1) Which of the following equation referred for Fick's law?
   A. $J_A = D_{AB} (dc_A / dz)$
   B. $J_A = -D_{AB} (dc_A / dz)$
   C. $N_A = Nx_A + J_A$
   D. $N_A = Nx_A - J_A$

2) Which following operation is direct mass transfer operation?
   A. Absorption
   B. Evaporation
   C. Drying
   D. Extraction

3) What is the unit of the diffusivity?
   A. m/s
   B. m^2/s
   C. m^3/s
   D. Kmol/s

4) As pressure increases diffusivity…….
   A. Increases
   B. Decreases
   C. Remains constant
   D. None of the above

5) The gas phase reaction $2A + B = C + D$ occurs on the surface of catalyst at steady state what is value of N_A / N_C
   A. -2
   B. -0.5
   C. 2

6) How do you define Stanton number for mass transfer
   A. Sh/Re.Sc
   B. $Sh/Re.Sc^{1/3}$
   C. Pe/Sc

7) What is slope of driving force line?
   A. -ky/kx
   B. Kx/ky
   C. -Kx/ky

8) What is slope of co-current cascade operating line

   a. Rs/Es
   b. Es/Rs
   c. -Rs/Es

9) For which of the following combination, does the absorption operation become gas-film controlled?

P. The solubility of gas in the liquid is very high

Q. The solubility of gas in the liquid is very low

R. The liquid-side mass transfer coefficient is much higher than the gas side mass transfer coefficient

S. The liquid-side mass transfer coefficient is much lower than the gas side mass transfer coefficient

    A. P & Q
    B. P & R
    C. P & S
    D. Q & R

10) Simultaneous heat and mass transfer is occurring in a fluid flowing over a flat plate. The flow is laminar. The concentration boundary layer will COINCIDE with thermal boundary layer when-

    A. Sc=Nu
    B. Sh=Nu
    C. Sh=Pr
    D. Sc=Pr

11) IN a countercurrent gas absorber both the operating and equilibrium relations are linear. The inlet liquid composition and the exit gas composition are maintained constant. In order to increase the absorption factor

    A. The liquid flow rate should decrease
    B. The gas flow rate should increase
    C. The slope of the equilibrium line should increase
    D. The slope of the equilibrium line should decrease

12) A packed tower containing berl saddles is operated with gas-liquid system in the countercurrent mode. Keeping the gas flow rate constant, if the liquid flow rate is continuously increased

    A. The void fraction for the gas to flow will decrease beyond the loading point
    B. The gas pressure drop will decrease
    C. Liquid will continue to flow freely the tower beyond the loading point
    D. The entrainment of liquid in the gas will considerably decrease near the flooding point

13) The dimensionless group in mass transfer that is equivalent to Prandtl number in heat transfer is

    A. Nusselt number
    B. Sherwood number
    C. Schmidt Number

D. Stanton number

14) The Reynolds analogy for the momentum heat and mass transfer is best applicable for

    A. Gasses in turbulent flow
    B. Gases in laminar flow
    C. Liquids in turbulent flow
    D. Liquids and Gases in laminar flow

15) The surface renewal frequency in Danckwerts' model of mass tranfer is given by (K_L: mass tranfer coefficient, m/s)

    A. $(K_L^2 D_A)^{1/2}$
    B. $K_L^2 D_A$
    C. K_L^2 / D_A
    D. K_L / D_A^2

16) The interfacial area per unit volume of dispersion in a gas liquid contactor for fractional holdup of gas = 0.1 and gas bubble diameter = 0.5 mm is given by (in m^2/m^3)

    A. 500
    B. 1200
    C. 900
    D. 800

17) The absorption factor is defined as

    A. L/mG
    B. G/mL
    C. mL/G
    D. LG/m

18) Isotherms are generally used for an operation

    A. Absorption
    B. Adsorption
    C. Leaching
    D. Drying

19) What is relation used for resistance in liquid phase

    A. (1/KY)/(1/Ky)
    B. (1/KX)/(1/Kx)
    C. (1/Kx)/(1/Ky)

20) For absorption height of transfer unit based on the gas phase is given by (G: superficial molar gas velocity; L: superficial molar liquid velocity; F_G: mass transfer coefficient, $mol/m^2 s$; a: interfacial area per unit volume of tower)

A. G/F_Ga

B. F_G/G_a

C. G_a/F_G

D. L/F_GG

21) The equilibrium characteristics of the solubility of a gas in liquid helps to determine the

A. Rate

B. Concentration

C. Time

D. No existence of equilibrium characteristics

22) According to Raoult's law, for a pure component solution the partial pressure is equals to

A. Total pressure

B. Vapour pressure

C. Atmospheric pressure

D. Mole fraction of respective phase

23) Find the false statement for the better choice of the absorbent.

A. Gas solubility should be high

B. Vapour pressure should be low

C. Viscosity should be high

D. Low freezing point

24) Find the most common example for absorption.

 A. Ammonia and air in solvent water

 B. Ammonia and Carbon dioxide in solvent water

C. Methane and air in solvent water

D. Methane and Carbon dioxide in solvent water

25) Column is the most suitable for achieving best performance for the mass transfer operation involving mass transfer with reaction

A. Packed Column

B. Tray Column

C. Ventury Scrubber

D. Spray Column

26) In a gas- liquid absorption column for getting maximum efficiency

A. Liquid stream distributed uniformly

B. Gas stream distributed uniformly

C. Both liquid and Gas stream distributed uniformly

D. By passing should be completely avoided

27) Which of the following equipment not used for gas dispersion

    A. Agitated Vessels
    B. Bubble Cap tray tower
    C. Perforated sieve tray tower
    D. Spray tower

28) The relation $Sc = Pr = 1$ is valid when the mechanism of _____

    A. Heat and Mass
    B. Mass and momentum
    C. Heat and momentum
    D. Heat, mass and momentum

29) In case of desorber (stripper)_____

    A. Operating line lies above equilibrium curve
    B. Operating line lies below equilibrium curve
    C. Temperature remains unaffected
    D. Temperature always increases

30) **Chemisorption (chemical adsorption) is**

    A. same as "Van der Waals" adsorption.
    B. characterised by adsorption of heat.
    C. an irreversible phenomenon.
    D. a reversible phenomenon.

31) **Which of the following quantities need not be fixed before starting the design of a co-current absorber ?**

    A. Heat gain or loss
    B. Flow rate of entering liquid
    C. Flow rate of gas
    D. None of these

32) **Absorption accompanied with chemical reaction is exemplified by the absorption of**

    A. ammonia in water.
    B. benzol present in coke oven gas by wash oil.
    C. SO_2 in alkaline solution.
    D. None of these

33) **The mass diffusivity, the thermal diffusivity and the eddy momentum diffusivity are same for, $N_{Pr} = N_{Sc} =$ _____**

    A. 1
    B. 0.5
    C. 10

D. 0

34) In a packed absorption tower, if the equilibrium and operating lines are both straight lines, then the ratio, HETP/HTU$_{OG}$ _____ the absorption factor.

    A. increases with increase in
    B. is one at unity value of
    C. both (A) and (B)
    D. neither (A) nor (B)

35) Which of the following plays an important role in problems of simultaneous heat and mass transfer?

    A. Lewis number
    B. Schmidt number
    C. Prandtl number
    D. Sherwood number

36) Consider steady state equimolar counter-diffusion through converging diverging tube with radius $r_1 = 1$cm, $r_2 = 2$ cm and flux rate $N_A = 10^{-6}$ Kmol/m^{2}s then the rate of transport will be

    A. $2 * 10^{-6}$ Kmol/s at vessel (1)
    B. $2 * 10^{-7}$ Kmol/s at vessel (1)
    C. $5 * 10^{-7}$ Kmol/s at vessel (2)

37) Sublimation long cylinder of naphthalene occurs in a large volume of stagnant air time required for complete sublimation

    A. Infinite
    B. Half of sublimation of sphere of the same mass
    C. Twice the time of sublimation of a cylinder of the same mass and length/Diameter = 1

38) The optimum ratio of actual liquid rate to the minimum liquid rate for absorption lies between

    A. 0 and 1
    B. 0.5 and 1.5
    C. 1.2 and 2

39) The length of unused bed for breakthrough curve in case of adsorption is more then mass transfer zone is

    A. Wide
    B. Narrow
    C. Asymmetric

40) Absorption of oxygen from air in water is liquid film resistance controlled if oxygen from air is absorbed in a strong solution of alkaline pyrogallate then controlling resistance offered by

    A. Gas phase
    B. Liquid phase
    C. Both gas and liquid phases