

12 — CHEMICAL ENGINEERING

(Answer ALL questions)

56. Which one of the following is incombustible?
1. H_2
 2. CCl_4
 3. C_2H_2
 4. S
57. The softness or hardness of a grinding wheel depends upon the type and amount of bonding material used. For general purpose cutter, _____ grinding wheel is normally used.
1. hard
 2. soft
 3. silicon carbide
 4. aluminium oxide
58. Tin based white metals are used, where bearings are subjected to
1. high pressure and load
 2. low pressure and load
 3. high temperature
 4. large surface wear
59. Friction factor for fluid flow in pipe does not depend upon the
1. pipe length
 2. pipe roughness
 3. fluid density and viscosity
 4. mass flow rate of fluid
60. All of the following alloying elements of steel increases hardness but sacrifice ductility, except
1. nickel
 2. vanadium
 3. molybdenum
 4. chromium
61. In troposphere (the weather domain), the temperature 't' at height 'h' above the sea level in meters is given by (where, temperature at sea level is $15^\circ C$ and t is in $^\circ C$.)
1. $t = 15 - 0.0065 h$
 2. $t = 15 + 0.0065 h$
 3. $t = 0.0035 h - 15$
 4. $t = 15 - 0.0035 h$
62. A high pressure boiler generates steam at a pressure greater than _____ kg/cm^2
1. 10
 2. 30
 3. 50
 4. 80
63. Evaporative cooling process employs a combination of cooling and humidification in which the
1. sensible heat is added
 2. sensible heat is removed and the latent heat is added
 3. latent heat is removed
 4. sensible heat is added and latent heat is removed
64. Which of the following is not an explosive?
1. TNT
 2. CMC
 3. RDX
 4. Lead azide
65. Maxwell's thermodynamic relations applies to the
1. chemical systems in equilibrium
 2. mechanical systems in equilibrium
 3. irreversible thermodynamic processes
 4. reversible thermodynamic processes
66. When vaporization takes place directly at the heating surface, it is called
1. film boiling
 2. nucleate boiling
 3. vapour binding
 4. none of the above
67. Steam consumption in kg/hr in case of an evaporator is given by (where, C & E are capacity the economy of the evaporator respectively)
1. C/E
 2. E/C
 3. CE
 4. 1/CE

68. Reynold's analogy states that
1. $N_{st} \propto f$
 2. $N_{st} \propto N_{Re}$
 3. $N_{Nu} \propto f$
 4. $N_{Re} \propto f$
69. With increase in temperature, the thermal conductivity of non-metallic amorphous solids
1. decreases
 2. increases
 3. remains constant
 4. first decreases upto certain temperature and then increases
70. Fourier's law applies to the heat transfer by
1. convection
 2. radiation
 3. conduction
 4. all (1), (2) and (3)
71. The Grashoff number is defined as the ratio of the
1. buoyancy to inertial forces
 2. buoyancy to viscous forces
 3. inertial to viscous forces
 4. buoyancy to surface tension forces
72. According to Reynolds analogy, Stanton number is equal to (where, f = Fanning friction factor)
1. $2f$
 2. f
 3. $f/2$
 4. $f/4$
73. The absorptivity of a body is equal to its emissivity
1. at a particular temperature
 2. for circular bodies
 3. under thermal equilibrium
 4. none of these
74. Absorptivity and reflectivity of a perfect black body are respectively
1. 1 and 0
 2. 0 and 1
 3. 1 and ∞
 4. 0 and 0.5
75. In thermal radiation for a black body (where, ϵ is emissivity and α is absorptivity)
1. $\alpha = 1; \epsilon \neq 1$
 2. $\alpha \neq 1, \epsilon = 1$
 3. $\alpha \neq 1, \epsilon \neq 1$
 4. $\alpha = 1, \epsilon = 1$
76. Total reflux in a distillation operation requires minimum
1. reboiler load
 2. number of plates
 3. condenser load
 4. all (1), (2) and (3)
77. The amount of steam required per unit quantity of distillate in case of steam distillation will be reduced by
1. raising the temperature
 2. lowering the total pressure
 3. both (1) and (2)
 4. neither (1) nor (2)
78. The difference of wet bulb temperature and adiabatic saturation temperature of unsaturated mixture of any system is
1. +ve
 2. -ve
 3. zero
 4. none of these
79. Fenske's equation for determining the minimum number of theoretical stages in distillation column holds good, when the
1. relative volatility is reasonably constant
 2. mixture (to be separated) shows negative deviation from ideality
 3. mixture (to be separated) shows positive deviation from ideality
 4. multicomponent distillation is involved

80. When the temperature and humidity of air is low, we usually use _____ draft cooling tower:
1. natural
 2. forced
 3. induced
 4. none of these
81. Solvent extraction is the terminology applied to the liquid-liquid extraction, which is preferred for the separation of the components of liquids, when
1. extracting solvent is cheaply and abundantly available
 2. one of the liquid components is heat sensitive
 3. viscosity of liquid components is very high
 4. one of the liquid components has very high affinity towards the solvent
82. Inside the distillation column, the
1. driving force for the vapour flow is the pressure drop
 2. liquids are not always at their bubble points
 3. pressure increases gradually from bottom to the top of the column
 4. none of the above
83. Diffusivity in concentrated solutions differs from that in dilute solutions, because of the changes in
1. viscosity with concentration
 2. degree of ideality of the solution
 3. both (1) and (2)
 4. neither (1) nor (2)
84. Occurrence of 'case hardening' during drying of a high moisture solid cake _____ the drying rate.
1. increases
 2. decreases
 3. does not affect
 4. exponentially increases
85. Which of the following is not a continuous drier?
1. Drum drier
 2. Spray drier
 3. Tunnel drier
 4. Tray drier
86. If the overall efficiency and Murphree plate efficiency are equal, then both the equilibrium and operating lines are
1. straight
 2. parallel
 3. both (1) and (2)
 4. neither (1) nor (2)
87. Which of the following operations does not involve leaching?
1. Dissolving gold from ores
 2. Dissolving pharmaceutical products from bark or roots
 3. Dissolving sugar from the cells of the beet
 4. Removing nicotine from its water solution by kerosene
88. The recovery of penicillin from the acidified fermentation broth is done by
1. distillation
 2. evaporation
 3. absorption
 4. liquid extraction
89. Unit operation involved in the prilling of urea is
1. evaporation
 2. drying
 3. crystallisation
 4. both (2) and (3)
90. Molecular sieves are porous
1. alumina
 2. silica
 3. synthetic zeolite crystals/metal aluminosilicates
 4. none of the above
91. Maximum work that could be secured by expanding the gas over a given pressure range is the _____ work.
1. isothermal
 2. adiabatic
 3. isentropic
 4. none of the above

92. Internal energy change of a system over one complete cycle in a cyclic process is
1. zero
 2. +ve
 3. -ve
 4. dependent on the path
93. Heating of water under atmospheric pressure is an _____ process.
1. isochoric
 2. isobaric
 3. adiabatic
 4. isothermal
94. Van Laar equation deals with the activity co-efficient in
1. binary solutions
 2. ternary solutions
 3. azeotropic mixture only
 4. none of the above
95. High _____ is an undesirable property for a good refrigerant.
1. specific heat
 2. latent heat of vaporization
 3. viscosity
 4. specific vapor volume
96. The heat capacities for the ideal gas state depend upon the
1. pressure
 2. temperature
 3. both (1) and (2)
 4. neither (1) nor (2)
97. Which of the following will increase the volume of a real gas by four times?
1. Doubling the absolute temperature as well as pressure of the gas
 2. Reducing pressure to one fourth at constant temperature
 3. Reducing temperature to one fourth at constant pressure
 4. Reducing the temperature to half and doubling the pressure
98. Pick out the wrong statement.
1. A refrigeration cycle violates the second law of thermodynamics
 2. Refrigeration cycle is normally represented by a temperature vs. entropy plot
 3. In a refrigerator, work required decreases as the temperature of the refrigerator and the temperature at which heat is rejected increases
 4. One ton of refrigeration is equivalent to the rate of heat absorption equal to 3.53 kW
99. The equation, $PV = nRT$, is best obeyed by gases at
1. low pressure and high temperature
 2. high pressure and low temperature
 3. low pressure and low temperature
 4. none of the above
100. Internal energy of an element at 1 atm and 25°C is _____ kcal/kg.mole.
1. 0
 2. 273
 3. 25
 4. none of the above
101. Which of the following denotes the effect of compressibility in fluid flow?
1. Weber number
 2. Mach number
 3. Euler number
 4. Reynolds number
102. Nominal size of the discharge pipe of a pump is usually _____ the nominal size of the inlet pipe.
1. smaller than
 2. larger than
 3. same as
 4. twice
103. The terminal velocity of a small sphere settling in a viscous fluid varies as the
1. first power of its diameter
 2. inverse of the fluid viscosity
 3. inverse square of the diameter
 4. square of the difference in specific weights of solid and fluid

104. If the discharge of a centrifugal pump is throttled, then its suction lift
1. increases
 2. decreases
 3. remains unchanged
 4. data insufficient to predict
105. Foot valves provided in pumps are _____ valves.
1. relief
 2. three/four way
 3. pressure reducing
 4. directional control
106. What is the order of a chemical reaction, if the rate of formation of 'C', increases by a factor of 2.82 on doubling the concentration of 'A' and increases by a factor of 9 on trebling the concentration of 'B'?
1. $7/2$
 2. $7/4$
 3. $5/2$
 4. $5/4$
107. For high conversion in a highly exothermic solid catalyzed reaction, use a _____ bed reactor.
1. fixed
 2. fluidised bed reactor followed by a fixed
 3. fixed bed reactor followed by a fluidized
 4. fluidised
108. For every 10°C rise in temperature, the rate of chemical reaction doubles. When the temperature is increased from 30 to 70°C , the rate of reaction increases _____ times.
1. 8
 2. 12
 3. 16
 4. 32
109. The single parameter model proposed for describing non-ideal flow is the _____ model.
1. tank in series
 2. dispersion
 3. both (1) and (2)
 4. neither (1) nor (2)
110. A first order reaction requires two equal sized CSTR. The conversion is
1. less when they are connected in series
 2. more when they are connected in series
 3. more when they are connected in parallel
 4. same whether they are connected in series or in parallel
111. A non-linear chemical system is exemplified by a/an
1. isothermal CSTR
 2. mixer
 3. non-isothermal CSTR
 4. none of these
112. The transfer function for an ideal proportional plus reset controller (reset time T) is
1. $K_c \left(1 + \frac{1}{TS} \right)$
 2. $K_c (1 + TS)$
 3. $\frac{K_c}{1 + TS}$
 4. $\frac{K_c}{1 + \frac{S}{T}}$
113. The frequency response of a first order system, has a phase shift with lower and upper bounds given by
1. $-\infty, \pi/2$
 2. $-\pi/2, \pi/2$
 3. $-\pi/2, 0$
 4. $0, \pi/2$
114. Gas chromatography is used for the measurement of
1. temperature
 2. pressure
 3. concentration
 4. flow rate
115. Which of the following thermocouples can measure the maximum temperature?
1. Platinum-rhodium
 2. Tungsten-molybdenum
 3. Chromel-alumel
 4. Iron-constantan