# *5. Chemical*

## *17.03.2019 AN 2-4 PM*

1. In which one of the following reactions, the rate is independent of the concentration of the reactants?

   (a) Zero-Order Reaction

   (b) Fractional-order Reaction

   (c) First-Order Reaction

   (d) Second-Order Reaction

2. When a metal is dipped into a solution containing its own ions:

   (a) Reversible electrode is formed

   (b) Irreversible cell is formed

   (c) A half cell is formed

   (d) $pH$ Electrode is formed

3. When 1 $g\ mol$ of $C_7H_{16}$ are mixed with 12 $g\ mol$ of $O_2$, to produce $CO_2$and $H_2O$. The limiting reactant will be:

   (a) $C_7H_{16}$

   (b) $O_2$

   (c) $CO_2$

   (d) $H_2O$

4. A property whose value is not an additive and does not vary with the quantity of material in the subsystem is called:

   (a) Intensive property

   (b) Extensive property

   (c) Chemical property

   (d) Physical property

5. The number of moles of $K_2CO_3$ for 117 $kg$ of $K$ will be:

   (a) 4.5 $kmol$

   (b) 3.5 $kmol$

   (c) 2.5 $kmol$

   (d) 1.5 $kmol$

6. $Na_2O$ content of lye containing 73 % of caustic soda will be nearly:

   (a) 47.8 %

   (b) 56.6 %

   (c) 65.4 %

   (d) 74.2 %

7. The weight of lime prepared by heating 95% pure limestone of 200 $kg$ will be:

(a) 102.8 $kg$

(b) 104.6 $kg$

(c) 106.4 $kg$

(d) 108.2 $kg$

8. The weight of $6.022 \times 10^{23}$ molecules of $CaCO_3$ will be:

(a) 75 $g$

(b) 100 $g$

(c) 125 $g$

(d) 150 $g$

9. One $litre$ of milk weighs 1.035 $kg$. The butter fat content is 4 % by volume and has a density of 875 $kg/m^3$. The density of the fat-free 'skimmed' milk will be: ($1\ m^3 = 10^3\ litres$)

(a) 1042 $kg/m^3$

(b) 1124 $kg/m^3$

(c) 1242 $kg/m^3$

(d) 1424 $kg/m^3$

10. Consider the following equilibrium equation:

$$N_2O_4(g) \rightleftharpoons 2NO_2(g)$$

The density of an equilibrium mixture of $N_2O_4$ and $NO_2$ at $1\ atm$ and $348\ K$ is 1.84 g/L. The value of $K_c$ for equilibrium will be:

(a) 7

(b) 8

(c) 9

(d) 6

11. Which one of the following pumps can be used for higher pressure delivery and metering?

(a) Centrifugal pump

(b) Rotary pump

(c) Reciprocating pump

(d) Steam pump

12. Which one of the following unit operations can be used to make tablets from powders of medicinals?

(a) Crushing

(b) Grinding

(c) Solid blending

(d) Pelletizing

13. Which one of the following catalyst can be used in the manufacturing of Sulphuric Acid by '*Contact Process*'?

(a) Vanadium Pentoxide

(b) Palladium

(c) Cobalt

(d) Titanium

14. Which one of the following temperature range can be maintained for fusion point of ash in the furnace for the manufacturing of producer gas?

(a) $800^{\circ}C - 1000^{\circ}C$

(b) $900^{\circ}C - 1250^{\circ}C$

(c) $1000^{\circ}C - 1500^{\circ}C$

(d) $1600^{\circ}C - 1950^{\circ}C$

15. Which one of the following gases can be produced by using Bituminous, anthracite coal or coke as raw material?

(a) Water gas

(b) Coke oven gas

(c) Natural gas

(d) Synthesis gas

16. Which one of the following elements can be used as protective atmosphere to prevent oxidation in metal working and food preservation?

(a) Oxygen

(b) Nitrogen

(c) Carbon

(d) Hydrogen

17. Which one of the following constituent is necessary in fertilizers for the early stages of plant growth to promote development of stems and leaves?

(a) Phosphorus

(b) Potassium

(c) Nitrogen

(d) Potash

18. The raw materials required for the manufacture of $DDT$ are:

(a) Ethanol and Chlorine

(b) Benzene and Chlorine

(c) Ethanol and Benzene

(d) Benzene and Methane

19. Which one of the following chemical industries is utilizing the process of Cyclization?

(a) Organic chemicals

(b) Synthetic rubber

(c) Dyes

(d) Petroleum

20. Which one of the following unit operation is versatile; can be used to mix, heat or cool; operates under pressure; and also useful for powders or sticky materials?

(a) Pneumatic conveying

(b) Bucket elevators

(c) Screw conveyor

(d) Belt conveyor

21. In which one of the following approaches a cubic equation of state is used for both vapour and liquid phases?

(a) Gamma-phi

(b) Phi-phi

(c) Alpha-phi

(d) Beta-phi

22. If ,

$W_s$ = Weight of dry solid
$S_s$ = Specific gravity of solids
$\gamma$ = unit weight of water
$W_f$ = Weight of fixed solids (non volatile)
$S_f$ = Specific gravity of fixed solids
$W_v$ = Weight of volatile solids
$S_v$ = Specific gravity of volatile solids

The specific gravity of solid matter in sludge can be computed from the relationship:

(a) $\frac{W_s}{S_s\gamma} = \frac{W_f}{S_f\gamma} + \frac{W_v}{S_v\gamma}$

(b) $\frac{W_s}{S_v\gamma} = \frac{S_s\gamma}{S_f\gamma} - \frac{W_v}{W_f}$

(c) $\frac{S_s\gamma}{S_f\gamma} = \frac{W_s}{W_v} - \frac{S_v\gamma}{W_f}$

(d) $\frac{W_v}{W_f} = \frac{W_f}{S_f\gamma} + \frac{W_v}{S_v\gamma}$

23. With standard notations Carnot engine can be written as:

(a) $\frac{|Q_H|}{T_H} = \frac{|Q_C|}{T_C}$

(b) $\frac{T_H}{|Q_H|} = \frac{|Q_C|}{T_C}$

(c) $\frac{T_H}{|Q_H|} = \frac{T_C}{|Q_C|}$

(d) $\frac{|Q_H|}{T_H} = \frac{T_C}{|Q_C|}$

24. When air is behaving as an ideal gas with heat capacities ratio of $1.4$, the molar heat capacity at constant pressure will be:

(a) $29.1\ J/mol\text{-}K$

(b) $28.3\ J/mol\text{-}K$

(c) $27.5\ J/mol\text{-}K$

(d) $26.7\ J/mol\text{-}K$

25. The first law of thermodynamics is also known as:

(a) Constant energy principle

(b) Conservation of energy principle

(c) Conservation of entropy process

(d) Constant entropy process

26. Consider the following constant-volume heat capacity of a substance:

$$C_V \equiv \left(\frac{\partial U}{\partial T}\right)_V$$

What does $U$ represent?

(a) Molar External Energy

(b) Specific Internal Energy

(c) Specific External Energy

(d) Potential Energy

27. 'The entire power plant, consisting of a compression device, a combustion chamber, and a nozzle', is a:

(a) Carnot engine

(b) Diesel engine

(c) Petrol engine

(d) Jet engine

28. To maintain the temperature of a solution at $261\ K$, $1000\ kJ$ of heat per minute is continuously removed from it. The surrounding temperature is $288\ K$. The least amount of power required will be nearly:

(a) 6.9 $hp$

(b) 4.7 $hp$

(c) 3.5 $hp$

(d) 2.3 $hp$

29. Which one of following theorems holds true for the statement given below?

'For any closed system formed initially from given masses of prescribed chemical species, the equilibrium state is completely determined when any two independent variables are fixed'.

(a) Gibbs theorem

(b) Duhem's theorem

(c) Liouville's theorem

(d) Guldberg theorem

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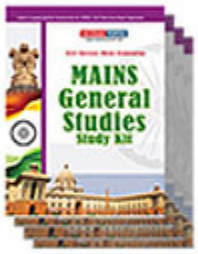


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30. Air at 1 $bar$ and 25$^{\circ}C$ enters a compressor at low velocity, discharges at 3 $bar$, and enters a nozzle in which it expands to a final velocity of 600 $m/s$ at the initial conditions of pressure and temperature. If the work of compression is 240 $kJ/kg$ of air, the amount of heat removed during the compression will be:

(a) $-90\ kJ/kg$

(b) $-80\ kJ/kg$

(c) $-70\ kJ/kg$

(d) $-60\ kJ/kg$

31. A body at a given temperature will emit radiation of a whole range of wavelengths and not a single wavelength. The statement is related to:

(a) Wavelength and Frequency

(b) The Origins of Radiant Energy

(c) The Distribution of Radiant Energy

(d) The Emissive Power

32. Which of the following laws are the laws of black-body radiation?

(a) Planck's law, Wien's law and Fourier's law

(b) Planck's law, Fourier's law and Stefan-Boltzmann law

(c) Planck's law, Wien's law and Stefan-Boltzmann law

(d) Fourier's law, Wien's law and Stefan-Boltzmann law

33. In diffusion, when vapour pressure of water in air equals that of the liquid, the air is saturated and vaporization:

(a) Persists

(b) Initiates

(c) Ceases

(d) Preserves

34. A Newtonian fluid which is in fully developed flow has the actual velocity distribution at the entrance to the heated section and the theoretical distribution throughout the tube. They both are:

(a) Parabolic

(b) Circular

(c) Linear

(d) Elliptic

35. If the liquid wets the surface, the condensate flows on the surface in the form of a film, and the process is called:

(a) Drop condensation

(b) Film condensation

(c) Film flow condensation

(d) Laminar film condensation

36. During the re-entry of a space vehicle into the earth's atmosphere a large quantity of heat is generated at the surface due to air friction, which is very rapidly removed by a process called:

(a) Ablation

(b) Abolition

(c) Abrasion

(d) Aeration

37. The transport of one constituent from a region of higher concentration to that of a lower concentration is known as:

(a) Mass Diffusion

(b) Mass Transition

(c) Mass Transfer

(d) Heat Transfer

38. The polluted water requires Chlorine of $8\,kg/day$ to treat $20{,}000\ cubic\ metre\ per\ day$. The residual after $10\ minutes$ contact is $0.20\ mg/l$. The dosage will be:

(a) $0.8\ mg/l$

(b) $0.6\ mg/l$

(c) $0.4\ mg/l$

(d) $0.2\ mg/l$

39. On a hot summer's day a concrete highway may reach a temperature of $55^{\circ}C$. A stream of water is directed on the highway so that the surface temperature is suddenly lowered to $35^{\circ}C$. The values of $k = 1.279\ W/mK$ $\alpha = 1.77 \times 10^{-3}\ m^2/h$ and $\frac{x}{2\sqrt{\alpha t}} = 0.482$ are for concrete. The time required to cool the concrete to $45^{\circ}C$ at a depth of $5\ cm$ from the surface will be:

(a) $1.26\ h$

(b) $1.52\ h$

(c) $2.52\ h$

(d) $3.26\ h$

40. The total hemispherical emissive power will be denoted by the symbol:

(a) $\epsilon$

(b) $\epsilon_\lambda$

(c) $e$

(d) $e_\lambda$

41. The upper limit of velocity in a sieve-tray column is determined by:

(a) Weeping point

(b) Flooding point

(c) Clogging point

(d) Leaking point

42. In a process, a soluble material is dissolved from its mixture with an insoluble solid by means of a liquid solvent is called:

(a) Absorption

(b) Adsorption

(c) Leaching

(d) Distillation

43. Compounds separated from solids or liquids with solvent held at pressure and temperature above critical point of solvent, the process is termed as:

(a) Extraction

(b) Supercritical fluid leaching

(c) Supercritical fluid extraction

(d) Adsorption

44. The reflux at the top of the distillation column is at its:

(a) Boiling point

(b) Melting point

(c) Critical point

(d) Triple point

45. The ratio of slope of operating line $\left(\frac{L}{V}\right)$ to the equilibrium line, $m$ is called:

(a) Adsorption factor

(b) Absorption factor

(c) Dew point

(d) Boiling point

46. When a dephlegmator is used, the liquid reflux is:

(a) having the same composition as the over head product

(b) not having the same composition as the over head product

(c) having a zero composition as the over head product

(d) having an infinity composition as the over head product

47. In a humidity chart, the slanting lines running downward and to the right of saturation line are called:

(a) Humidity lines

(b) Humid volume lines

(c) Adiabatic-cooling lines

(d) Temperature lines

48. The portion of the water in the wet solid that cannot be removed by the inlet air due to humidity is called:

(a) Equilibrium moisture

(b) Free moisture

(c) Relative humidity

(d) Unbound moisture

49. If saturated steam is used as the heating medium,

$\bar{V}$ = Vapour rate from reboiler
$\lambda_s$ = Latent heat of steam
$\lambda_m$ = Molal latent heat of mixture

The steam required at reboiler $\dot{m}_s$ is:

(a) $\frac{\bar{V}\,\lambda_s}{\lambda_m}$

(b) $\frac{\lambda_m}{\bar{V}\,\lambda_s}$

(c) $\frac{\lambda_s}{\bar{V}\,\lambda_m}$

(d) $\frac{\bar{V}\lambda_m}{\lambda_s}$

50. $q$ is defined as mole of liquid flow in stripping section resulting from introduction of each mole of feed. Its value for feed partially vapour is:

(a) $q = 0$

(b) $q = 1$

(c) $0 < q < 1$

(d) $q > 1$

51. Which one of the following catalyst poisons is true for the statement below?

'It results due to change in structure of the catalyst. An example of this poison is that, when $SO_2$- air mixture along with moisture is passed over platinum-aluminium catalyst, the water affects the structure of alumina carrier'.

(a) Deposited poison

(b) Chemisorbed poison

(c) Selectivity poison

(d) Stability poison

52. Consider the following reaction between hydrogen and bromine in the chain reaction:

$$H^{\bullet} + HBr \rightarrow H_2 + Br^{\bullet}$$

The reaction is called as chain:

(a) Initiation step

(b) Retardation step

(c) Termination step

(d) Propagation step

53. Consider the following statements regarding catalyst and catalytic reactions:

1. Hot spots are developed in fluidized bed reactors
2. Bubbling fluidized bed is most commonly used in industries
3. Very little reaction occurs in the gas bubbles
4. Catalytic reaction and catalyst regeneration in a single unit is more costly

Which of the above statements are correct?

(a) 1 and 3 only

(b) 2 and 3 only

(c) 1 and 4 only

(d) 2 and 4 only

54. Which one of the following is the disadvantage of an 'Emulsion Polymerization'?

(a) Low dispersion viscosity

(b) Product of high molecular weight

(c) Film formation at reactor wall

(d) Good heat transfer rate

55. The ratio of the substrate concentration required for 75 % of $R_{max}$ to the concentration required for 25 % of $R_{max}$ is:

(a) 7

(b) 8

(c) 9

(d) 6

56. Which one of the following is ***not*** the '$Slurry\ Reactors$'?

(a) Hydrogenation of fatty acid in presence of supported Nickel catalyst

(b) Hydrogenation of aniline in presence of Nickel supported on clay

(c) Hydrogenation of Glucose in presence of raney Nickel catalyst

(d) Oxidation of ethylene in presence of $PdCl_2$ carbon catalyst

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57. Which one of the following methods is ***not*** suitable for the determination of order of reaction?

(a) Use of differential rate expression

(b) Use of integral rate expression

(c) Use of reaction rate method

(d) Use of isolation method

58. Recycle ratio $R$ is:

(a) $\frac{Reactor\ \ Volume}{Reservoir\ \ Volume}$

(b) $\frac{Reservoir\ \ Volume}{Reactor\ \ Volume}$

(c) $\frac{Volume\ \ of\ \ fluid\ \ leaving\ \ at\ the\ reactor\ \ outlet}{Volume\ \ of\ \ fluid\ \ returned\ \ at\ the\ reactor\ \ inlet}$

(d) $\frac{Volume\ \ of\ \ fluid\ \ returned\ \ at\ the\ reactor\ \ inlet}{Volume\ \ of\ \ fluid\ \ leaving\ \ at\ the\ reactor\ \ outlet}$

59. Which one of the following is ***not*** the resistance in a gas-liquid reaction?

(a) Gas film resistance

(b) Liquid film resistance

(c) Magnitude of convection resistance

(d) Bulk liquid resistance

60. Which one of the following is ***not*** an advantage for three phase catalytic reactors?

(a) Normal operating conditions

(b) Long catalyst life and high sensitivity

(c) High heat transfer efficiency

(d) Endothermic reactions can be controlled

61. Hydrothermal reservoirs refer to:

(a) Hot water stored in a natural dam

(b) Large pools of steam or hot water trapped in porous rocks

(c) Molten rock found below earth's crust

(d) Heat contained in shallow ground

62. The leakage of methyl isocyanate ($MIC$) gas from Union Carbide India Ltd, Bhopal is due to:

(a) Excess production of $MIC$

(b) Breakdown of $MIC$ plant

(c) Entry of a large volume of water into $MIC$ storage tank, causing valve to open

(d) Hole was formed on the $MIC$ tank

63. Thermal pollution is mainly caused due to:

(a) Sudden change in temperature caused by periodic plant outages

(b) Sudden decrease in temperature of river or lake

(c) Increase of dissolved oxygen $(DO)$ in water bodies

(d) Gradual increase in temperature of earth

64. $'Nitrogenous\ oxygen\ demand'$ $(NBOD)$ is oxygen needed to:

(a) Convert ammonia to nitrate

(b) Convert nitrogen dioxide to nitrogen trioxide

(c) Denitrifying bacteria to grow

(d) Oxidize organic matters

65. A sample of groundwater has 100 $mg/L$ of $Ca^{2+}$ and 10 $mg/L$ of $Mg^{2+}$. Its total hardness will be nearly:

(a) 2.4 $meq/L$

(b) 3.8 $meq/L$

(c) 4.4 $meq/L$

(d) 5.8 $meq/L$

66. Trickling filter is used in:

(a) Filtering fruit juice

(b) Secondary / biological treatment of wastewater

(c) Primary treatment of wastewater

(d) Tertiary treatment of wastewater

67. Consider a spherical droplet of water with diameter $2\ \mu m$, the viscosity of air $\eta$ is $0.0172\ g/m.s.$; and the density of water is$10^6\ g/m^3$. Its settling velocity will be nearly:

(a) $3.3 \times 10^{-4}\ m/s$

(b) $2.5 \times 10^{-4}\ m/s$

(c) $1.3 \times 10^{-4}\ m/s$

(d) $0.5 \times 10^{-4}\ m/s$

68. In '$Fluidized\ Bed\ Combustion$' ($FBC$) boiler, sulfur oxides formed during combustion react with the lime-stone ($CaCO_3$) to:

(a) Form solid $CaSO_4$ which falls to the bottom of the furnace

(b) Form solid $CaS$ which falls to the bottom of the furnace

(c) Separate ash from coal

(d) Increase the combustion rate

69. '$Trash$' in Municipal Solid Waste (MSW) is:

(a) Combustible portion of rubbish

(b) Non combustible portion of rubbish

(c) Garbage residue of food

(d) Construction of auto bodies and industrial waste

70. '$Volatile\ Organic\ Compounds$' ($VOCs$) are effectively removed by:

(a) Vacuum filter

(b) Air-stripping tower followed by granular activated carbon filter

(c) Plate and frame filter

(d) Sonicator

71. Which one of the following type of a control system is concerned with the controlling a sequence of events rather than regulation or variation of individual variables?

(a) Connected state control system

(b) Non Discrete-state control system

(c) Discrete-state control system

(d) Digital state control system

72. Pressure $p = 2.1 \times 10^3\ dyne/cm^2$ is:

(a) $210\ Pa$

(b) $210\ kPa$

(c) $210\ MPa$

(d) $210\ mPa$

73. The base 10 equivalent of the binary whole number $00100111_2$ will be:

(a) 33

(b) 39

(c) 45

(d) 51

74. Which one of the following is ***not*** an $ADC\ characteristic$?

(a) Analog voltage input

(b) Power supplies

(c) Control lines

(d) Analog voltage output

75. The temperature of $335\ K$ in a material is:

(a) $541^{\circ}R$

(b) $571^{\circ}R$

(c) $603^{\circ}R$

(d) $643^{\circ}R$

76. An aluminium rod of $10\ m$ long at $20^{\circ}C$ is expanding between temperature ranges of $0^{\circ}C$ to $100^{\circ}C$ . If the coefficient of thermal expansion $\gamma = 2.5 \times 10^{-5}\ m/$℃, then the expansion of the rod will be:

(a) $20\ mm$

(b) $25\ mm$

(c) $30\ mm$

(d) $35\ mm$

77. A water pipe vibrates at a frequency of $10\ Hz$ with a displacement of $0.5\ cm$. The peak acceleration $a_{peak}$ will be:

(a) $2\ g$

(b) $3\ g$

(c) $4\ g$

(d) $5\ g$

78. The velocity of $EM$ radiation in the glass for an index of refraction of $n = 1.57$ will be nearly:

(a) $4.6 \times 10^{8}\ m/s$

(b) $3.7 \times 10^{8}\ m/s$

(c) $2.8 \times 10^{8}\ m/s$

(d) $1.9 \times 10^{8}\ m/s$

79. The atoms on one side of the boundary are located in the mirror-image positions of the atoms on the other side, is called:

(a) Twin boundary

(b) Twist boundary

(c) Tilt boundary

(d) Angle grain boundary

80. Which one of the following pyrometers is designed to collect the radiation extending from the visible through the infrared wavelengths?

(a) Broad band Pyrometer

(b) Total Radiation Pyrometer

(c) Narrow band Pyrometer

(d) Optical Pyrometer

81. The distance between two parallel plates is $0.00914\ m$, the lower plate is being pulled at a relative velocity of $0.366\ m/s$ greater than the top plate. The fluid used is soyabean oil with viscosity of $0.4 \times 10^{-2}\ Pa.s$ at $303\ K$. The shear stress will be nearly:

(a) $0.12\ N/m^2$

(b) $0.14\ N/m^2$

(c) $0.16\ N/m^2$

(d) $0.18\ N/m^2$

82. When the momentum flux is less than the value of $\tau_0$, the velocity gradient for a Bingham fluid, will be:

(a) Two

(b) One

(c) Half

(d) Zero

83. Process Safety Information ($PSI$) is needed:

1. To document formally the as-built/as-modified condition of the plant
2. To provide the necessary data with which to perform the required hazard analysis
3. To communicate information on hazardous substances to employees and others as required by state or federal regulations

(a) 1 and 2 only

(b) 1 and 3 only

(c) 2 and 3 only

(d) 1, 2 and 3

84. If,

$\in$ is void fraction
$\rho$ is density
$V'$ is superficial velocity
$\Delta L$ is length
$D_P$ is diameter of packed bed

Burke-Plummer equation will be:

(a) $\Delta P = \frac{1.75\rho\ (V')^2\ \Delta L}{D_P}\left(\frac{1-\in}{\in^3}\right)$

(b) $\Delta P = \frac{1.25\rho\ (V')^2\ \Delta L}{D_P}\left(\frac{1-\in}{\in^3}\right)$

(c) $\Delta P = \frac{1.75\rho\ (V')^3 \Delta L}{D_P}\left(\frac{1-\in}{\in^2}\right)$

(d) $\Delta P = \frac{1.25\rho\ (V')^3\ \Delta L}{D_P}\left(\frac{1-\in}{\in^2}\right)$

85. A packed bed is composed of cylinders having a diameter $D_p = 0.02\,m$ and length $1\,m$. For Bulk density of $962\,kg/m^3$, solid density of $1000\,kg/m^3$ and with $a = 288\,m^2$ the value of $D_e$ will be nearly:

(a) $0.29\,mm$

(b) $0.37\,mm$

(c) $0.45\,mm$

(d) $0.53\,mm$

86. In heat conduction with a nuclear heat source:

$S_{no}$ = Thermal energy produced at the centre per unit volume
$b$ = Constant
$r$ = Radius of cylindrical shell
$R_f$ = Radius of nuclear fuel rod

Thermal energy production per unit volume $S_n$ will be:

(a) $S_{no}\left[1 + b\left(\frac{r}{R_f}\right)^2\right]$

(b) ${S_{no}}^2\left[1 - b\left(\frac{r}{R_f}\right)^2\right]$

(c) $S_{no}\left[1 + b^2\left(\frac{r}{R_f}\right)^{\frac{1}{2}}\right]$

(d) ${S_{no}}^2\left[1 - b^2\left(\frac{r}{R_f}\right)^{\frac{1}{2}}\right]$

87. Consider the following data for an insulating wall:

Thick fibre insulating board $\Delta x = 25.4\ mm$
Inside temperature $T_1 = 352.7\ K$
Outside temperature $T_2 = 297.1\ K$
Thermal conductivity of fibre $k = 0.048\ W/m.K$

The rate of heat transfer per unit area will be nearly:

(a) $70\ W/m^2$

(b) $105\ W/m^2$

(c) $145\ W/m^2$

(d) $170\ W/m^2$

88. Wilke - Chang correlation for dilute solutions of concentration of $A$ into $B$ of non-dissociating solutes upto about $\pm 10$ % is:

(a) $D_{AB} = 7.4 \times 10^{-8} \frac{(\psi_B M_B)^{\frac{1}{2}} T}{\mu \hat{V}_A^{0.6}}$

(b) $D_{AB} = 4.4 \times 10^{-8} \frac{(\psi_B)^{\frac{1}{4}} T}{\mu \hat{V}_A^{0.4}}$

(c) $D_{AB} = 7.4 \times 10^{8} \frac{(\psi_B)^{\frac{1}{2}} T}{\mu \hat{V}_A^{0.2}}$

(d) $D_{AB} = 4.4 \times 10^{8} \frac{(\psi_B)^{\frac{1}{2}} T}{\mu \hat{V}_A^{0.2}}$

89. The causes of desertification are:

1. Overgrazing
2. Cultivation of marginal lands

(a) 1 only

(b) 2 only

(c) Both 1 and 2

(d) Neither 1 nor 2

90. Froude number $N_{Fr}$ is:

(a) $\frac{V^2}{gL}$

(b) $\frac{P}{\rho V^2}$

(c) $\frac{\mu}{\rho D_{AB}}$

(d) $\frac{kL}{D_{AB}}$

91. The process of Galvanization can refer as the process in which:

(a) The steel is melted in high temperature to provide ductility

(b) The metal is dipped in an acid for the fixed length of time, rinsed with water and stored for further use

(c) The metal surface is covered with a thin coat of zinc for protection against corrosion

(d) A thin coat of one metal over the surface of other metal or non metal to alter the surface properly

92. As per $NFPA$ (National Fire Protection Association), the background colours of information on health, flammability and reactivity are respectively:

(a) Red, Yellow and Blue

(b) Blue, Yellow and Red

(c) Red, Blue and Yellow

(d) Blue, Red and Yellow

93. The $EPA$ Hazardous Waste Number for ignitability is:

(a) $DOO1$

(b) $DOO2$

(c) $DOO3$

(d) $DOO9$

94. $LD_{50}$ refers to:

(a) The dose (amount per unit body weight) of a chemical at which first 80 % test animal population dies within a period of time by administering chemicals through ingestion

(b) The concentration of a chemical at which first 50 test animal population dies within a period of time

(c) The dose (amount per unit body weight)of a chemical at which 50% of a test animal population dies within a period of time by administering chemicals through ingestion

(d) The dose (amount per unit body weight) of a chemical at which last 50 test animal population dies within a period of time by administering chemicals through ingestion

95. Threshold Limit Values ($TLVs$) for slightly toxic classes in dilution ventilation is:

(a) $< 10\ ppm$

(b) $(100 - 500)\ ppm$

(c) $> 500\ ppm$

(d) $(10 - 100)\ ppm$

96. International Atomic Energy Agency has recommended the maximum permissible radiation dose limit per week by Roentgen Equivalent Man ($REM$) as:

(a) 1

(b) 0.5

(c) 0.1

(d) 0.05

97. Waste minimization techniques focus primarily on the activities of:

(a) Identification and storage

(b) Recycling and reuse

(c) Source reduction and recycling

(d) Land disposal and record keeping

98. Positive pressure respirators are:

1. Self-contained breathing apparatus
2. Air-purifying respirators
3. Supplied-air respirators

(a) 1 only

(b) 2 only

(c) 1 and 2

(d) 1 and 3

99. The maximum possible efficiency of Ocean Thermal Energy Conversion ($OTEC$) system for an electric generating station operating between $30^{\circ}C$ and $5^{\circ}C$ is:

(a) 4 %

(b) 6 %

(c) 8 %

(d) 10 %

100. The pollutional effects of discharging raw waste water from a paper mill are:

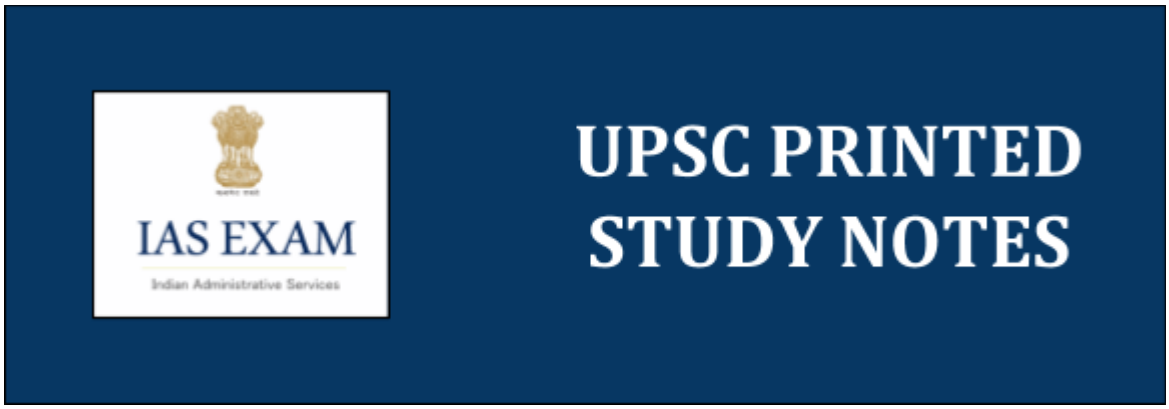
1. Oxygen depletion in the receiving body of water
2. Presence of undesirable colour, odour and taste in water
3. Reduced photosynthesis
4. Toxicity added to the aquatic life due to the formation of mercaptans, pentachlorophenol and pentachlorophenate

(a) 1, 2, 3 and 4

(b) 1, 2 and 3 only

(c) 1, 3 and 4 only

(d) 2 and 4 only

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