2021
CHEMICAL ENGINEERING
(Degree Standard)

Duration : Three Hours]   [Total Marks : 300

Read the following instructions carefully before you begin to answer the questions.

IMPORTANT INSTRUCTIONS

1. You will be supplied with this question booklet 15 minutes prior to the commencement of the examination.

2. This question booklet contains **200** questions. Before answering the questions, you are requested to check whether all the questions are printed serially and ensure that there are no blank pages in the question booklet. **If any defect is noticed in the question booklet, it shall be reported to the invigilator within the first 10 minutes and get it replaced with a complete question booklet. If the defect is reported after the commencement of the examination, it will not be replaced.**

3. Answer **all** the questions. All the questions carry equal marks.

4. You must write your register number in the space provided on the top right side of this page. Do not write anything else on the question booklet.

5. An answer sheet will be supplied to you separately by the room invigilator to shade the answers. Instructions regarding filling of answers etc., which are to be followed mandatorily, are provided in the answer sheet and in the memorandum of admission (Hall Ticket).

6. You shall write and shade your question booklet number in the space provided on page one of the answer sheet with **BLACK INK BALL POINT PEN.** If you do not shade correctly or fail to shade the question booklet number, your answer sheet will be invalidated.

7. Each question comprises of five responses (answers) : i.e. (A), (B), (C), (D) and (E). You have to select ONLY ONE correct answer from (A) or (B) or (C) or (D) and shade the same in your answer sheet. If you feel that there are more than one correct answer, shade the one which you consider the best. **If you do not know the answer, you have to mandatorily shade (E).** In any case, choose ONLY ONE answer for each question. If you shade more than one answer for a question, it will be treated as a wrong answer even if one of the given answers happens to be correct.

8. You should not remove or tear off any sheet from this question booklet. You are not allowed to take this question booklet and the answer sheet out of the examination room during the time of the examination. After the examination, you must hand over your answer sheet to the invigilator. You are allowed to take the question booklet with you only after the examination is over.

9. **You should not make any marking in the question booklet except in the sheets before the last page of the question booklet, which can be used for rough work. This should be strictly adhered to.**

10. Failure to comply with any of the above instructions will render you liable for such action as the Commission may decide at their discretion.

1. In which of the following reaction equilibria, K_p and K_y will have the same value?

   (A) $N_2 + 3H_2 \rightleftharpoons 2NH_3$ ✓(B) $N_2 + O_2 \rightleftharpoons 2NO$

   (C) $2SO_2 + O_2 \rightleftharpoons 2SO_3$ (D) $2CO + O_2 \rightleftharpoons 2CO_2$

   (E) Answer not known

2. Degree of freedom at triple point will be

   (A) 3   (B) 2

   (C) 1   ✓(D) 0

   (E) Answer not known

3. Enthalpy 'H' is defined as

   (A) $H = F - TS$ (B) $H = F + TS$

   ✓(C) $H = U + PV$ (D) $H = U - PV$

   (E) Answer not known

   Where,

   H – enthalpy

   U – Internal energy

   P – Pressure

   V – Volume

   T – Temperature

   S – Entropy

   F – Force

4. The point at which an three phases (solid, liquid and gas) coenst is known as

   ✓(A) triple point   (B) freezing point

   (C) boiling point   (D) melting point

   (E) Answer not known

5. Hess's law of constant heat summation is based on conservation of mass. It deals with

   (A) Equilibrium constant   (B) reaction rate

   ✓(C) changes in heat of reaction   (D) heat of mixing

   (E) Answer not known

6.   For an ideal gas, the compressibility factor

     (A)   decreases with pressure raise   (B)   is unity at all temperature

     (C)   increases with pressure raise   (D)   zero

     (E)   Answer not known

7.   Newton's second law gives the relationship as

     (A)   Force = mass × acceleration

     (B)   Force = mass / acceleration

     (C)   Force = mass × volume

     (D)   Force = pressure / volume

     (E)   Answer not known

8.   What will be molecular weight of nitric acid (HNO_3)?

     (A)   43   (B)   53

     (C)   63   (D)   73

     (E)   Answer not known

9.   In the absence of experimental values, ――――――― may be used to calculate heat capacity of solids.

     (A)   Dulong and Petit law   (B)   Kopp's rule

     (C)   The Kistyakowsky equation   (D)   Trouton's rule

     (E)   Answer not known

10. Polyolefins Industries Limited at Bombay is a manufacturer of

     (A)   Polyesters   (B)   Polymeric oils

     (C)   High density polyethylene   (D)   Butadiene

     (E)   Answer not known

11. The softest material in Mho's scale (for measuring hardness) is

(A) Talc ✓   (B) Gypsum

(C) Rubber   (D) Graphite

(E) Answer not known

12. For the uniform indexing of both ferrous and non-ferrous alloys ——————— is used.

(A) Unified numbering system ✓   (B) Badegro numbering system

(C) Reynolds number   (D) ASTM standards

(E) Answer not known

13. Separation of solids from gases can be done by

(A) thickness   (B) centrifuge

(C) classifier   (D) cycloes separater ✓

(E) Answer not known

14. Choose the wrong statement of the following :

(A) Filters operate a vaccum on the upstream side ✓

(B) Filters operate a vaccum on the downstream side

(C) Filters operate with a pressure above atmospheric on the upstream side

(D) Filters operate with a pressure of atmospheric on the upstream side

(E) Answer not known

15. Cake resistance is

(A) important in the beginning of filtration

(B) decreased with the time of filtration

(C) independent of particle size and porosity

(D) dependent on particle size and porosity ✓

(E) Answer not known

16. In a standard agitated vessel, the typical proportion of liquid depth to tank diameter is

   (A) $\frac{1}{3}$ (B) $\frac{1}{2}$

   (C) 1 ✓   (D) 2

   (E) Answer not known

17. Tumbling Mills operate at ——————— percentage of the critical speed.

   (A) 5 – 15%   (B) 25 – 50%

   (C) 65 – 80% ✓   (D) 55 – 60%

   (E) Answer not known

18. Which one of the following is a Ultrafine grinder?

   (A) Roller mills

   (B) Tumbling mills

   (C) Hammer mills

   (D) Fluid energy mills ✓

   (E) Answer not known

19. The ratio of the area of openings in one screen to that of the openings in the next smaller screen for Taylor series is

   (A) 1.5   (B) 1

   (C) $\sqrt{2}$ (D) 2 ✓

   (E) Answer not known

20. Which of the following equipment is suitable for mixing pastes and plastic masses?

   (A) Agitated mills   (B) Jaw crusher

   (C) Pony mixer ✓   (D) Colloid mills

   (E) Answer not known

21. The expression $\sum_{i=1}^{n} x_i \overline{D}_{pi}$ represent

Where,

x_i = mass fraction in given increment

$\overline{D}_{pi}$ = average particle diameter

(A) ✓ mass mean diameter

(B) volume surface mean diameter

(C) arithmetic mean diameter

(D) volume mean diameter

(E) Answer not known

22. Ultra fine wet grinding is done in

(A) Jaw crusher

(B) Ball mill

(C) Gyratory crusher

(D) ✓ Agitated mill

(E) Answer not known

23. For mesophilic bacteria (30°C), the optimal digestion period is between ————— and ————— days.

(A) 0 and 4 days

(B) 5 and 10 days

(C) 12 and 15 days

(D) ✓ 20 and 30 days

(E) Answer not known

24. Which of the following fuel cells can with stand high temperature operation?

(A) ✓ Solid oxide fuel cells

(B) PEM fuel cells

(C) Alkaline fuel cells

(D) Molten carbon fuel cells

(E) Answer not known

25. The raw juice extracted from sugarcane contains

   (A) 11–15% sucrose by weight   (B) 75–80% sucrose by weight

   (C) 1.1–1.5% sucrose by weight   (D) 60–65% sucrose by weight

   (E) Answer not known

26. The hydrogenation of oils in the presence of nickel catalyst is a/an

   (A) Endothermic reaction

   (B) Exothermic reaction

   (C) Homogeneous reaction

   (D) Heterogeneous reaction

   (E) Answer not known

27. Fourdrinier machine is used in

   (A) Sugar industry   (B) Petroleum processing

   (C) Paper industry   (D) Glass industry

   (E) Answer not known

28. In the manufacturing of paper, sulphite pulping is carried out between pH

   (A) 0.5 and 1   (B) 1 and 1.5

   (C) 1.5 and 5   (D) 5 and 7

   (E) Answer not known

29. The ability to react with —————— enhanced the use of unsaturated acids as firm forming vehicles for paints.

   (A) Carbon   (B) Hydrogen

   (C) Oxygen   (D) Nitrogen

   (E) Answer not known

30. Soda ash is

 (A) $CaSO_4$ (B) NaOH

 (C) $Ca(OH)_2$ (D) ✓ Na_2CO_3

 (E) Answer not known

31. Sulphuric acid is sold in the form of oleum and is

 (A) SO_2 in water (B) ✓ SO_3 in H_2SO_4

 (C) SO_3 in water (D) SO_2 in H_2SO_4

 (E) Answer not known

32. Which among the following belongs to a category of continuous – indirect heat dryers?

 (A) ✓ Drum dryer (B) Screen – Conveyor dryer

 (C) Vacuum tray dryer (D) Rotary dryer

 (E) Answer not known

33. ——————— selectively adsorbs oxygen from air and is used for the production of nitrogen.

 (A) Lime (B) ✓ Carbon molecular sieve

 (C) Graphene (D) Silica gel

 (E) Answer not known

34. The unit of gas mass velocity used in absorption columns is

 (A) Kg/s (B) $(Kg.m)/s$

 (C) ✓ $Kg/(m^2.s)$ (D) $Kg/(m.s)$

 (E) Answer not known

35. What should generally be the minimum fractional density difference between the carrier and the solvent so that phase separation may not be very difficult?

(A) 1%   (B) 5% ✓

(C) 20%   (D) 25%

(E) Answer not known

36. For binary gas mixtures at low pressure diffusivity ——————— with increasing pressure and ——————— with increasing temperature.

(A) decreases, increases ✓   (B) increases, increases

(C) increases, decreases   (D) decreases, decreases

(E) Answer not known

37. Concentration of a solution consisting of a non volatile solute and a volatile solvent is known as

(A) Drying   (B) Distillation

(C) Boiliy   (D) Evaporation ✓

(E) Answer not known

38. Heat sensitive materials such as fruit juices can be concentrated in a ——————— evaporator.

(A) Long tube   (B) Falling film ✓

(C) High pressure   (D) Forced circulation

(E) Answer not known

39. The physical significance of Grashof number is

(A) $\dfrac{\text{Buoyancy forces} - \text{inertia forces}}{(\text{viscous forces})^2}$ (B) $\dfrac{\text{Buoyancy forces} \times \text{inertia forces}}{(\text{viscous forces})^2}$ ✓

(C) $\dfrac{\text{Buoyancy forces} \times \text{inertia forces}^2}{(\text{viscous forces})^2}$ (D) $\dfrac{\text{Buoyancy forces}^2 \times \text{inertia force}}{(\text{viscous forces})^2}$

(E) Answer not known

40. Kirchhoff's law states that

Where

W_1 and W_2 = Total radiating power of two bodies

α_1 and α_2 = Absorptivism of two objects

(A) ✓ $\dfrac{W_1}{\alpha_1} = \dfrac{W_2}{\alpha_2}$ (B) $\dfrac{W_1}{\alpha_2} = \dfrac{W_2}{\alpha_1}$

(C) $\dfrac{\alpha_1}{W_1} = \dfrac{\alpha_2}{W_2}$ (D) $\dfrac{\alpha_1}{W_2} = \dfrac{\alpha_2}{W_1}$

(E) Answer not known

41. The unit for thermal conductivity is

Where

w = Watt

m = meter

k = kelvin

(A) wm/k (B) $\dfrac{m}{wk}$

(C) $\dfrac{k}{wm}$ (D) ✓ $\dfrac{w}{mk}$

(E) Answer not known

42. Which of the following is correct with respect to thermal conductivity values

(A) Liquid > gas > solid (B) Gas > liquid > solid

(C) ✓ Solid > liquid > gas (D) Solid > gas > liquid

(E) Answer not known

43. Emissivity of the body is

(A) Same as the total emissive power to black body

(B) The total emissive power of black body minus the total emissive power of other bodies

(C) ✓ The ratio of total emissive power of a body to that of a black body

(D) The ratio of total emissive power of black body to that of other body

(E) Answer not known

44. Priming is needed in a ——————— pump.

   (A) Reciprocating   (B) Gear
   (C) Centrifugal   (D) Diaphragm
   (E) Answer not known

45. During isentropic expansion of a gas in a convergent – divergent, nozzle, The stagnation temperature ——————— in the conduit.

   (A) Increases   (B) Decreases
   (C) Does not change   (D) Zero
   (E) Answer not known

46. When a falling body has attained terminal velocity, the weight of the body is equal to

   (A) Drag force minus buoyant force
   (B) Buoyant force minus drag force
   (C) Drag force plus buoyant force
   (D) Pressure drag plus friction drag
   (E) Answer not known

47. Relationship between drag coefficient (C_D) and particle Reynolds number (Rep) is

   (A) $C_D = 24\,Rep$ (B) $C_D = 24\,Rep^{-1.0}$
   (C) $C_D = 24\,Rep^{0.5}$ (D) $C_D = 24\,Rep^{-0.5}$
   (E) Answer not known

48. When Reynolds Number $(N_{Re}) = 10^6$, the ratio of average velocity and maximum velocity is

   (A) 10   (B) 1.0
   (C) 0.87   (D) 0.5
   (E) Answer not known

49. Hagen – Poiseville Equation can be used for the experimental measurement of

   (A) Flow rate

   (B) Procedure

   (C) ✓ Viscosity

   (D) Velocity

   (E) Answer not known

50. The power law model for non-Newtonian fluids is given by

$$\tau = k\left(-\frac{dv}{dr}\right)^n$$

   What is the value of 'n' for dilatant fluids?

   (A) 0

   (B) 0.5

   (C) 1

   (D) ✓ Greater than 1

   (E) Answer not known

51. In thixotropic fluid viscosity ————— with time.

   (A) Increase

   (B) ✓ Decrease

   (C) No change

   (D) Increases and then decreases

   (E) Answer not known

52. The Effective Diffusivity (D_e) in catalytic Reaction is defined as
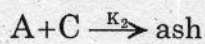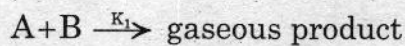
(A) ✓ $D_e = D_A . \phi_p \sigma / \tau$

(B) $D_e = \phi_p \sigma / D_A . \tau$

(C) $D_e = \tau \phi_p D_A / \sigma$

(D) $D_e = \tau D_A . \sigma / D_A \phi_p$

(E) Answer not known

53. Consider the following reactions between gas A and two solid sperical particles B and C of the same size

$A + B \xrightarrow{K_1}$ gaseous product

$A + C \xrightarrow{K_2}$ ash

The ash does not leave the particle C. Let t_1 and t_2 be the times required for A to completely consume particles B and C respectively. If k_1 and k_2 are equal at all temperatures and gas phase mass transfer resistance is negligible, then

(A) $t_1 = t_2$ at all temperatures

(B) $t_1 = t_2$ at high temperatures

(C) $t_1 > t_2$ at high temperatures

(D) ✓ $t_1 < t_2$ at high temperatures

(E) Answer not known

54. The loss of catalytic activity due to a loss of active surface area resulting from prolonged exposure to high gas temperature is called

(A) Promoter

(B) Poisioning

(C) Carrier

(D) ✓ Sintering

(E) Answer not known

55. If 'n' is the order of reaction, then unit of rate constant is

    ✓(A) $\dfrac{1}{(\text{time})(\text{Concentration})^{n-1}}$

    (B) $(\text{time})^{-1}(\text{Concentration})^{n-1}$

    (C) $(\text{time})^{n-1}(\text{Concentration})$

    (D) $(\text{time})(\text{Concentration})^{n-1}$

    (E)   Answer not known

56. For the reaction $P+2Q=3R$, molar rate of consumption of P is

    (A)   Double of that of Q

    (B)   Same as that of Q

    ✓(C)   Half of that of Q

    (D) $\frac{2}{3}$ of that of Q

    (E)   Answer not known

57. Consider the reaction $B+2D \rightarrow 3T$ and the rate equation $-r_B = K_B C_B C_D^2$, $-r_D = K_D C_B C_D^2$, $r_T = K_T C_B C_D^2$; pick up the correct statement

    ✓(A) $-r_B = -\dfrac{1}{2} r_D = \dfrac{1}{3} r_T$

    (B) $-K_B = -\dfrac{1}{2} K_D = \dfrac{1}{3} K_T$

    (C) $r_B = \dfrac{1}{2} r_D = \dfrac{1}{3} r_T$

    (D) $K_B = 3K_D = 2K_T$

    (E)   Answer not known

58. The reaction in which time rate equation corresponds to a stoichiometric equation is called ———————— reaction

    (A) ✔ Elementary   (B) Non-Elementary

    (C) Parallel   (D) Auto kinetic

    (E) Answer not known

59. "A control system is unstable if the open loop frequency response exhibits an amplitude ratio exceeding unity at the Cross-over frequency" this rule is called

    (A) Nyquist Criterion

    (B) Routh Stability Criterion

    (C) ✔ Bode Stability Criterion

    (D) Root LOCUS Criterion

    (E) Answer not known

60. The Bode stability criterion is applicable when

    (A) ✔ Gain and phase curves both decrease continuously with increase in frequency

    (B) Gain curve increases and phase curve decreases with increase in frequency

    (C) Gain and phase curves both increase with increase in frequency

    (D) Gain curve decreases and phase curve increases with increase in frequency

    (E) Answer not known

61. The Controller produces an output signal that is proportional to the Error is called as

    (A) PI – Controller   (B) ✔ P – Controller

    (C) PID – Controller   (D) PD – Controller

    (E) Answer not known

62. The expression $\exp\left(-\dfrac{\pi\zeta}{\sqrt{1-\zeta^2}}\right)$ represents,

Where ζ = damping coefficient.

(A) Response time   (B) Decay ratio

(C) Rise time   (D) Over shoot ✓

(E) Answer not known

63. The approach used for Linearization of nonlinear terms is

(A) Pade approximation   (B) Taylor-series expansion ✓

(C) Fourier series   (D) Laplace tranforms

(E) Answer not known

64. The initial value of the Unit step response of the transfer function $\dfrac{S+1}{2S+1}$ is

(A) 0   (B) $\frac{1}{2}$ ✓

(C) 1   (D) 2

(E) Answer not known

65. The nature of roots of under damped system is

(A) Real and Equal   (B) Complex ✓

(C) Real and unequal   (D) Cannot be determined

(E) Answer not known

66. The expression for oversheet is

where, ζ = damping coeffcient

(A) $\exp\left(-\pi\zeta/\sqrt{1-\zeta^2}\right)$ ✓   (B) $\exp\left(-\dfrac{\sqrt{1-\zeta^2}}{\pi\zeta}\right)$

(C) $\exp\left(\sqrt{1-\zeta^2}\right)$ (D) $\exp\left(\sqrt{1+\zeta^2}\right)$

(E) Answer not known

67. The effect that relates the absorption and evolution of heat at the junctions of a thermocouple to the current flow in the circuit is called as

   (A)   EMF Effect   (B)   Peltier Effect ✓

   (C)   Temperature Effect   (D)   Static Effect

   (E)   Answer not known

68. To measure limited range of flow rates of slurries and liquids with suspended materials, the most suitable type of flow meter is

   (A) ✓ Coriolis force type   (B)   Turbine type

   (C)   Calorimetric type   (D)   Nutating disc

   (E)   Answer not known

69. Calomel electrode is used for measuring

   (A)   Temperture   (B)   Pressure

   (C)   Velocity   (D) ✓ p^H

   (E)   Answer not known

70. All the four entries of 2×2 matrix $p = \begin{bmatrix} p_{11} & p_{12} \\ p_{21} & p_{22} \end{bmatrix}$ are non-zero, and one of its Eigen

   Value is zero, which of the following statement is true.

   (A) $p_{11} p_{22} - p_{12} p_{21} = 1$ (B) $p_{11} p_{22} - p_{12} p_{21} = -1$

   (C) ✓ $p_{11} p_{22} - p_{12} p_{21} = 0$ (D) $p_{11} p_{22} + p_{12} p_{21} = 0$

   (E)   Answer not known

71. If $A^2 = A$, then matrix 'A' is called

   (A) ✓ Idempotent matrix   (B)   Transpose matrix

   (C)   Conjugate matrix   (D)   Hermitian matrix

   (E)   Answer not known

72. The dimt of $f(x) = \dfrac{x}{\sin x}$ as $x \to 0$ is

   (A)   0   (B)   1 ✓

   (C)   2   (D) ∞

   (E)   Answer not known

73. The value of $(1+i)^8$, where $i = \sqrt{-1}$ is

   (A) $8 + 4i$ (B) $8 - 4i$

   (C)   16 ✓   (D)   8

   (E)   Answer not known

74. Selectivity in a super critical fluid are strong functions of

   (A)   Ion exchange

   (B)   Concentrations

   (C)   Osmosis

   (D)   Pressure ✓

   (E)   Answer not known

75. If the extraction temperature and pressure are only slightly above the critical point of the solvent, the operation is termed as

   (A)   Sublimation

   (B)   Leaching

   (C)   Supecritical fluid extraction ✓

   (D)   Gas permeation

   (E)   Answer not known

76. The term permeability is defied as

   (A) Permeability = Solubility × diffusivity ✓

   (B) Permeability = Solubility / diffusivity

   (C) Permeability = diffusivity / Solubility

   (D) Permeability = diffusivity / $(Solubility)^2$

   (E) Answer not known

77. Nanofiltration exhibits a molecular weight cut off (MWCO) in the range of

   (A) 10 – 90 Da

   (B) 100 – 5000 Da ✓

   (C) 6000 – 10,000 Da

   (D) 12,000 – 20,000 Da

   (E) Answer not known

78. Concentration polarization in Reverse Osmosis is

   (A) an ionic effect

   (B) higher concentration of solute at the bulk solution

   (C) higher solute concentration at permeate side

   (D) higher solute concentration of membrane surface ✓

   (E) Answer not known

79. The recovery of Caustic from hemi cellulose solutions in rayon manufacture uses the technique of

   (A) Dialysis ✓

   (B) Reverse Osmosis

   (C) Ultra filtration

   (D) Micro filtration

   (E) Answer not known

80. The problems associated with concentration polarization and fouling is overcome by ——————— filtration instead of conventional dead-end filtration

   (A) Ultra filtration

   (B) Cross flow ✓

   (C) Counter flow

   (D) Micro filtration

   (E) Answer not known

81. The way in which people interpret the environment or the way in which a person belives or understands a situation is

(A) Attitude   (B) Perception ✓

(C) Motivation   (D) Psycology

(E) Answer not known

82. In which year, the Flixborough chemical disaster occured?

(A) 1959   (B) 1974 ✓

(C) 1963   (D) 1982

(E) Answer not known

83. A chemical (or) physical condtion that has the potential to cause damage to people, property, environment is termed as

(A) Safety   (B) Prevention

(C) Hazard ✓   (D) Risk

(E) Answer not known

84. In which year, was the OSHA Act introduced?

(A) 1949   (B) 1962

(C) 1970 ✓   (D) 1968

(E) Answer not known

85. The generation and use of the hydroxyl free radical to destroy compounds in the waste water treatment processes is called

(A) Chemical precipitation processes

(B) Tertiary treatment processes

(C) Ion exchange processes

(D) Advanced oxidation processes ✓

(E) Answer not known

86. What will be the dosage of Cl_2 for disinfection for effluent from untreated waste water?

    (A) ✓   6 – 25 mg/l   (B)   2 – 8 mg/l

    (C)   1 – 5 mg/l   (D)   2 – 6 mg/l

    (E)   Answer not known

87. What is the half life period of Radon ^{211}Rn ?

    (A)   10 hrs   (B) ✓   14.6 hrs

    (C)   8.3 hrs   (D)   20 hrs

    (E)   Answer not known

88. The percentage (volume) of Krypton constituent in the composition of unpolluted atmosphere is

    (A)   1.3 ppm   (B) ✓   1.0 ppm

    (C)   0.5 ppm   (D)   0.25 ppm

    (E)   Answer not known

89. The building up of concentration of toxic levels at successive levels of food chain is called as

    (A)   Bio accumulation   (B) ✓   Bio magnification

    (C)   Eutrophication   (D)   Contamination

    (E)   Answer not known

90. Which air pollutant is responsible for chlorosis in plants

    (A) ✓ SO_2 (B)   Ozone

    (C)   PAN   (D) NO_2

    (E)   Answer not known

91. Presence of soluble organics in polluted water causes

    (A)   undesirable plant growth   (B) ✓   depletion of oxygen

    (C)   fire hazards   (D)   explosion hazards

    (E)   Answer not known

92.

$f(x)$ represents
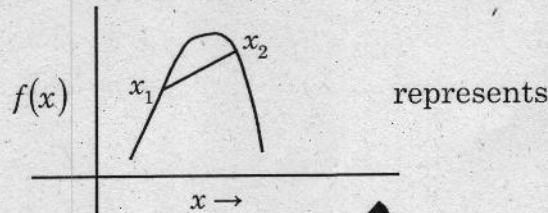
(A) Convex function   ✓ (B) Concave function
(C) Elliptical function   (D) Hyperbolic function
(E) Answer not known

93. For a concave objective function whose constraints form a convex set,
    ✓ (A) Local maximum = Global maximum
    (B) Local maximum < Global maximum
    (C) Local minimum < Global minimum
    (D) Local minimum = Global minimum
    (E) Answer not known

94. When Spatial variations are considered, then the model is
    (A) Steady state   (B) Unsteady state
    (C) Lumped parameter   ✓ (D) Distributed parameter
    (E) Answer not known

95. The function $f(x) = 6x^2 - 4x$ has
    (A) maximum at $x = -\frac{1}{3}$ (B) maximum at $x = \frac{1}{3}$
    (C) minimum at $x = -\frac{1}{3}$ ✓ (D) minimum at $x = \frac{1}{3}$
    (E) Answer not known

96. A well mixed CSTR without any concentration and temperature gradient is an example of
    ✓ (A) Lumped Parameter Model   (B) Distributed Parameter Model
    (C) Stochastic Model   (D) Discrete Model
    (E) Answer not known

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97. Which among the following equations is not related to activity coefficient?
   (A) Lewis-Randall ✓
   (B) Wohl's
   (C) Margules
   (D) Wilson
   (E) Answer not known

98. Activity coefficient is a measure of
   (A) departure from ideal solution behaviour ✓
   (B) departure of gas phase from ideal gas law
   (C) vapour pressure of liquid
   (D) partial pressure of gas
   (E) Answer not known

99. Choose the incorrect equation for Differential equation for Entropy
   (A) $ds = \dfrac{C_p}{T}dT - \left(\dfrac{\partial V}{\partial T}\right)_p dP$

   (B) $ds = \dfrac{C_v}{T}dT + \left(\dfrac{\partial p}{\partial T}\right)_v dV$

   (C) $ds = \dfrac{C_v}{T}dT - \dfrac{(\partial V/\partial T)_p}{(\partial V/\partial p)_T}dV$

   (D) $ds = \dfrac{C_p}{T}dT - \dfrac{(\partial V/\partial T)_p}{(\partial p/\partial V)_T}$ ✓

   (E) Answer not known

100. For a steady – state, steady – flow process between one entrance and one exit, the mathematical expression of first law of thermodynamics is given by
   (A) $\Delta H + \dfrac{\Delta U^2}{2} + g\Delta z = Q + W_S$ ✓

   (B) $\Delta H = Q$

   (C) $\dfrac{\Delta U^2}{2} = Q/W_S$

   (D) $\Delta H + g\Delta z = W_S$

   (E) Answer not known

101. For the hydrogenation of Acetylene to ethylene at a given temperature and pressure the required reaction is obtained by adding the following two reactions.

   $C_2H_2 \rightarrow 2C + H_2$ —— (1)

   $2C + 2H_2 \rightarrow C_2H_4$ —— (2)
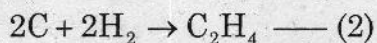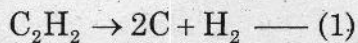
   If K_1 and K_2 are the equilibrium constants for the reaction (1) and (2) respectively, the equilibrium constant for the hydrogenation of acetylene to ethylene is
   (A) K_1/K_2
   (B) K_2/K_1
   (C) $K_1 + K_2$
   (D) $K_1 K_2$ ✓
   (E) Answer not known

102. In a textile mill, a double effect evaporator system concentrates weak liquor containing 4% by mass caustic soda to produce lye containing 25% solids by mass. The water evaporated per 100 kg feed is

(A) 90 kg

(B) 84 kg ✓

(C) 72 kg

(D) 75 kg

(E) Answer not known

103. A "Limiting reactant" is the one, which decides the —————— in the chemical reaction.

(A) Equilibrium constant

(B) Conversion ✓

(C) Rate constant

(D) Molecularity

(E) Answer not known

104. The molecular weight of ideal gas is 40. What will be volume occupied by 0.2 kg of this gas at standard Tempressure and Pressure (STP)?

(A) 22.4 Litres

(B) 22.4 m^3

(C) 112 litres ✓

(D) 4.48 m^3

(E) Answer not known

105. —————— is defined as the ratio of the actual absolute humidity to the saturation humidity.

(A) Relative humidity

(B) Percentage relative humidity

(C) Percentage humidity ✓

(D) Relative saturation

(E) Answer not known

106. Molality is defined as the number of gram moles of solute per —————— of solvent.

(A) Litre

(B) Kg ✓

(C) gm mole

(D) gm_8/cm^2

(E) Answer not known

107. Lyotropic liquid crystals are formed when compounds are treated with
    (A) Dipolar solvents
    (B) Polar solvents ✓
    (C) Non polar solvents
    (D) Aprotic solvents
    (E) Answer not known

108. Which one among the following belongs to structure-insensitive properties of metals?
    (A) Creep strength
    (B) Thermal conductivity
    (C) Electrical resistance
    (D) Thermal expansion coefficient ✓
    (E) Answer not known

109. 18/8 stainless steel means that it contains
    (A) 18% chromium and 8% molybednum
    (B) 18% nickel and 8% chromium
    (C) 18% nickel and 8% molybednum
    (D) 18% chromium and 8% nickel ✓
    (E) Answer not known

110. German silver is an alloy of
    (A) Copper, Nickel and Zinc ✓
    (B) Copper, Aluminium and Silver
    (C) Silver, Zinc and Aluminium
    (D) Silver, Nickel and Zinc
    (E) Answer not known

111. Babbitt metal (used for making bearing) comprises of
    (A) saw dust and iron dust mixture
    (B) mainly tin (85%) and lead ✓
    (C) zinc and aluminium
    (D) copper and nickel
    (E) Answer not known

112. The most common filter aid is

(A) diatomaceous earth ✓ (B) calcium silicate

(C) sodium carbonate (D) silica gel

(E) Answer not known

113. As settling continues, the moment when compression first evident is called

(A) differential settling (B) settling velocity

(C) critical point ✓ (D) sedimentation

(E) Answer not known

114. In constant-rate filtration,

(A) the pressure drop continuously decreases

(B) the pressure drop continuously increases ✓

(C) the flow rate continuously decreases

(D) the flow rate continuously increases

(E) Answer not known

115. Power number N_p in agitated vessel defined by,

(A) $N_p = \dfrac{p}{n^5 D_a^3 \rho}$ (B) $N_p = \dfrac{p}{n^3 D_a^5 \rho}$ ✓

(C) $N_p = \dfrac{p}{n^2 D_a^3 \rho}$ (D) $N_p = \dfrac{p}{n^3 D_a^2 \rho}$

(E) Answer not known

Where,

P – Power

D_a – Agitator diameter

ρ – Density

n – Speed

116. A propeller agitator

(A) produces axial flow ✓ (B) produces radial flow

(C) moves at a speed above critical speed (D) moves at a speed below critical speed

(E) Answer not known

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117. Rittinger's law states that the work required in crushing is proportional to

    (A)   the number of particles obtained

    (B)   the new surface created ✓

    (C)   the surface area of the feed particles

    (D)   the number of particles crushed

    (E)   Answer not known

118. In Blake jaw crusher, the angle between the jaws is usually

    (A) $5° - 10°$ (B) $15° - 19°$

    (C) $20° - 30°$ ✓   (D) $45° - 60°$

    (E)   Answer not known

119. The basic laws of crushing is used to calculate

    (A)   surface – volume ratio of product   (B)   sphericity of product

    (C)   average size of the product   (D)   power required for size reduction ✓

    (E)   Answer not known

120. Which of the following denotes the effect of compressibility in fluid flow

    (A)   Weber number   (B)   Mach number ✓

    (C)   Euler number   (D)   Reynolds number

    (E)   Answer not known

121. In size reduction crushing efficiency is the ratio of the

    (A)   surface energy created by crushing to the energy absorbed by the solid ✓

    (B)   energy absorbed by the solid to that fed to the machine

    (C)   energy fed to the machine to the surface energy created by crushing

    (D)   energy absorbed by the solid to the surface energy created by crushing

    (E)   Answer not known

122. Phosphoglycolate is a
    - (A) toxic compound ✓
    - (B) enzyme
    - (C) precursor
    - (D) photosensitive compound
    - (E) Answer not known

123. Which of the following is not an example of fuel cell?
    - (A) Hydrogen – Oxygen cell
    - (B) Methyl – Oxygen alcohol cell
    - (C) Propane – Oxygen cell
    - (D) Hexanone – Oxygen cell ✓
    - (E) Answer not known

124. The standard emf of the hydrogen – oxygen fuel cell is
    - (A) 1.23 V ✓
    - (B) 2.54 V
    - (C) 3.96 V
    - (D) 0.58 V
    - (E) Answer not known

125. The monomer from which neoprene produced is
    - (A) Propylene
    - (B) Ethylene
    - (C) Chloroprene ✓
    - (D) Styrene
    - (E) Answer not known

126. Crushed glass from imperfect articles, trim and other waste glasses is known as
    - (A) Feldspar
    - (B) Cullet ✓
    - (C) Borax
    - (D) Fluorspar
    - (E) Answer not known

127. Stabilizer used in paper manufacturing process is

    (A)   Zinc oxide   (B)   Potassium chloride

    (C)   Chlorine   ✓(D)   Sodium silicate

    (E)   Answer not known

128. Absolute alcohol contains

    ✓(A)   100% alcohol   (B)   95% alcohol

    (C)   96% alcohol   (D)   90% alcohol

    (E)   Answer not known

129. If a high proportion of H_2S is present in natural gas, it is called as

    (A)   Sweet gas   ✓(B)   Sour gas

    (C)   Wet gas   (D)   Residue gas

    (E)   Answer not known

130. Arsenic trioxide, a minor ingredient of glass manufacture, is added

    ✓(A)   To remove bubbles

    (B)   To facilitate the resistance to sudden temperature variation

    (C)   To lower the melting point of glass

    (D)   To add colour to the glass

    (E)   Answer not known

131. High alumina cement is manufactured by fusing

    (A)   Limestone and slaked lime

    (B)   Limestone and quick lime

    ✓(C)   Limestone and bauxite

    (D)   Limestone and sand

    (E)   Answer not known

132. In a gas absorption column, if the absorption factor is equal to 1 and the murphree efficiency is 0.7, what is the overall column efficiency?

(A) 0.58   (B) 0.46

(C) 0.7   (D) 0.9

(E) Answer not known

133. In continuous distillation, the slope of the food line is

Where q is the moles of liquid flow in the stripping section

(A) $q/(1-q)$ (B) $-q/(1-q)$

(C) $(1-q)/q$ (D) $-(1-q)/q$

(E) Answer not known

134. Which of the following relationship relates the mole fractions of components in liquid and vapor phases ——————— for flash distillation of binary mixtures.

Where

α — is relative volatility

x — is mole fraction in liquid

y — is mole fraction in vapor

(A) $y = \dfrac{x}{1+(\alpha-1)x}$ (B) $y = \dfrac{\alpha x}{1+(\alpha-1)x}$

(C) $y = \dfrac{x}{1-(\alpha-1)x}$ (D) $y = \dfrac{\alpha x}{1-(\alpha-1)x}$

(E) Answer not known

135. Flash distillation operation is suitable for separating components that

(A) Boils at very close temperature   (B) Boils at widely different temperature

(C) Forms minimum boiling azeotrope (D) Forms maximum boiling azeotrope

(E) Answer not known

136. The gas phase reaction $2A + B = C + D$ occurs on the surface of a catalyst pellet at steady state. What is the value of the flux ratio N_A/N_c

(A) -2 (B) -0.5

(C) 2   (D) 0.5

(E) Answer not known

137. The temperature difference on either side of a heat exchanger ΔT_1 and ΔT_2 are equal. So the effective ΔT value is equal to ΔT_1 (or) ΔT_2. What would be the value of *LMTD* in this case?

(A) $LMTD > \Delta T_1$ (B) $LMTD < \Delta T_2$

(C) $LMTD = \Delta T_1$ (D) 0

(E) Answer not known

138. In extended surfaces, ——————— of the tube is multiplied a extended by fins, disks etc.,

(A) Overall area   (B) Inside area

(C) Outside area   (D) Average area

(E) Answer not known

139. The point on the boiling curve where the heat flux is at the minimum and the surface is completely covered by a vapour blanket is called

(A) Nucleate point   (B) Boiling point

(C) Leidenfrost point   (D) Critical heat point

(E) Answer not known

140. "Maximum wave length of radiation is inversly proportional to the temperature" is ——————— law.

(A) Stefan–Boltzman law

(B) Planck's law

(C) Wien's displacement law

(D) Kirchhoff's law

(E) Answer not known

141. Unsteady state heat conduction occurs, when

(A) Temperature distribution is independent of time

(B) Temperature distribution is dependent on time

(C) Heat flows in one direction only

(D) Three dimensional heat flow

(E) Answer not known

142. If the monochromatic emissivity of a body is the same for all wave lengths, then it is called as

    (A)   Black body   (B)   White body

    (C)✓   Gray body   (D)   Red body

    (E)   Answer not known

143. Peclet number is the product of

    (A)✓   Reynolds number and Prandtl number

    (B)   Reynolds number and Nusselt number

    (C)   Grashoff number and Prandtl number

    (D)   Reynolds number and Grashof number

    (E)   Answer not known

144. Heat transfer from higher temperature to low temperature region takes place according to

    (A)✓   Fourier's law   (B)   Fick's law

    (C)   Newton's law of viscosity   (D)   Pascal's law

    (E)   Answer not known

145. The terminal settling velocity u_t varies with D_p in the Newton's law range is,

    (A)✓ $D_p^{0.5}$ (B) $D_p^{0.25}$

    (C) $D_p^{0.005}$ (D) $D_p^{1.0}$

    (E)   Answer not known

146. Which of the following is an area flow meter?

    (A)   Orifice meter   (B)   Venturi meter

    (C)   Pitot tube   (D)✓   Rotameter

    (E)   Answer not known

147. For a fully developed flow, relationship between transition length and Re for laminar flow is

Where

x_t = transition length

D = diameter of pipe

Re = Reynolds number

(A) $x_t/D = 0.5\,\text{Re}$ ✓(B) $x_t/D = 0.05\,\text{Re}$

(C) $x_t/D = 0.005\,\text{Re}$ (D) $x_t/D = \text{Re}$

(E) Answer not known

148. Terminal velocity is

✓(A) A constant velocity with no acceleration

(B) A fluctuating velocity

(C) Attained after moving one-half of the total distance

(D) Velocity of solid on the fluid

(E) Answer not known

149. Kinematic viscosity is defined as equal to

(A) Dynamic viscosity × density ✓(B) Dynamic viscosity / density

(C) Dynamic viscosity × pressure (D) Pressure × density

(E) Answer not known

150. Fully developed flow is

(A) Changing velocity distribution

✓(B) Un changing velocity distribution

(C) Changes in density

(D) No change in density

(E) Answer not known

151. In a gas-liquid reaction, if the resistance to reaction lies in bulk of liquid, then
————————— reactors need to be avoided.

(A) Tower type   (B) Spherical type

(C) Rectangular type   (D) Conical type

(E) Answer not known

152. Which of the following is a controlling factor in very fast heterogenous reaction?

(A) Heat and mass transfer effects (B) Pressure

(C) Density   (D) Composition of reactant

(E) Answer not known

153. Which of the following relationship is applicable for fluid-particle reaction, when diffusion through gas film is controlling?

Where t/τ is the fractional time

r_c is radius of unreacted core

R is radius of particle?

(A) $t/\tau = 1 - 3\left(\dfrac{r_c}{R}\right)^2 + 2\left(\dfrac{r_c}{R}\right)^3$

(B) $t/\tau = 1 - \left(\dfrac{r_c}{R}\right)^3$

(C) $t/\tau = 1 - \left(\dfrac{r_c}{R}\right)^{5/3}$

(D) $t/\tau = \left(\dfrac{r_c}{R}\right)^3 - 1$

(E) Answer not known

154. The constriction factor (σ) is a function of the ratio of maximum to minimum

(A) Pore volume

(B) Pore area ✓

(C) Temperature

(D) Void space

(E) Answer not known

155. The conversion X_A and residence time τ data are collected for zero order liquid phase reaction in a CSTR. Which of the following will be a Straight Line.

(A) X_A Vs τ ✓

(B) X_A Vs $\ln \tau$

(C) $\dfrac{X_A}{1-X_A}$ Vs τ

(D) $-\dfrac{X_A}{1+X_A}$ Vs τ

(E) Answer not known

156. When a plug flow reactor of two different size is connected in series (Bigger reactor first and smaller reactor Second) is modified as smaller reactor first and bigger reactor second. Then conversion of new arrangement X_{A2} compared with old arrangement X_{A1}

(A) $X_{A1} > X_{A2}$

(B) $X_{A1} < X_{A2}$

(C) $X_{A1} = X_{A2}$ ✓

(D) No comparision can be made

(E) Answer not known

157. For identical feed composition and flow rate, N mixed flow reactor in series of equal size with a total volume V gives the same conversion as a single ———————— for first order reactions.

(A) Plug flow reactor of volume V ✓

(B) CSTR of volume $\dfrac{N}{V}$

(C) Plug flow reactor of volume V/N

(D) Plug flow reactor of volume VN

(E) Answer not known

158. Space time equals the mean residence time

(A) When the density of the reaction mixture is constant ✓

(B) For large diameter tubular reactor

(C) For narrow diameter tubular reactor

(D) For CSTR

(E) Answer not known

159. The value of 'n' for a chemical reaction $A \rightarrow B$, whose reaction rate is $\alpha\ C_A^n$, will be
───────── if the rate of the reaction increases by a factor of 8 when the concentration of A is doubled.

(A)   0
(B)   1
(C)   2
(D) ✓ 3
(E)   Answer not known

160. The reaction $A \rightarrow B$ is conducted in an isothermal batch reactor. If the convertion of A increases Linearly with holding time, then the order of the reaction is

(A) ✓ 0
(B)   1
(C)   1.5
(D)   2
(E)   Answer not known

161. For the following reaction, the rate constant at 373 K is 0.5/min. 0.5 $A + B \rightarrow C$, the overall order of the reaction is

(A)   0.5
(B) ✓ 1.0
(C)   1.5
(D)   0
(E)   Answer not known

162. Consider the parallel decomposition of A of different orders

$A \rightarrow R$ $r_R = 1.0$

$A \rightarrow S$ (desired) $r_s = 2C_A$

$A \rightarrow T$ $r_T = C_A^2$
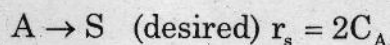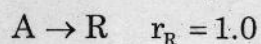
S is the desired product, the fractional yield in terms of 'S' is

(A) ✓ $\dfrac{2C_A}{\left(1+C_A\right)^2}$
(B) $2C_A\left(1+C_A\right)^2$

(C) $\dfrac{\left(1+C_A\right)^2}{2C_A}$
(D) $\dfrac{1}{2C_A}$

(E)   Answer not known

163. ───────── is the ratio of the number of moles of desired product formed per mole of undesired product formed.

(A)   Yield
(B) ✓ Selectivity
(C)   Conversion
(D)   Order
(E)   Answer not known

164. Bode diagram is the graph between

   (A) Amplitude ratio versus frequency

   (B) Phase angle versus frequency

   (C) Frequency Versus phase angle

   (D) ✓ Amplitude ratio, phase angle versus frequency

   (E) Answer not known

165. The value of phase angle for a PID controller with $\omega = 0$ is

   (A) $90°$ (B) ✓ $-90°$

   (C) $-180°$ (D) $180°$

   (E) Answer not known

166. 1 Decibels =

   where,

   AR = Amptitude ratio

   (A) $20\log_e(AR)$ (B) $20\log_{10}(AR)^{0.5}$

   (C) ✓ $20\log_{10}(AR)$ (D) $20\log_e(AR)^{0.5}$

   (E) Answer not known

167. Response of a Linear Control System for a change in set point is called

   (A) Frequency response   (B) Transient response

   (C) ✓ Servo problem   (D) Regulator problem

   (E) Answer not known

168. When the response of a second-order system for the damping ratio (ζ) of the system less than 1 is said to be

   (A) ✓ Under Damped System   (B) Damped System

   (C) Over Damped System   (D) Critically Damped System

   (E) Answer not known

169. Hydraulic radius is the ratio of

(A) Wetted perimeter to flow area

(B) Flow area to wetted perimeter ✓

(C) Flow area to square of wetted perimeter

(D) Square root of flow area to wetted perimeter

(E) Answer not known

170. Pick out the first order system from the following

(A) Damped vibrator

(B) Mercury manometer

(C) Mercury in glass thermometer ✓

(D) Two Tank in series

(E) Answer not known

171. Find $x(t)$ for the following ODE using Laplace transformation $\frac{dx}{dt}+3x=0; x(0)=2$.

(A) $2e^{3t}$

(B) e^{3t}

(C) $2e^{-3t}$ ✓

(D) e^{-3t}

(E) Answer not known

172. The temperature limits of the mercury filled pressure thermometer are about

(A) $-35°$ F to $1000°$ F ✓

(B) Less than $-35°$ F

(C) Greater than $4000°$ F

(D) Between $1500 - 3500°$ F

(E) Answer not known

173. Optical pyrometers are calibrated by focussing them on a standard ———— strip lamp whose temperature is known.

(A) Sodium

(B) Tungsten ✓

(C) Mercury

(D) Flourascent

(E) Answer not known

174. The type of error occured due to limitations of Physical measurement and human blunder is

(A) ✔ Data error   (B) Absolute error

(C) Relative error   (D) Round off error

(E) Answer not known

175. Which of the following will be termed as Neumann Boundary condition in heat transfer through retangular fin?

(A) $T(x=L)=T_\infty$ (B) $T(x=0)=T_b$

(C) ✔ $\left.\dfrac{dT}{dx}\right|_{x=L}=0$ (D) $-K\left.\dfrac{dT}{dx}\right|_{x=L}=h(T-T_\infty)$

(E) Answer not known

176. The rate of convergence in Newton Raphson method is of order

(A) 1   (B) ✔ 2

(C) 3   (D) 0

(E) Answer not known

177. The general equation to a non-homogenous linear first order ordinary differential equation will be

(A) $\dfrac{dy}{dx^2}+P(x)y=Q(y)$ (B) $\dfrac{d^2y}{dx}+P(y)x=Q(y)$

(C) $\dfrac{d^2y}{dx^2}+P(xy)=Q(xy)$ (D) ✔ $\dfrac{dy}{dx}+P(x)y=Q(x)$

(E) Answer not known

178. The system of Equations

$2x+4y=10$

$5x+10y=25$

(A) has no unique solutions   (B) has only one solution

(C) has only two solutions   (D) ✔ has infinite solutions

(E) Answer not known

179. Plate and Frame module has a high cost and a moderate Packing density, it finds use in all membrane applications except
   (A) Flash distillation
   (B) Crystalization
   (C) Pervaporation
   (D) Gas-Permeation ✓
   (E) Answer not known

180. The mean free path of the molecules is greater than the pore diameter, resulting in so-called
   (A) Knudsen diffusion ✓
   (B) Eddy diffusion
   (C) Passive diffusion
   (D) Facilitated diffusion
   (E) Answer not known

181. The ion exchanger consists of a water insoluble matrix to which charged groups have been ——————— kind of bound.
   (A) ionic
   (B) non-ionic
   (C) covalent ✓
   (D) mettalic
   (E) Answer not known

182. The technique used to treat the reject Salt Solution from a reverse Osmosis System is
   (A) Extraction
   (B) Leaching
   (C) Electro dialysis ✓
   (D) Adsorption
   (E) Answer not known

183. The Membranes, which have Pore Size of ———————, are used Primarily to filter bacteria and yeast and Provide Cell-Free Suspensions
   (A) $0°A – 50°A$
   (B) $50°A – 100°A$
   (C) $100°A – 200°A$
   (D) $200 – 1,00,000°A$ ✓
   (E) Answer not known

184. Flat sheet membranes for reverse osmosis are usually used in
   (A) tubular module
   (B) spiral wound module ✓
   (C) frame module
   (D) hollow module
   (E) Answer not known

[Turn over

185. The separation process in which a stream of super saturated solution is passed through a fluidized bed of growing crystals, within which supersaturation is released by nucleation and growth is

  (A) Circulating liquid Crystallisation ✓

  (B) Circulating magma Crystallisation

  (C) Evaporative Crystallisation

  (D) Forced Crystallisation

  (E) Answer not known

186. In melt Crystallization, two (or) more soluble species are separated by

  (A) Zone melting

  (B) Partial freezing ✓

  (C) Sublimation

  (D) Progressive freezing

  (E) Answer not known

187. In the Nalgonda technique for defluoridation, the chemicals used are

  (A) Activated alumina

  (B) Lime and alum ✓

  (C) Bone char

  (D) Sodium chloride

  (E) Answer not known

188. Chlorine has an odour threshold of —————— ppm (parts per million)

  (A) 0.01 ppm

  (B) 0.02 ppm

  (C) 0.05 ppm ✓

  (D) 0.5 ppm

  (E) Answer not known

189. Reaction Hazard Index is

  (A) $\dfrac{10\,T_d}{T_d + 30E_a}$ ✓

  (B) $\dfrac{10\,T_d}{T_d - 30E_a}$

  (C) $\dfrac{T_d}{T_a + 30E_a}$

  (D) $\dfrac{T_d}{T_a + E_a}$

  (E) Answer not known

190. In waste water treatment, which of the following process is used to control corrosion due to H_2S

(A) Anaerobic treatment
(B) Chemical neutralisation ✓
(C) Aerobic treatment
(D) Chemical precipitation
(E) Answer not known

191. Primary sedimentation tanks remove

(A) 50 – 70% of the suspended solids ✓
(B) 10 – 20% of the suspended solids
(C) 20 – 40% of the suspended solids
(D) 1 – 10% of the suspended solids
(E) Answer not known

192. The major advantage of anaerobic treatment of waste water is

(A) lower biomass yield ✓
(B) large nutrient requirement
(C) higher reactor volume required
(D) higher energy requirement
(E) Answer not known

193. The noise level at the Threshold of pain is

(A) 85 dB
(B) 140 dB ✓
(C) 90 dB
(D) 120 dB
(E) Answer not known

194. Excess nitrate present in drinking water causes

(A) Minamata disease
(B) Itai-Itai disease
(C) Blue baby syndrome ✓
(D) Fluorosis
(E) Answer not known

195. Dropping of leaves due to pollution is called as

(A) abscission ✓
(B) epinasty
(C) chlorosis
(D) necrosis
(E) Answer not known

196. The Simplest Device used for Sampling Particles greater than 10 μm in diameter is the
   (A) Dust fall collector
   (B) High volume filter
   (C) Electrostatic Precipitation
   (D) Absorption method
   (E) Answer not known

197. The Return On Investment (ROI) is defined by

   (A) $ROI = \dfrac{\text{Cumulative net profit}}{\text{Plant life} \times \text{initial investment}} \times 100$

   (B) $ROI = \dfrac{\text{Plant life} \times \text{Initial investment}}{\text{Cumulative net profit}} \times 100$

   (C) $ROI = \dfrac{\text{Plant life} - \text{Initial investment}}{\text{Cumulative net profit}} \times 100$

   (D) $ROI = \dfrac{\text{Cumulative net profit}}{\text{Plant life} + \text{Initial investment}} \times 100$

   (E) Answer not known

198. Bomb calorimeter is used to find ———————— property of the fuel.
   (A) Viscosity
   (B) Calorific value
   (C) Density
   (D) Latent heat
   (E) Answer not known

199. min $f(x)$

   Subject to $a_i \leq g_i(x) \leq b_i$, $i = 1,......m$

   and $l_j \leq x_j \leq U_j$; $J = 1,.... n$

   is the general form of
   (A) Linear Programming
   (B) Dynamic Programming
   (C) Non Linear Programming
   (D) Quadratic Programming
   (E) Answer not known

200. Pick out the property of Newton iterative method from the following:
   (A) First and Second derivate is not utilised
   (B) Quadratic convergence
   (C) Quadratic divergence
   (D) Polynomial function
   (E) Answer not known

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