PaperCode: 3006 **Paper Name:** 3006-M.TECH.(SET-VII) CHEMICAL ENGG(PG-CE) **Set Name:** Original

Q-1 Find the rate of heat leakage from a spherical vessel (1.2 m diameter and 100 mm thick), if the temperature difference between the inner and outer surfaces is 200°C. Thermal conductivity of material is 0.3 kJ /mh°C.

A 786.2W
B 630.5W
C 879.1W
D 936.2W

Correct Answer : C

Q-2 In case of heat transfer equipments, LMTD stands for

A Lateral mean temp. difference
B Log mean temperature difference
C Log mean temperature deviation
D Linear minimum temp. difference

Correct Answer : B

Q-3 In which type of condensation, the heat transfer is more?

A Film wise
B Drop wise
C Both A and B above
D None of the above

Correct Answer : B

Q-4 What is the mode of heat transfer through which the heat travels from sun to earth?

A Conduction
B Convection
C Radiation
D All of above

Correct Answer : C

Q-5 What will be the cut diameter of a cyclone (inlet width 15 cm, the shortest length 25 cm, diameter 0.50 m) operating at five effective turns? The gas temperature is 345K and inlet velocity is 20m/s. Average particle size is 10μm with particle density 1.2 g/cm³. The viscosity of air at 345K is 0.0745 kg/m-h.

A 13.6 μm
B 18.6 μm
C 15.6 μm
D 19.6 μm

Correct Answer : A

Q-6 Which of the following is ultrafine grinder?

A Fine impact mill
B Spiral jet mill
C Fluidized bed jet mill
D All of the above

Correct Answer : D

Q-7 In natural convection, the Nusselt number is function of

A Reynold's number & Grashoff's number
B Grashoff's number & Reynold's number
C Grashoff's number & Prandtl number
D Prandtl number & Reynold's number

Correct Answer : C

Q-8 What will be the rate of heat transfer through a sheet with thickness 0.2 m, thermal conductivity 0.4 W/mK and surface area 1 m² if the temperatures on both sides of sheet are 600 and 400°C?

A 800 W

B 400 W

C 600 W

D 200 W

Correct Answer : B

Q-9 A reverse flow cyclone separator has _____ dimension ratios.

A 4

B 5

C 6

D 7

Correct Answer : D

Q-10 For designing the settling chamber

A Bulk density is required

B Particle density is required

C True density is required

D None of the above

Correct Answer : B

Q-11 At terminal velocity

A Acceleration is zero

B Velocity is zero

C Acceleration is negative

D None of the above

Correct Answer : A

Q-12 Flooding in a column results due to

A High flow rate of liquid

B Low velocity of liquid

C High pressure drop

D High temperature

Correct Answer : A

Q-13 Which of the following is an undesirable property for an absorbing solvent?

A Low vapour pressure

B Low viscosity

C Low freezing point

D None of above

Correct Answer : D

Q-14 Drying of a solid involves _____ transfer.

A Only heat

B Only mass

C Both heat and mass

D None of these

Correct Answer : C

Q-15 Which law is used for crushing and grinding the materials?

A Bond's law

B Kick's law

C Rittinger's law

D All of the above

Correct Answer : D

Q-16 McCabe-Thiele method is used to find

A **No. of trays in the column**

B Pressure drop in the column

C Reflux ratio

D None of the above

Correct Answer : A

Q-17 Filtration rate does not depend upon the

A pressure drop

B resistance of the cake

C area of filtering surface

D **None of above**

Correct Answer : D

Q-18 Estimate the value of the mass transfer coefficient for air at 30°C flowing at 45 m/s past a wet flat plate of length 0.5 m. (assuming negligible moisture initially). For air: diffusion coefficient $D = 0.256 \times 10^{-4}$ m^2/s, dynamic viscosity $\mu = 1.86 \times 10^{-5}$ kg/m·s, specific heat $c_p = 1.005$ kJ/kg·°C, Prandtl number Pr = 0.701, and density $\rho = 1.165$ kg/m^3.

A 0.3075 m/s

B **0.1075 m/s**

C 0.4075 m/s

D 0.2075 m/s

Correct Answer : B

Q-19 What will be the relative saturation for nitrogen gas if its vapour pressure is 400mmHg and the partial pressure is 300mmHg.

A 100

B 50

C **75**

D 133

Correct Answer : C

Q-20 Find the moisture content on dry basis if the weight of dry solid is 5 kg and the moisture is 2 kg.

A **0.4**

B 0.5

C 0.6

D 0.7

Correct Answer : A

Q-21 As per Graham's law, which gas will diffuse faster?

A Oxygen

B Carbon dioxide

C Nitrogen

D **Hydrogen**

Correct Answer : D

Q-22 15. 8 moles of A initially are added to 24 moles of B for the reaction 2A + 3B -> 4C + 5D. How many moles of D will be produced?

A 10

B 20

C **30**

D 40

Correct Answer : C

Q-23 Which of the following is a green house gas other than CO_2?

A Methane
B Nitrous oxide
C Chloro fluoro carbons
D All of these

Correct Answer : D

Q-24 What will be the ratio of the time required for 90% conversion to time required for 45% conversion for an isothermal second order aqueous phase reaction A → B.

A 2
B 4
C 11
D 22

Correct Answer : C

Q-25 Mixed reactor of 3 litres is used for gas reaction. Volume at a rate of 1 litre/second. Space time is _____ seconds.

A 1
B 3
C 1/3
D 32

Correct Answer : B

Q-26 The reason of increasing the rate of reaction by using catalyst is

A Lowering in activation energy barrier
B Increase in activation energy
C Decrease in molecular collision diameter
D All of the above

Correct Answer : A

Q-27 With increase in temperature, the equilibrium conversion of a reversible exothermic reaction

A Decreases
B Increases
C Remains unaffected
D Decreases linearly with temp.

Correct Answer : A

Q-28 For a zero order reaction, the concentration of product increases with

A Increase in initial concentration
B Increase of reaction time
C Total pressure
D Decrease in total pressure

Correct Answer : B

Q-29 In a furnace, incomplete combustion results in the formation of

A Carbon soot
B Carbon monoxide
C Both A and B above
D None of the above

Correct Answer : C

Q-30 Which of the following laws is applicable to the hydraulic lift?

A Kirchhoff's law
B Pascal's law
C Stoke's law
D Archimedes' law

Correct Answer : B

Q-31 The value of critical Reynold's number for pipe flow is

A 1300
B 16000
C 10000
D None of above

Correct Answer : C

Q-32 Which pump may require priming?

A Reciprocating

B Centrifugal

C Diaphragm

D Gear

Correct Answer : B

Q-33 Pitot Tube is used to measure

A Stagnation pressure

B Terminal velocity

C Velocity at stagnation point

D Pressure drop

Correct Answer : A

Q-34 What will be the NPSH of a pump to lift water from 1 meter below the pump level (Temperature 20 °C). Reservoir is open to the atmosphere. Assume the friction loss of 1.7 meters. Vap. Pr. of the system at given temperature is 2.34 kPa

A 7.4 m

B 16.5 m

C 200 m

D 100 m

Correct Answer : A

Q-35 IRR in engineering economics stands for

A Internal rate of return

B investment rate ratio

C Internal rapport rate

D None of the above

Correct Answer : A

Q-36 An investment of Rs. 100000 gives annual net profit of Rs. 10000. What is the payback period in years?

A 5

B 10

C 15

D 20

Correct Answer : B

Q-37 The value of cost index for any equipment will generally _____ with time

A Decrease

B Becomes negative

C Increase

D None of these

Correct Answer : C

Q-38 For one year compounded annually, the simple interest will be _____ compounded interest

A More than

B Less than

C Equal to

D Inverse of

Correct Answer : C

Q-39 Process which does not produce Cl_2 as a co-product during manufacture of caustic soda is

A Diaphragm electrolytic cell process

B Lime soda process

C Mercury electrolytic cell process

D None of the above

Correct Answer : B

Q-40 The cheapest material of construction for the storage of sodium hydroxide upto a concentration of 75% is

A Copper
B Nickel
C Silver
D Stainless steel

Correct Answer : D

Q-41 In the solvex plants, the solvent used for oil extraction is mainly _____.

A Furfural
B Propane
C Hexane
D Butane

Correct Answer : C

Q-42 In Contact process, SO_3 is adsorbed in H_2SO_4 and not in water, because

A Mist is formed and absorption becomes difficult
B Temperature increases if dissolved in water
C Absorption of gas in water is zero
D Acid is good absorber of gas

Correct Answer : A

Q-43 Teflon (PTFE) is corroded by

A Dilute HCl acid
B Conc. HCl acid
C Sulphuric acid
D None of above

Correct Answer : D

Q-44 Coefficient of performance of a Carnot's refrigeration working between two extreme temperatures of 5°C and 50°C will be

A 0.11
B 6.18
C 0.9
D 9.0

Correct Answer : B

Q-45 Gibbs-Duhem equation is used for

A Checking the consistency of thermodynamic data
B Finding boiling temperature
C Relating fugacity with pressure
D None of the above

Correct Answer : A

Q-46 Two liquids form an azeotropic mixture can be separated by

A Batch distillation
B Extractive distillation
C Crystallization
D Leaching

Correct Answer : B

Q-47 To double the volume of a given mass of an ideal gas at 290°K keeping the pressure constant, raise temperature to

A 580°K
B 700°K
C 300°K
D 1000°K

Correct Answer : A

Q-48 For a chemical reaction at equilibrium, change in Gibb's free energy (ΔG) is

A **Zero**
B Greater than zero
C Less than Zero
D None of above

Correct Answer : A

Q-49 The component of fuel which initiates the combustion is

A Oxygen
B Hydrogen
C **Volatile matter**
D Carbon

Correct Answer : C

Q-50 Material of construction for storage of sulphuric acid is

A HDPE
B Carbon steel
C FRP
D **All of the above**

Correct Answer : D

Q-51 An amount is invested at 10% per annum compound interest for 2 years, and the interest earned is Rs. 840. What is the principal amount?

A Rs. 3500
B Rs. 4500
C **Rs. 4000**
D Rs. 5000

Correct Answer : C

Q-52 In covering a distance of 30 km, A takes 2 hours more than B. If A doubles his speed, then he would take 1 hour less than B. A's speed is:

A **5 km/h**
B 7 km/h
C 9 km/h
D 10 km/h

Correct Answer : A

Q-53 Fill the blank in the middle of the following series.
SCD, TEF, UGH, _____, WKL

A CMN
B UJI
C **VIJ**
D IJT

Correct Answer : C

Q-54 The Chandrayaan 3 mission's rover is known as

A PSLV
B **Pragyaan**
C Dhruv
D Vikram

Correct Answer : B

Q-55 We were very tired, So we _____ early.

A Leave
B Leaving
C **Left**
D Lost

Correct Answer : C

Q-56 Consider the system of linear equations

$$x+2y-3z=-2,$$
$$3x-y+4z=3,$$
$$6x+5y+\lambda z=-3$$

where x,y,z are the variables and λ is a constant. Then which one of the following is true ?

A If λ=5, then system has unique solution

B If λ=5, then system has infinitely many solutions

C If λ=5, then system has no solution

D System is inconsistence for any value of λ

Correct Answer : B

Q-57 Evaluate double integral $\int_0^\infty \int_x^\infty \frac{e^{-y}}{y} dy\, dx.$

A 0

B 1

C -2

D 2

Correct Answer : B

Q-58 Using Newton's iterative method with initial approximation $x_0 = 2$, the root of the equation $x^3 - 2x - 8 = 0$ after one iteration is

A 2.40

B 2.33

C 2.12

D 2.50

Correct Answer : A

Q-59 Find the directional derivative of $F(x,y,z) = x^2yz + 4xz^2$ at $(1,-2,-1)$ in the direction of vector $2\hat{\imath} - \hat{\jmath} - 2\hat{k}$.

A 31/3

B 35/3

C 37/3

D 38/3

Correct Answer : C

Q-60 The general solution of the first order differential equation $\frac{dy}{dx} + 2y \tan x = \sin x$ is

A $y = \sin x + k \cos^2 x$

B $y = \sin x + k \sin^2 x$

C $y = \cos x + k \sin^2 x$

D $y = \cos x + k \cos^2 x$

Correct Answer : D