Prepp

Practice, Learn and Achieve
Your Goal with Prepp

APPSC Exam

Previous Paper

Simplifying
Government Exams

SSC CHSL | IAS EXAM | RRB NTPC | NTSE | CDS
SSC CGL | CBSE UGC NET | IBPS PO | NDA
SBI PO | IBPS CLERK | AFCAT | SSC JE | CTET
CSIR UGC NET | CAPF | IBPS RRB

www.prepp.in

FOI/513

2009

CHEMICAL ENGINEERING

Time : 150 Minutes *Max. Marks : 300*

INSTRUCTIONS

1. Please check the Test Booklet and ensure that it contains all the questions. If you find any defect in the Test Booklet or Answer Sheet, please get it replaced immediately.

2. The Test Booklet contains **150** questions. Each question carries **two** marks.

3. Each question is followed by 4 answer choices. Of these, you have to select one correct answer and mark it on the Answer Sheet by darkening the appropriate circle for the question. If more than one circle is darkened, the answer will not be valued at all. Use HB pencil to make heavy black marks to fill the circle completely. Make **no** other stray marks.

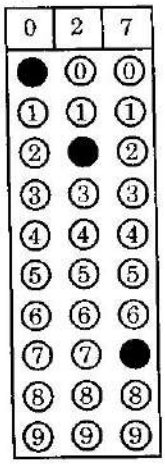
e.g. : If the answer for Question No. **1** is Answer choice (2), it should be marked as follows :

1 | (1) | ● | (3) | (4) |

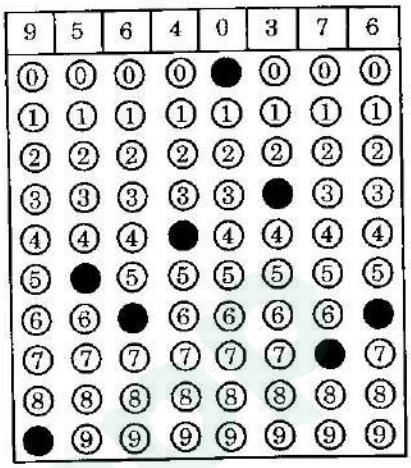
4. Mark Paper Code and Roll No. as given in the Hall Ticket with HB pencil by darkening appropriate circles in Part A of side 2 of the Answer Sheet. Incorrect/not encoding will lead to ***invalidation*** of your Answer Sheet.

Example : If the Paper Code is **027**, and Roll No. is **95640376** fill as shown below :

Paper Code



Roll No.



5. Please get the signature of the Invigilator affixed in the space provided in the Answer Sheet. An Answer Sheet without the signature of the Invigilator is liable for ***invalidation***.

6. To change an answer, erase completely the already darkened circle and use HB pencil to make fresh mark.

7. The candidate should **not** do rough work or write any irrelevant matter in the Answer Sheet. Doing so will lead to ***invalidation***.

8. Do **not** mark answer choices on the Test Booklet. Violation of this will be viewed seriously.

9. Before leaving the examination hall, return the Answer Sheet to the Invigilator, failing which, disciplinary action will be taken.

1. Continuity equation is based on :
   (1) Newton's law of viscosity
   (2) Newton's law of cooling
   (3) The law of conservation of mass
   (4) Newton's law of motion

2. The dimensions of kinematic viscosity :
   (1) L^2T^{-1}
   (2) MLT
   (3) $ML^{-1}T$
   (4) L^2T^{-2}

3. The flow condition is identified by :
   (1) Froude number
   (2) Prandtl number
   (3) Reynolds number
   (4) Weber number

4. Tooth paste is an example of a fluid that exhibits a behaviour of :
   (1) Pseudoplastics
   (2) Bingham plastics
   (3) Newtonian
   (4) Dilatant

5. Water is flowing at 50°F through a long horizontal plastic pipe of 3 inch inside diameter at a velocity of 8 ft/s. The density of water is 62.42 lb/ft^3 and the viscosity is 8.8×10^{-4} lb/ft.s. The Reynolds number is :
   (1) 2×10^6
   (2) 1.4×10^5
   (3) 5.32×10^3
   (4) 1.53×10^4

6. The ratio of V_{av} to V_{max} for a laminar flow of Newtonian fluid in a circular tube is :
   (1) 0.75
   (2) 2
   (3) 0.5
   (4) 0.66

7. The equation valid for a fluid flow through packed bed for very large Reynolds numbers :
   (1) Fanning equation
   (2) Blake-Plummer equation
   (3) Kozeney-Carmen equation
   (4) Hagen-Poiseuille equation

8. The hydraulic diameter of an annulus of inner and outer radii, R_i and R_o respectively is :

(1) $4(R_o - R_i)$

(2) $\sqrt{R_o - R_i}$

(3) $2(R_o - R_i)$

(4) $R_o + R_i$

9. For crushing of solids the Rittinger's law states that the work required for crushing is proportional to :

(1) The size reduction ratio

(2) The new surface created

(3) The change in volume due to crushing

(4) The number of particles crushed

10. Variable area meter used for a flow measurement :

(1) Orifice meter

(2) Rotameter

(3) Venturimeter

(4) Manometer

11. The ratio of inertial force to gravity force is called :

(1) Reynolds number

(2) Schmidt number

(3) Froude number

(4) Weber number

12. If the average bed density at a given velocity is the same in all sections of the bed, then it is called :

(1) Aggregative fluidization

(2) Particulate fluidization

(3) Minimum fluidization

(4) Bubbling fluidization

13. A high grade pulp for paper manufacture :

(1) Rag pulp

(2) Sulphate pulp

(3) Sulfite pulp

(4) Mechanical pulp

14. Catalyst used in the catalytic cracking is :

(1) Silica gel

(2) Silica-Alumina

(3) Vanadium pentoxide

(4) Nickel-Iron

15. Portland cement is primarily a mixture of :

(1) Calcium, magnesium, oxychlorides

(2) Calcium aluminates and silicates

(3) Calcium and magnesium bicarbonates

(4) Gypsum and fly ash

16. The main difference between a paint and varnish is, varnish has no :

(1) oil

(2) pigment

(3) drier

(4) resin

17. Low density polyethylene (LDPE) is classified as :

(1) Thermosetting

(2) Thermoplastic

(3) Elastomer

(4) Polyester fibre

18. The catalyst used in the ammonia synthesis is :

(1) Aluminium oxide

(2) Iron oxide

(3) Zeolite

(4) Copper oxide

19. Liquefied Petroleum Gas (LPG) is mainly a mixture of :

(1) Propane and butane

(2) Methane and ethane

(3) High boiling olefins

(4) High boiling naphthenes

20. Turn over ratio is defined as the ratio of :

(1) Gross annual sales to fixed capital investment

(2) Net annual sales to operating costs

(3) Rate of production to total product cost

(4) Fixed capital investment to total capital investment

21. In manufacturing industry, break-even point occurs when :

(1) The annual sales equals the fixed costs

(2) The total annual product cost equals the total annual sales

(3) The annual profit equals the expected value

(4) All of the above

22. An investment of Rs. 100 lakhs is to be made for construction of a plant which will take two years to start production. The annual profit from operation of the plant is Rs. 20 lakhs. Then the pay-back time is :

(1) 5 years

(2) 12 years

(3) 7 years

(4) 10 years

23. A bond matures after 5 years and has a maturity value of Rs. 1,000. If the interest rate is 12%, what is the present worth of the bond ?

(1) Rs. 600

(2) Rs. 567.43

(3) Rs. 473.54

(4) Rs. 670.92

24. 'Sixteenth factor' rule is used for estimating the :

(1) Equipment installation cost

(2) Equipment cost by scaling

(3) Cost of piping

(4) Utilities cost

25. Which is the *correct* statement of the following ?

(1) Profit = revenue – operating cost

(2) Profit = revenue – fixed cost

(3) Profit = revenue – book value

(4) Profit = revenue – total cost

26. In the straight line method for determining depreciation, it is assumed that the value of the property :

(1) Decreases exponentially with time

(2) Decreases logarithmically with time

(3) Decreases linearly with time

(4) Remains constant with time

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

(1) Plant overhead cost

(2) Fixed charges

(3) Direct production cost

(4) General expenses

28. A composite wall consists of two layers of different materials having conductivity k_1 and k_2. For equal thickness of the two layers, the equivalent thermal conductivity of the slab will be :

(1) $k_1 + k_2$

(2) $\frac{2k_1k_2}{k_1 + k_2}$

(3) $\frac{k_1 + k_2}{k_1k_2}$

(4) $k_1^2k_2$

29. A device which converts the latent or sensible heat of one fluid into the latent heat of vaporization of another is called a :

(1) Heat exchanger

(2) Recuperator

(3) Boiler

(4) Regenerator

30. Baffles are provided in heat exchanger to enhance :

(1) Heat transfer area

(2) Heat transfer coefficient

(3) Temperature gradient

(4) Thermal resistance

31. Dropwise condensation usually occurs on :

(1) Glazed surface

(2) Coated surface

(3) Oily surface

(4) Rough surface

32. A multiple effect evaporator has a capacity to process 40,000 kg of a 10% NaOH solution per day to 25% solids. The water evaporated in kg per day :

(1) 700

(2) 50,000

(3) 24,000

(4) 40,000

33. The heat transfer takes place based on :

(1) Zeroth law of thermodynamics

(2) Second law of thermodynamics

(3) First law of thermodynamics

(4) Kirchhoff's law of heat transfer

34. If a body reflects all radiations incident on it, then it is known as a :

(1) Black body

(2) White body

(3) Grey body

(4) Opaque body

35. The dimensionless number associated with natural convection is :

(1) Nusselt number

(2) Prandtl number

(3) Grashoff number

(4) Reynolds number

36. In shell and tube heat exchanger the corrosive liquid is generally passed through :

(1) Shell side

(2) Tube side

(3) Both (1) and (2)

(4) None of the above

37. The gas which contributes the maximum to the heating value of natural gas is :

(1) CO

(2) H_2

(3) C_2H_4

(4) CH_4

38. Sucrose is a disaccharide consisting of :
(1) Glucose and maltose
(2) Glucose and fructose
(3) Glucose and galactose
(4) Fructose and galactose

39. Which one of the following is *not* likely to be the constituent of vegetable oil ?
(1) Oleic acid
(2) Stearic acid
(3) Citric acid
(4) Glycerol

40. A bio-degradable detergent is one which :
(1) is manufactured using bio-technology
(2) containing long chain alkyl benzenes
(3) is easily decomposed by microorganisms
(4) is manufactured using organic chemicals

41. A bio-catalyst produced by living cells which acts independent of the cell is called :
(1) Substrate
(2) Nutrient
(3) Enzyme
(4) Vitamin

42. Criterion of a chemical equilibrium is that the total Gibbs free energy change is :
(1) positive
(2) always negative
(3) zero
(4) not defined

43. $2H_2(g) + O_2(g) \rightarrow 2H_2O(l)$,
$\Delta H = -13.66$ kcal. In the reaction heat of formation of one mole of $H_2O(l)$ is :
(1) –13.66 kcal
(2) 27.32 kcal
(3) 6.83 kcal
(4) –6.83 kcal

44. A system is said to be isopiestic if there is no :
(1) temperature change
(2) pressure change
(3) volume change
(4) entropy change

45. Freon-22 is used as a refrigerant, chemically known as :
(1) Monochloro difluoro methane
(2) Dichloro difluoro methane
(3) Trichloro monofluoro methane
(4) Difluoro methane

46. Gibbs phase rule is :

(1) $C = P - F + 2$

(2) $F = C - P - 2$

(3) $P + F = C + 2$

(4) $P = F - C - 2$

47. The log mean temperature difference can be replaced by the arithmetic mean when the ratio of the two terminal values of temperature differences, ΔT_1 and ΔT_2 *does not* exceed :

(1) 10

(2) 2

(3) 4

(4) 3.5

48. The mechanism of heat transfer in solids is mainly by :

(1) Convection

(2) Conduction

(3) Radiation

(4) Natural convection

49. The term $\frac{Q}{A}$ is known as (in heat transfer) :

(1) Thermal resistance

(2) Thermal conductivity

(3) Thermal loading

(4) Thermal gradient

50. The units of overall heat transfer coefficient are :

(1) kcal/m/hr/°C

(2) kcal/m^2/hr/°C

(3) kcal/hr/°C

(4) kcal/m^2/hr^2/°C

51. Log mean temperature difference in the case of counter current flow as compared to concurrent flow heat exchanger is :

(1) more

(2) less

(3) same

(4) none of the above

52. First law of thermodynamics is mathematically stated as :

(1) $dQ = du + dw$

(2) $dQ = dw - du$

(3) $dw = dQ + du$

(4) $dH = du + dv$

53. Which of the following is *not* a state function ?

(1) Temperature

(2) Pressure

(3) Specific volume

(4) Heat

54. Throttling process is a constant ..... process.

(1) Entropy

(2) Enthalpy

(3) Pressure

(4) None of the above

55. The degree of freedom for a system comprising liquid water in equilibrium with its vapour :

(1) 2

(2) 1

(3) 4

(4) 3

56. Efficiency of a Carnot engine working between temperature T_1 ant T_2 ($T_1 < T_2$) is :

(1) $\frac{T_2 - T_1}{T_2}$

(2) $\frac{T_2 - T_1}{T_1}$

(3) $\frac{T_1 - T_2}{T_2}$

(4) $\frac{T_1 - T_2}{T_1}$

57. Mixing of two liquids is a :

(1) reversible process

(2) irreversible process

(3) isothermal process

(4) a mechanical process

58. Entropy is :

(1) intensive property

(2) derived property

(3) extensive property

(4) fundamental property

59. Rotary driers are used :

(1) To make milk powder

(2) To make synthetic detergent powder

(3) To make free-flowing granular fertilizers

(4) To dry sticky materials

60. Mass transfer coefficient is defined as :

(1) flux = coefficient/concentration difference

(2) coefficient = flux/concentration difference

(3) coefficient = flux × concentration

(4) flux = concentration difference/ coefficient

61. 100 mol/h of butane (C_4H_{10}) and 5000 mol/h of air are fed into a combustor. The percentage excess air used was :

(1) 50.6

(2) 20

(3) 30

(4) 61.6

62. Molar composition of air is 79% N_2 and 21% O_2. Its weight composition is :

(1) 77% N_2 and 23% O_2

(2) 78% N_2 and 22% O_2

(3) 80% N_2 and 20% O_2

(4) 50% N_2 and 50% O_2

63. For steady state system :

(1) The rate of input is zero

(2) The rate of consumption is zero

(3) The rate of accumulation is zero

(4) The rate of generation is zero

64. The molar composition of a gas is 10% H_2, 10% O_2, 30% CO_2 and balance H_2O. If 50% H_2O condenses, the final mole percent of H_2 in the dry gas will be :

(1) 10

(2) 5

(3) 19.2

(4) 20

65. Methane is completely burned with air. The maximum possible volume percent of CO_2 (dry basis) in the flue gas is :

(1) 11.7

(2) 21

(3) 44

(4) 28

66. Avogadro's number is equal to :

(1) 6.023×10^{23} molecules/kg.mole

(2) 6.023×10^{23} molecules/gm.mole

(3) 6.023×10^{26} molecules/gm.mole

(4) 6.023×10^{15} molecules/kg.mole

67. 1 gm mole of an alcohol weighs 74 grams contains 48 grams of carbon, 10 grams of hydrogen and 16 grams of oxygen. Its molecular formula is :

(1) $C_3H_{21}OH$

(2) C_4H_9OH
$\uparrow$
C_4H_9OH

(3) C_3H_5OH

(4) $C_2H_{33}OH$

68. For ideal gaseous mixtures :

(1) vol% = mole% = press%

(2) vol% = wt% = mole%

(3) wt% = mole% = press%

(4) Mole fraction of components = mass fraction

69. An adiabatic system is one in which there is :

(1) Exchange of heat between the system and surroundings

(2) No exchange of heat between system and surroundings

(3) System and surroundings will be in thermal equilibrium

(4) None of the above

70. The objective of recycling in chemical processing is :

(1) To increase yield

(2) To enrich a product

(3) To conserve heat

(4) All of the above

71. Purging is done to control :

(1) Building of impurities in the system

(2) Heat losses

(3) The reaction

(4) Input of the reactants

72. The reactant which is present in less than its stoichiometric proportion is called the :

(1) Excess reactant

(2) Net reactant

(3) Limiting reactant

(4) Reacted reactant

73. Under operating conditions of process vessel, the maximum working pressure is usually expressed in :

(1) gauge pressure

(2) absolute pressure

(3) vacuum pressure

(4) differential pressure

74. Bracket supports are most suitable for :

(1) Spherical vessels

(2) Vertical vessels

(3) Horizontal vessels

(4) Storage vessels

75. Two 30 cm diameter steel pipes are connected by :

(1) Threaded joints

(2) Union couplings

(3) Flanges

(4) Sleeves

76. The ends of a cylindrical vessel can be closed by a :

(1) Flat plate

(2) Hemispherical head

(3) Torispherical head

(4) Any one of the above

77. Floating head heat exchangers are used for :

(1) Heat transfer between corrosive fluids

(2) Co-current heat transfer systems

(3) Where ΔT between the shell and the tubes is more

(4) Counter-current heat transfer

78. In most of the shell and tube heat exchangers the tube pitch as compared to tube dia is :

(1) Less

(2) 1.25 to 1.5 times

(3) 2.5 times

(4) One-fourth

79. Triangular pitch tube layout is preferred over square pitch because :

(1) It permits use of less tubes in a given shell dia

(2) Permits easy external cleaning

(3) More tubes can be accommodated in a given shell dia

(4) Easy to layout the tubes

80. Minimum plate spacing in most of the petroleum refinery distillation column (dia > 3 ft) is normally :

(1) 6 inches

(2) 12 inches

(3) 34 inches

(4) 18 inches

81. Diameter of the distillation column is set by :

(1) Number of theoretical plates

(2) Allowable vapour velocity

(3) Feed rate to the column

(4) Static submergence

82. Length to diameter ratio of most rotary drier is in the range of :

(1) 1 to 2

(2) 4 to 10

(3) 10 to 20

(4) 20 to 30

83. LMTD correction factor is used for :

(1) Double pipe exchanger

(2) Plate and frame heat exchanger

(3) Multipass shell and tube heat exchanger

(4) Counterflow of hot and cold fluids

84. Best tube materials from thermal conductivity point of view alone is :

(1) Aluminium

(2) Stainless steel

(3) Carbon steel

(4) Copper

85. Molecularity of an elementary reaction $P + Q \rightarrow R + S$ is :

(1) 1

(2) 2

(3) 3

(4) 4

86. The dimensions of the rate constant for nth order homogeneous reaction are :

(1) $(\text{time})^n$

(2) $(\text{time})^{-1}\ (\text{concentration})^{1-n}$

(3) $(\text{time})^{-n}\ (\text{concentration})^{n-1}$

(4) $(\text{time})\ (\text{concentration})^{n-1}$

87. The temperature dependency of the rate constant k, of bimolecular reaction by collision theory is given by :

(1) $k \propto e^{-E/RT}$

(2) $k \propto T^{1/3}e^{-E/RT}$

(3) $k \propto Te^{-E/RT}$

(4) $k \propto T^{1/2}e^{-E/RT}$

88. The conversion of a reactant undergoing a first order reaction at a time equal to 3 times the half life of the reaction is :

(1) 0.5

(2) 0.875

(3) 0.45

(4) 0.7

89. For the gaseous reaction $2A \rightarrow B$ where the feed consists of 50 mole% A and 50 mol % inerts, the expansion factor is :

(1) 1.5

(2) –0.5

(3) –0.25

(4) 0

90. The Knudsen diffusivity is dependent on :

(1) the molecular velocity only

(2) the pore radius of the catalyst only

(3) the molecular velocity and pore radius

(4) the molecular mean free path

91. For first order chemical reaction in a porous catalyst the Thiele modulus is 10. The effectiveness factor is nearly equal to :

(1) 1

(2) 0.5

(3) 0.1

(4) 0

92. Every two minutes one reactor volume of feed is being treated at specified conditions in a CSTR. What is the space time ?

(1) 1/2

(2) 2

(3) 1

(4) 4

93. In an ideal mixed reactor at steady state, the :

(1) composition anywhere in the reactor same

(2) exit stream has same composition as the fluid within the reactor

(3) space time is equal to holding time for a constant density system

(4) all of the above

94. Exothermic reactions are best carried out in :

(1) CSTR

(2) CSTR's in series

(3) PFR followed by CSTR

(4) CSTR followed by PFR

95. Unreacted Core model represents the reaction involving :

(1) Combustion of coal particles

(2) Roasting of sulphide ores

(3) Manufacturing of CS_2 from elements

(4) None of the above

96. Swirling in an agitated vessel can be prevented by :

(1) increasing the vessel diameter

(2) reducing the impeller diameter

(3) mounting baffles in the vessel

(4) by using turbine impllers

97. Pneumatic transport of material is observed in :

(1) Screw conveyor

(2) Bucket elevator

(3) Vacuum cleaner

(4) Belt conveyor

98. Fluidized beds are formed, when :

(1) Fluid friction is zero

(2) Gravity force is less than fluid friction

(3) Pressure force is equal to gravity force

(4) Sum of fluid friction and pressure forces is equal and opposite to gravity forces

99. The performance equations for constant density systems are identical for :

(1) PFR and CSTR

(2) PFR and Batch reactor

(3) PFR, Batch and Backmix reactors

(4) CSTR and Batch reactor

100. When an exothermic reversible reaction is conducted adiabatically the rate of reaction :

(1) Continuously increases

(2) Passes through a maximum

(3) Continuously decreases

(4) Passes through a minimum

101. The upper layer of atmosphere is called the :

(1) Troposphere

(2) Ionosphere

(3) Stratosphere

(4) None of the above

102. Common air pollutants are :

(1) Oxides of sulfur

(2) Oxides of nitrogen

(3) Oxides of carbon

(4) Oxides of hydrogen

103. Equipment used for very fine dust removal from air is :

(1) Bagfilter

(2) Scrubber

(3) Electrostatic precipitator

(4) Cyclone separator

104. Global warming may result in :

(1) floods

(2) cyclones

(3) fall in food productivity

(4) all of the above

105. SO_2 from air can be removed by :

(1) Iron oxide

(2) Alkaline solutions

(3) Silica gel

(4) Activated carbon

106. Which of the following is a green house gas other than O_2 ?

(1) Methane

(2) Nitrous oxide

(3) Chlorofluorocarbons

(4) All of the above

107. Peroxyacyl nitrate (PAN), a pollutant is found in the :

(1) Automobile exhaust

(2) Power plant exhaust

(3) Nitric acid plant exhaust

(4) Sulfuric acid plant exhaust

108. Biological oxidation ponds remove organic compounds present in the polluted water by :

(1) Using activities of microbes

(2) Aerobic oxidation

(3) Both (1) and (2)

(4) Anaerobic reaction

109. Pollutant responsible for 1984 Bhopal tragedy :

(1) Benzene

(2) Methyl isocyanate

(3) Methyl-ethyl ketone

(4) Phosgene

110. Radioactive solid nuclear wastes are disposed off by :

(1) High temperature incineration

(2) Pathological incineration

(3) Pyrolysis

(4) Underground burial in concrete containers

111. The units of diffusivity are :

(1) m/s

(2) m^2/s

(3) $kmol/m^2.s$

(4) s/m

112. The man transfer coefficient for a solid sphere of radius '*a*' dissolving in a large volume of quiscent liquid, in which D is the diffusivity of the solute, is :

(1) D/a

(2) D/2a

(3) Proportional to D 0.5

(4) Function of the volume of the liquid

113. For steady state molecular diffusion of gas 'A' through non-diffusing B, the rate $N_A/(N_A + N_B)$ is :

(1) 0

(2) 1

(3) ∞

(4) 1/2

114. The Schmidt number is the ratio of :

(1) The mass diffusivity to the momentum diffusivity

(2) The momentum diffusivity to the mass diffusivity

(3) The thermal diffusivity to the mass diffusivity

(4) The momentum to thermal diffusivity

115. For turbulent mass transfer in pipes the Sherwood number depends upon the Reynolds number (Re) as :

(1) $Re^{0.33}$

(2) $Re^{0.53}$

(3) $Re^{0.83}$

(4) Re

116. The absorption factor is defined as :

(1) L/(mG)

(2) G/(mL)

(3) mL/G

(4) LG/m

117. In binary distillation, the separation of the components is easier if the relative volatility (α) is :

(1) $\alpha << 1$

(2) $\alpha >> 1$

(3) $\alpha = 1$

(4) $\alpha = 0$

118. In distillation under minimum reflux condition, number of theoretical stages would be :

(1) one

(2) minimum

(3) infinite

(4) 15

119. If the specific heats of a gas and vapour are 0.2 and 1.5 kJ/kg.K respectively and the humidity is 0.01, the humid heat in kJ/kg.K is :

(1) 0.31

(2) 0.107

(3) 0.017

(4) 0.215

120. The Lewis relation for air-water humidification is given by :

(1) $\frac{h_G^2}{k_y C_S} = 1$

(2) $\frac{k_y C_S^2}{h_G} = 1$

(3) $\frac{k_y^2 h_G}{C_S} = 1$

(4) $\frac{h_G}{k_y C_S} = 1$

121. Number of theoretical stages for an ideal binary system can be estimated by using :

(1) Ponchou-Savarit method

(2) McCabe-Thiele method

(3) Sherwood method

(4) Fenske-Underwood method

122. An ideal plate is defined as one where :

(1) The vapor and liquid leaving streams are in equilibrium

(2) The vapor and liquid entering streams are in equilibrium

(3) The vapor leaving stream is in equilibrium with the liquid entering stream

(4) The vapor entering stream is in equilibrium with liquid leaving stream

123. The general transfer function of a 1st order system is :

(1) $\frac{1}{\tau s - 1}$

(2) $\frac{A}{\tau s + 1}$

(3) $\frac{A}{\tau s - 1}$

(4) $\tau s + 1$

124. An input which increases linearly with time is known as :

(1) Step input

(2) Impulse input

(3) Sinusoidal input

(4) Ramp input

125. When a bare thermocouple is covered by a protective sheath, the response becomes :

(1) Faster and oscillatory

(2) Slower and non-oscillatory

(3) Faster and non-oscillatory

(4) Slower and oscillatory

126. Solenoid valve works like :

(1) Proportional controller

(2) P-D controller

(3) P-I-D controller

(4) On-off controller

127. On-off control is a special case of :

(1) Proportional controller

(2) Proportional integral controller

(3) P-D controller

(4) P-I-D controller

128. Which of the following controllers has maximum off-set ?

(1) Proportional controller

(2) P-I controller

(3) P-D controller

(4) P-I-D controller

129. The transfer function of an ideal proportional controller is :

(1) k_C

(2) $\frac{1}{k_C}$

(3) $1 + k_C$

(4) $\frac{1}{k_C + 1}$

130. When the damping coefficient is unity the system is :

(1) overdamped

(2) critically damped

(3) underdamped

(4) highly fluctuating

131. Cascade control employs :

(1) two feed-forward

(2) two feedbacks

(3) one feedback and one feed-forward

(4) one of the above

132. For an input forcing function $X(t) = 2t^2$, the Laplace transform of this function is :

(1) $2/s^2$

(2) $\frac{4}{s^2}$

(3) $\frac{2}{s^3}$

(4) $\frac{4}{s^3}$

133. A control system has the following transfer function :

$$F(s) = \frac{(s-1)(s+1)}{s(s-2)(s+4)}$$

The initial value of the corresponding time function is :

(1) 1

(2) 1/8

(3) 7/8

(4) -1

134. A typical example of a physical system with under-damped characteristics is a :

(1) U-tube manometer

(2) Spring-loaded diaphragm valve

(3) CSTR with first order reaction

(4) Thermocouple kept in a liquid-filled thermowell

135. The time constant of a first order system with resistance R and capacitance C is :

(1) R + C

(2) R – C

(3) RC

(4) $\frac{1}{(RC)}$

136. Bode diagrams are generated from output response of the system subjected to which of the following input ?

(1) impulse

(2) step

(3) ramp

(4) sinusoidal

137. The mechanism of separation in reverse osmosis :

(1) Screening

(2) Diffusion

(3) Adsorption

(4) Extraction

138. The range of particles separated in ultrafiltration :

(1) 0.5 μm – 10^{-3} μm

(2) 1 – 1000 nm

(3) 0.5 μm – 5 μm

(4) 1 cm – 10^{-3} mm

139. Separation of uranium isotopes is done by :

(1) Ultrafiltration

(2) Adsorptive separation

(3) Gas separation by porous membranes

(4) Cyclone separator

140. Selective removal of low molecular weight solutes from a solution is called :

(1) Dialysis

(2) Reverse osmosis

(3) Ion-exchange

(4) Molecular distillation

141. Milk is pasteurized if it is heated to 63°C for 30 min but if it is heated to 74°C it only needs 15 seconds for the same result. The activation energy of this sterilization process is :

(1) 422 kJ/mol

(2) 500 kJ/mol

(3) 395 kJ/mol

(4) 109 kJ/mol

142. In the vicinity of the power plant air contains 15 ppm of SO_2. Its mole fraction in the air is :

(1) 15×10^{-20}

(2) 15×10^{-6}

(3) 15×10^{-3}

(4) 0.15

143. An explosion in which the reaction front moves at a speed greater than the speed of sound in the unreacted medium is called :

(1) Confined explosion

(2) Deflagration

(3) Detonation

(4) Mechanical explosion

144. The three components of a good fire triangle are :

(1) Pentane—Hydrogen peroxide—A spark

(2) Wood—Metal particles—A spark

(3) Water—Oxygen—A spark

(4) Plastics—Wood—A spark

145. Fault tree analysis is a method of identifying ways in which hazards can lead to accidents. It mainly works on the logic of :

(1) Defining top event and working backward toward the various scenarios that can cause an accident

(2) Preparing a detailed process hazards check list

(3) Making an advanced hazards survey

(4) By making a 'what if' analysis

146. The solubility of a solute in a supercritical fluid :

(1) decreases

(2) increases

(3) remains the same

(4) all of the above

147. An attractive supercritical solvent used for extraction of phyto-chemicals :

(1) Water

(2) Ethylene

(3) Carbon dioxide

(4) Methane

148. Synthetic polymer membranes are produced by polymerization of a monomer by :

(1) Condensation polymerization

(2) Addition polymerization

(3) Copolymerization

(4) All of the above

149. Permeance of a solute through a membrane is defined as :

(1) The ratio of permeability to the membrane thickness

(2) The ratio of molecular weight of the polymer to the thickness of the membrane

(3) The ratio of membrane thickness to the solute diffusivity

(4) The ratio of molar trans-membrane flux to the thickness of the membrane

150. Distillation separates components of a liquid mixture based on their difference in :

(1) Density

(2) Diffusivity

(3) Boiling points

(4) Specific heats

Rough Work