured value of the controlled variable is returned to a device is called as

(A) Controller referred (B) Comparator

(C) Final control element (D) Measuring element

(E) Answer not known

85. The breakeven point is obtained at intersection of

(A) Total revenue and total cost line

(B) Total cost and variable cost

(C) Variable cost and fixed cost line

(D) Fixed cost and total cost line

(E) Answer not known

86. A drier today costs Rs. 2,21,000. The estimated inflation rates are expected to be : Ist year = 3.5%, IInd year = 4.2%, IIIrd year = 4.7%. What is the cost of that drier 3 years hence?

(A) Rs. 2,54,900
(B) Rs. 2,94,500
(C) Rs. 2,49,000
(D) Rs. 2,49,500
(E) Answer not known

87. Utilities cost in the operation of chemical process plant comes under

(A) Plant overhead cost
(B) Fixed charges
(C) Direct production cost
(D) General expenses
(E) Answer not known

88. Demand for a utility in plant increases, the cost of unit

(A) Increase
(B) Remain same
(C) Decrease
(D) Can't predictable
(E) Answer not known

89. _____ method to be simple in theory and its not convenient from a practical point of view in non linear programming.

(A) Simplex method
(B) Barrier method
(C) Direct substitution method
(D) Newton method
(E) Answer not known

90. The term hysterisis is associated with

(A) On-Off Control
(B) P-I Control
(C) Feed Forward Control
(D) Ratio Control
(E) Answer not known

91. The time required for the response to first reach its ultimate value is

(A) Time Constant
(B) Response Time
(C) Rise Time
(D) Period of Oscillation
(E) Answer not known

92. The open loop transfer function of a unity feed back control system is $\frac{30}{S(S+1)(S+T)}$ where T is a variable parameter. The closed loop system will be stable, for all values of

(A) $T > 0$
(B) $0 < T < 3$
(C) $T > 5$
(D) $3 < T < 5$
(E) Answer not known

93. Which of the following is not a characteristics of open loop system?

(A) it is inaccurate
(B) it is economical
(C) it has small bandwidth
(D) it has feedback element
(E) Answer not known

94. If a gain margin is unity or less than 1, it indicates system will be

(A) Stable
(B) Unstable
(C) Step
(D) Sinusoidal
(E) Answer not known

95. Name the type of controller used to measure the disturbances variables and take corrective action before they upset the process.

(A) Feed forward
(B) Feed backward
(C) Cascade
(D) Ratio control
(E) Answer not known

96. A stray cattle on the rail track caused the derailment of goods train. Cattle is the cause, the owner of the cattle is

(A) Casual responsible
(B) Morally responsible
(C) Both moral and casual responsible
(D) Legally responsible
(E) Answer not known

97. Maximum period for which an under trial prisoner can be detained

(A) By public prosecutor
(B) By magistrate
(C) By public
(D) By public prosecutor and Nexon to be recorded in writing
(E) Answer not known

98. Identify the loyalty related to fulfill ones contractual duties to an employee.

(A) Agency loyalty
(B) Identification loyalty
(C) Misguided loyalty
(D) Attitude loyalty
(E) Answer not known

99. The Engineers acted as expert-witnesses are likely to abuse their position in the given manner is

(A) Non Hired Guns
(B) Money Bias
(C) No Ego Bias
(D) Non Sympathy Bias
(E) Answer not known

100. Value-Guided advocates are

(A) Honest and Independent
(B) Honest
(C) Independent
(D) All the above
(E) Answer not known

101. Conflict of interests state with

(A) Design Vs Operation
(B) Public safety Vs Loyalty to the company
(C) Maintenance Vs User manual
(D) Company Vs Administration
(E) Answer not known

102. Collective bargaining by engineers through professional society can play a great role in the promotion and establishment of principles and practices towards.

(A) Fair employment and exploitation
(B) Collective action be resorted
(C) Collective bargaining by engineer
(D) Assessment on unionism
(E) Answer not known

103. Expand NSPE.

(A) National Society of Professional Engineers
(B) National Scheme of Professional Engineers
(C) National Society of Professional Ethics
(D) National Scheme of Professional Ethics
(E) Answer not known

104. Procrastination is the

(A) Involvement
(B) Thief of time
(C) Commitment
(D) Experimentation
(E) Answer not known

105. Theory to explain about context-oriented and ethics of care and the study on men and women.

(A) Kohlberg's Theory
(B) Carol Gilligan's Theory
(C) Logical Theory
(D) Moral Theory
(E) Answer not known

106. Kohlberg's theory is based on the study on

(A) Men and Women
(B) Men
(C) Emotional
(D) Future Focus
(E) Answer not known

107. Name the source of values that is comprised of a set of traditions which guide the routine behaviour and decision-making of an individual.

(A) Culture
(B) Personal Factors
(C) Life experiences
(D) Religion
(E) Answer not known

108. Number of developments of human thought distinguished by Lawson Kohlberg is

(A) 2
(B) 1
(C) 3
(D) 4
(E) Answer not known

109. Ethical theories are useful in

(A) Mistakes will ensure success
(B) Justifying professional obligations and decisions
(C) Empowered by rules and laws
(D) Answerable for meeting specific obligations
(E) Answer not known

110. In which Kohlberg's stages of moral development do individuals follow ruler but are also willing to change them if they do not serve the common good?

(A) Punishment and obedience orientation
(B) Conventional level
(C) Social contract orientation
(D) Post-conventional level
(E) Answer not known

111. In ion exchange, electrically charged thin film composite layer is

(A) PP
(B) PS
(C) Polyester
(D) PVC
(E) Answer not known

112. Which technique is used for the dehydration of ethanol-water azeotrope?

(A) Microfiltration
(B) Electrodialysis
(C) Ultrafiltration
(D) Pervaporation
(E) Answer not known

113. Local mass transfer co-efficients can be measured with relative ease through,

(1) Sublimation
(2) Dissolution of solids
(3) Saturation of solids

(A) Only (1)
(B) Only (1) and (2)
(C) Only (2)
(D) Only (2) and (3)
(E) Answer not known

114. In super critical extraction solvent selection depends on the

(A) Feed mixture
(B) Separating component
(C) Temperature of feed
(D) Pressure of the feed
(E) Answer not known

115. In pervaporation with hollow-fiber modules of silicone rubber can be used for the removal

(A) VOCs
(B) VIC
(C) Halides
(D) Inorganic compounds
(E) Answer not known

116. Let f be the molal fraction of lt feed that in vapourized and withdrawn as vapour. Then lt $(1-f)$ is the

(A) Mole fraction of residue
(B) Molal fraction of vapour
(C) Molal fraction of feed
(D) Residue
(E) Answer not known

117. Membranes are fabricated into spiral wound or hollow fiber modules to achieve

(A) a high selectivity
(B) a high surface area per unit volume
(C) a high permeability
(D) a good mass transfer flux
(E) Answer not known

118. In real porous membranes, pores may not be cylindrical and straight and therefore cylindrical pores are replaced by a bundle of capillary tubes oriented at 45°C to the surface. This was modified by

(A) Ergun
(B) Kozeny-Carman
(C) Darcy
(D) Faraday
(E) Answer not known

119. The flux per unit membrane area depends on an effective diffusivity De, that is,

(A) Lower than the pore diffusivity
(B) Higher than the pore diffusivity
(C) Equal to the pore diffusivity
(D) Zero pore diffusivity
(E) Answer not known

120. At the liquid surface, the concentration of the dissolved gas in τ_{Aj} in equilibrium with the pressure of A in the gas,

(A) Since $\tau_{Aj} > \tau_{AD}$
(B) Since $\tau_{Aj} < \tau_{AD}$
(C) Since $\tau_{Aj} = \tau_{AD}$
(D) Since $\tau_{Aj} \neq \tau_{AD}$
(E) Answer not known

121. A method used for softening of water and the production of deionised or demineralised water is

(A) Ion exchange technique using batch method
(B) Ion exchange technique using column method
(C) Molecular adsorption method
(D) Molecular desorption method
(E) Answer not known

122. Many large-scale application of _____ use ion-selective membranes and a potential gradient to speed migration of ions through the membranes.

(A) Electrodialysis
(B) Ion exchanger
(C) Pervapouration
(D) Chromatography
(E) Answer not known

123. In Ion exchange technique the weak acid cation exchange resin is used for the TDS feed level

(A) 3000 mg/l
(B) > 3000 mg/l
(C) < 3000 mg/l
(D) Not affect the resin
(E) Answer not known

124. _____ technique is based on differences in affinities of the compounds in a mixture towards a suitable adsorbent.

(A) Ion exchange
(B) Chromatography
(C) Membrane
(D) Dialysis
(E) Answer not known

125. The experimental data for evaporation of several liquids in wetted wall towers are correlated in the form of

(A) $Sh = 0.23\ Re^{0.81}\ Pr^{0.33}$
(B) $Sh = 0.023\ Re^{0.33}\ Pr^{0.81}$
(C) $Sh = 0.023\ Re^{0.81}\ Se^{0.33}$
(D) $Sh = 0.023\ Re^{0.81}\ Se^{0.44}$
(E) Answer not known

126. Under steady-state condition, the Fick's first law of diffusion is given as, $J_A = -D_{AB}\frac{\partial C_A}{\partial Z}$. The unit of diffusion co-efficient (D_{AB}) is

(A) m/s^2
(B) m/s
(C) m^2/s
(D) kg/m^3
(E) Answer not known

127. Diffusivity of gases can be estimated using

(A) Donhaque equation
(B) Chapman Enskog equation
(C) Virial equation
(D) Stokes Einstein equation
(E) Answer not known

128. In interphase mass transfer operations, a group of stages interconnected so that various streams flow from one to the other is called

(A) Counter current
(B) Cocurrent
(C) Cascades
(D) Batch processes
(E) Answer not known

129. The product of Reynolds number and Schmit number is

(A) Peclet number
(B) Prantl number
(C) Nusselt number
(D) Sherwood number
(E) Answer not known

130. Rotary Dryer widely used for drying the

(1) Salt, sugar
(2) Granular and crystalline materials
(3) Liquid compounds

(A) Only (1)
(B) Only (2)
(C) Only (3)
(D) Only (1) and (2)
(E) Answer not known

131. In view of heat sensitivity of solids, co-current operation will be used. The outlet gas temperature is found from equation for adiabatic drying. Assume the number of transfer unit (N_t) is 1.5. The inlet wet-bulb temperature T_{wb} is 102°F. The inlet gas temperature, T_{hb} is 260°F. What is the outlet gas temperature?

(A) 137°F
(B) 130°F
(C) 132°F
(D) 170°F
(E) Answer not known

132. Which dryer is suitable for drying pharmaceutical products?

(A) Pan dryer
(B) Rotary dryer
(C) Infra red dryer
(D) Film drum dryer
(E) Answer not known

133. The relative Humidity is the ratio of the partial pressure of the vapour to the vapour pressure of the liquid at the

(A) Gas temperature
(B) Vapour temperature
(C) Gas pressure
(D) Vapour pressure
(E) Answer not known

134. Choose the right answer from the apparent adsorption of a given solute

(1) Depends upon the concentration of solute
(2) Depends upon it temperature
(3) Depends upon it solvent
(4) Types of adsorbent

(A) Only (1)
(B) Only (1) and (2)
(C) Only (1), (2), (3) and (4)
(D) Only (3) and (4)
(E) Answer not known

135. The economics of absorption in a counter current column, the driving force for mass transfer is Y – Y*, which is proportional to the vertical distance between the operating line and the _____ line.

(A) Equilibrium line
(B) Saturated line
(C) Adiabatic line
(D) Sensible line
(E) Answer not known

136. An emf of the order of mV is generated when two solutions of different hydrogen ion concentration are separated by a thin wall. This is the working principle of

(A) pH meter
(B) Polarimeter
(C) Chromatography
(D) Polarograph
(E) Answer not known

137. The differential form of the mole balance equation interms of catalyst weight for a packed-bed reactor is given by _____ for the reaction $2A \rightarrow B + C$. (second order reaction)

(A) $FAO = \frac{dW}{dX} = -r'_A$

(B) $FAO = \frac{dX}{dW} = -r'_A$

(C) $FAO = \frac{dW}{dX} = -r''_A$

(D) $FAO = \frac{dX}{dW} = -r''_A$

(E) Answer not known

138. The packed bed contractors use _____ size of solid particles.

(A) Large

(B) Small

(C) Fine

(D) Coarse

(E) Answer not known

139. As per Geldart classification, D type solids in bubbling fluidized bed reactor will behave as

(A) Cohesive

(B) Sand like

(C) Spoutable

(D) Aeratable

(E) Answer not known

140. Non-ideal flow patterns in process equipment, such as heat exchangers, packed columns and reactors, _____ the performance of the unit.

(A) rapidly increases

(B) lowers

(C) increases

(D) decreases and then increases

(E) Answer not known

141. The unit for space time and space velocity is

(A) time, $time^{-1}$ (B) $time^{-1}$, time

(C) time, time (D) $time^{-1}$, $time^{-1}$

(E) Answer not known

142. Which among the following statement is true for the dispersion coefficient (D) represents this spreading process. Thus

Option 1 : Large D means rapid spreading of the tracer curve.

Option 2 : D = O means slow spreading

(A) Option 1 only true (B) Option 2 only true

(C) Option 1 and 2 is true (D) Option 1 and 2 is false

(E) Answer not known

143. For slow catalyst decay, the idea of a temperature - time trajectory is to _____ the temperature in such a way that the rate of reaction remains constant.

(A) Increase (B) Decrease

(C) Rapidly decrease (D) Exponentially decrease

(E) Answer not known

144. Pore resistance effects from experiments relates the Wagner modulus (M_W) with thick modulus (M_T) and effectiveness factor as,

(A) $M_W = M_T^2 / \varepsilon$ (B) $M_W = M_T \varepsilon^2$

(C) $M_W = \varepsilon / M_T^2$ (D) $M_W = M_T^2 \varepsilon$

(E) Answer not known

145. Impurity in the feed may deposit on the catalyst and deactivate the surface is called as _____ deactivation.

(A) Parallel
(B) Side-by-side
(C) Series
(D) Independent
(E) Answer not known

146. The shell model of poisoning of catalyst pellet will occur in case of,

(A) No pore resistance
(B) Very low pore resistance
(C) Very strong pore resistance
(D) Medium pore resistance
(E) Answer not known

147. In a dispersion model, the vessel dispersion number $\frac{D}{uL} \to \infty$, the suitable flow is ;

(A) Plug flow
(B) Mixed flow
(C) Bubble flow
(D) Back mix flow
(E) Answer not known

148. A mechanism in which the reaction between an adsorbed molecule and a molecule in the gas phase occurs is called as

(A) Langmuir-Hinshelwood kinetics
(B) Single-site mechanism
(C) Eley-Rideal mechanism
(D) Dual-site mechanism
(E) Answer not known

149. As per transition theory, which one of the following reduces the energy barrier in a reaction path?

(A) Intermediates
(B) Products
(C) Catalyst
(D) Reactants
(E) Answer not known

150. The expression for effectiveness factor for a single cylindrical porous catalyst with first order reaction is

(A) $\frac{mL}{\cosh mL}$
(B) $\frac{mL}{\tanh mL}$
(C) $\frac{\tanh mL}{mL}$
(D) $\frac{mL}{\sinh mL}$
(E) Answer not known

151. Match the typical industrial reaction with their space times.

(a)	$C_2H_6 \rightarrow C_2H_4 + H_2$ (PFR)	1.	4.5 s
(b)	$C_6H_5CH_2CH_3 \rightarrow C_6H_5CH = CH_2 + H_2$(PBR)	2.	1 s
(c)	$CO + H_2O \rightarrow CO_2 + H_2$ (PBR)	3.	0.2 s
(d)	Catalytic cracking (PBR)	4.	1s < e < 400 s

	(a)	(b)	(c)	(d)
(A)	4	2	3	1
(B)	2	3	1	4
(C)	3	1	4	2
(D)	1	4	2	3

(E) Answer not known

152. The half life period of a first order reaction is given by (Where, K = rate constant)

(A) 1.5 K

(B) 2.5 K

(C) $\frac{0.693}{K}$

(D) 6.93 K

(E) Answer not known

153. For an irreversible consecutive unimolecular type first-order reactions in series, $A \xrightarrow{k_1} R \xrightarrow{k_2} S$ the time at which the maximum concentration of R occurs is given by

(A) $t_{max} = \frac{k_1 - k_2}{\ln (k_1 / k_2)}$

(B) $t_{max} = \frac{k_2 - k_1}{\ln (k_2 / k_1)}$

(C) $t_{max} = \frac{\ln (k_2 / k_1)}{k_2 - k_1}$

(D) $t_{max} = \frac{\ln (k_1 / k_2)}{k_1 - k_2}$

(E) Answer not known

154. Rate of chemical reaction is not influenced by the

(A) Catalyst

(B) Temperature

(C) Reactants concentration

(D) Number of molecules of reactants taking in the reaction

(E) Answer not known

155. Isothermal liquid phase irreversible first order reaction is carried out in a CSTR. The residence time is 5 min and the rate constant of the reaction is 2 min^{-1}. What is the conversion obtained in a CSTR?

(A) 65%

(B) 75%

(C) 80%

(D) 91%

(E) Answer not known

156. Hydrochloric acid is often used in industry for

(A) Fertilizer
(B) Cooling Industrial Machinery
(C) Steel pickling
(D) Making perfumes
(E) Answer not known

157. Triple superphosphate is manufactured reacting phosphate rock with

(A) CO_2
(B) H_2SO_4
(C) H_3PO_4
(D) HNO_3
(E) Answer not known

158. Sylvinite is a mixture of

(A) Sylvite and halide
(B) Quartz and halide
(C) Sylvite and Quartz
(D) Limestone and Quartz
(E) Answer not known

159. In which process of Ammonia production higher amount of conversion can be obtain?

(A) Claude dupoint process
(B) Casale
(C) Haber
(D) Kellogg
(E) Answer not known

160. The material used to give bluish - green coloration to glass is

(A) Nio
(B) F_eO
(C) $FeSo_4$
(D) CdS
(E) Answer not known

161. Which residue of petroleum refinery process is used as electrodes?

(A) Petroleum coke
(B) Ammonia
(C) Wax
(D) Fuel oil
(E) Answer not known

162. Ample supply of potassium in the soil helps in

(A) Development of stems and leaves
(B) Accelerating seeding
(C) To prevent disease
(D) Early stages of plant growth
(E) Answer not known

163. Which of the following drugs is made from vegetables?

(A) Insulin
(B) Quinine
(C) Aspirin
(D) ATS
(E) Answer not known

164. In the sulphate pulp process, the digester conditions are

(A) 120 – 130°C and 5 atm
(B) 120 – 130°C and 1 atm
(C) 75 – 80°C and 15 atm
(D) 175 – 180°C and 10 atm
(E) Answer not known

165. Hydrogenation of edible oils is carried out in the presence of finely divided

(A) Copper
(B) Nickel
(C) Iron
(D) Hydrogenation
(E) Answer not known

166. During evaporation of milk, solid content increases from 8.6% to

(A) 45%
(B) 65%
(C) 75%
(D) 85%
(E) Answer not known

167. Starch is a high polymer carbohydrate occurring in grains and roots in the form of granules of

(A) 1 – 25 μ size
(B) 3 – 100 μ size
(C) 125 – 150 μ size
(D) 50 – 100 μ size
(E) Answer not known

168. Formalin is

(A) 10% solution of HCHO
(B) 20% solution of HCHO
(C) 37% solution of HCHO
(D) 50% solution of HCHO
(E) Answer not known

169. Butadiene and styrene is used for the manufacture of

(A) Polypropylene
(B) SBR
(C) Polyethylene
(D) Synthetic rubber
(E) Answer not known

170. The reverse process of electrolysis is the essence of the _____ technology as, the chemical energy stored in hydrogen and oxygen have been combined to produce electricity.

(A) Dual cell
(B) Fuel cell
(C) Microbial cell
(D) Generator
(E) Answer not known

171. Fuel cells may be classified according to the temperature range in which medium temperature fuel cell operates at

(A) 25 – 100 °C
(B) 100 – 500 °C
(C) 500 – 1000 °C
(D) Above 1000 °C
(E) Answer not known

172. The relationship between velocity of wind (v) and power generation (p) is _____.

(A) $p \propto v^2$
(B) $p \propto v$
(C) $p \propto v^3$
(D) $p \propto \sqrt{v}$
(E) Answer not known

173. Which isotope of hydrogen is called as heavy hydrogen?

(A) Protium
(B) Deuterium
(C) Hydrogen
(D) All of the above
(E) Answer not known

174. Massive, Spinning formations of wind with multiple thunderstorms is called as

(A) Hurricanes
(B) Tornadoes
(C) Wind power
(D) Fluctuating nature
(E) Answer not known

175. Ratio of the power actually delivered by the rotor to the power of the wind in the rotor disc is known as

(A) The power coefficient
(B) The power number
(C) The power efficiency
(D) The power factor
(E) Answer not known

176. The UNIFAC method for predicting activity coefficients is based on

(A) UNIQUAC Equation
(B) Wilson Equation
(C) Margules Equation
(D) Van Laar Equation
(E) Answer not known

177. Activity coefficients are strong functions of _____ of solution

(A) Temperature
(B) Concentration
(C) Pressure
(D) Mole fraction
(E) Answer not known

178. The partial pressure of the species in the vapour phase is directly proportional to its liquid - phase mole fraction is states

(A) Henry's law

(B) Raoult's law

(C) Vandarwalls equation

(D) Ideal gas law

(E) Answer not known

179. The Helmholtz free energy (A) is given by

(A) A = U – TS

(B) A = H – TS

(C) A = G – PV

(D) A = H + TS

(E) Answer not known

180. Which one is used to remove gases or vapors from an evacuated space and compress them for discharge at a higher pressure?

(A) Diffuser

(B) Nozzle

(C) Ejectors

(D) Compressors

(E) Answer not known

181. The residual Gibb's energy dG^R is given by the expression

(A) $dG^R = RT\, d \ln f$

(B) $dG^R = RT\, d \ln p$

(C) $d\,G^R = RTd \ln (fp)$

(D) $dG^R = RT\, d \ln (f/p)$

(E) Answer not known

182. The ratio of actual velocity to sonic velocity of a gas is known as

(A) Reynold's number
(B) Mach number
(C) Sonic number
(D) Prandtl number
(E) Answer not known

183. The equation relating E, P, V and T which is true for all substances under all condition is given by $\left(\frac{\partial E}{\partial V}\right)_T = T\left(\frac{\partial P}{\partial T}\right)_H - P$. This is called

(A) Maxwell's equation
(B) Thermodynamic equation of state
(C) Equation of state
(D) Redlich - Kwong equation of state
(E) Answer not known

184. The mole fraction or the solubility of gas in the liquid is proportional to the partial pressure of the gas over the liquid as given by

$x_i = \frac{\overline{P_i}}{K_i}$, K_i is the

(A) Henry's law constant
(B) Ideal gas constant
(C) Gibbs free constant
(D) Gas constant
(E) Answer not known

185. The Gibbs – Duhem equation relates

(A) Partial molar properties of a mixture

(B) The Gibbs free energy to temperature

(C) Pressure and volume changes in an ideal gas

(D) Heat capacity and Enthalpy

(E) Answer not known

186. Isochoric process is

(A) $Q = \Delta H = \int C_P \, dT$

(B) $Q = \Delta U = \int C_V \, dT$

(C) $Q = \Delta A = \int C_A \, dT$

(D) $Q = \Delta G = \int C_G \, dT$

(E) Answer not known

187. The plot of ln K. Versus reciprocal of absolute temperature for chemical reactions will be

(A) Exponential

(B) Quadratic

(C) Linear

(D) Non Linear

(E) Answer not known

188. Which rule is applicable for real solutions? When the composition of a component approaches unity?

(A) Lewis Randall rule

(B) Henry's law

(C) Gibbs rule

(D) Phase rule

(E) Answer not known

189. Mathematical representation of first law of thermodynamics

(A) $dQ = dE - dW$ (B) $dE = dQ + dW$

(C) $dW = dQ + dE$ (D) $dQ = dE + dW$

(E) Answer not known

190. In most chemical reactions. An excess reactant is the

(A) one which is in excess amount over the stoichiometric requirement of the reactant

(B) one which decides the conversion of the reactions

(C) one which decides the rate of the reactions

(D) one which decides the efficiency of the reaction

(E) Answer not known

191. Yield is defined as

(A) $\frac{\text{moles of product formed} \times \text{stoichiometry factor}}{\text{moles of reactant consumed}}$

(B) $\frac{\text{moles of reactant consumed} \times \text{stoichiometry factor}}{\text{moles of product formed}}$

(C) stoichiometric factor × moles of reactant and product formed

(D) stoichiometric factor only

(E) Answer not known

192. Selectivity is defined as

(A) Sum of moles of desired and undesired product

(B) Ratio of desired and undesired product

(C) Moles of desired product only

(D) Moles of undesired product only

(E) Answer not known

193. The sublimation is known as

(A) Vapour is produced from solids
(B) Vapour is produced from liquids
(C) Solid-liquid reaction
(D) Solid-liquid thermal reaction
(E) Answer not known

194. The number of atoms present in 416.6 g barium chloride is

(A) 12.044
(B) 10.044×10^{23}
(C) 12.044×10^{23}
(D) 8.314
(E) Answer not known

195. The SI Unit of mass flow rate?

(A) kg/h
(B) kg/s^2
(C) m/s
(D) g/s^2
(E) Answer not known

196. A double effect evaporator concentrates a liquor containing 4% (by mass) caustic soda to produce a lye containing 25% solids (by mass). The amount of water evaporated per 100 kg of feed is

(A) 50 kg
(B) 25 kg
(C) 16 kg
(D) 84 kg
(E) Answer not known

197. A Grosvenor Humidity is expressed as

(A) $Y = \left(\overline{P}_A / P_t - \overline{P}_A\right)$

(B) $Y = \left(\overline{P}_A / P_t - \overline{P}_A\right) \times \left(\frac{M_A}{M_B}\right)$

(C) $Y = \left(P_A^\circ / P_t - P_A^\circ\right)$

(D) $Y = \left(P_A^\circ / P_t - P_A^\circ\right) \times \left(\frac{M_A}{M_B}\right)$

(E) Answer not known

Where,

$\overline{P}_A$ = Partial Pressures

P_A° = Vapour Pressure

P_t – Total Pressure

M_A & M_B – Molecular weights

198. The barometer reads 100 KPa. The vapor pressure of water at dew point is 2.0624 KPa. The molar humidity of air is

(A) $0.052 \frac{\text{K mol water pa Vapor}}{\text{kg mol of dry air}}$

(B) $0.12 \frac{\text{K mol water Vapor}}{\text{kg mol of dry air}}$

(C) $0.02 \frac{\text{Kg mol water Vapor}}{\text{Kg mol of dry air}}$

(D) $0.01 \frac{\text{Kg mol of water vapor}}{\text{Kg mol of dry air}}$

(E) Answer not known

199. The quantity of heat to be supplied to a substance to rise its temperature by one degree celcius is called

(A) Specific heat
(B) Heat Capacity
(C) Sensible heat
(D) Latent heat
(E) Answer not known

200. The quantity of material that does not change during particular operation is known as

(A) Trace material
(B) Reactive material
(C) Tie material
(D) Solute material
(E) Answer not known