

SUB: CHEMICAL ENGINEERING (CH)**Time: 1 Hour 30 minutes****Instructions:**

1. Ensure that all pages are printed.
2. Use Black ball pen only
3. Change in option is not allowed
4. There is no negative marking
5. Use of non-programmable scientific calculator is allowed

1.	The condition for which Bernoulli's equation is invalid			
	A	Applies along stream line	B	Incompressible flow
	C	Viscous flow	D	Steady Flow
2.	If a liquid enters a pipe of diameter d with a velocity v , what will its velocity at the exit if the diameter reduces to $0.5d$?			
	A	$0.5v$	B	v
	C	$2v$	D	$4v$
3.	Which of the following is not a differential pressure flow meter,			
	A	Rota Meter	B	Venturi Meter
	C	Orifice meter	D	Flow nozzle
4.	For an incompressible fluid does density vary with temperature and pressure?			
	A	It varies only for lower values of temperature and pressure	B	It varies only for higher values of temperature and pressure
	C	It varies for all temperature and pressure range	D	It remains constant
5.	Water is flowing through a 20 cm diameter pipe with friction factor, $f = 0.04$. the flow is			
	A	Non viscous	B	viscous
	C	Both (A) and (B)	D	None of these
6.	Specific speed of a centrifugal pump is an index of pump type using capacity and head obtained at the point of maximum efficiency (find out incorrect statement)			
	A	Impellers for high heads have low specific speed	B	Impeller shape depends on the specific speed
	C	Large impellers have large specific speed	D	It is the RPM at which impeller would run to deliver 1 gallon per minute against total head of 1 ft
7.	Overall efficiency of a centrifugal pump is the ratio of			
	A	Actual work done by the pump to the energy supplied to the pump by the prime mover	B	Manometric head to the energy supplied by the impeller per Newton of water

	C	Energy available at the impeller to the energy supplied to the pump by the prime mover	D	Energy supplied to the pump to the energy available at the impeller
8.	When the frictional drag on the particles becomes equal to their apparent weight, then			
	A	Less resistance is seen	B	High resistance is seen
	C	No resistance is seen	D	No changes occurs
9.	According to Rittingers law, work required in crushing is proportional to			
	A	Initial Feed	B	Energy Consumed
	C	Surface area created	D	Final volume
10.	Which of the following works on the principle of shearing?			
	A	Roll Crusher	B	Toothed crusher
	C	Ball mill	D	Rod mill
11.	For a given value of Nusselt number, the convective surface coefficient h is directly proportional to,			
	A	Thermal conductivity	B	Surface
	C	Length	D	Density
12.	The convective coefficients for condensation usually lie in the range,			
	A	30-300 W/m ² -K	B	60-3000 W/m ² -K
	C	300-10000 W/m ² -K	D	2500-10000 W/m ² -K
13.	Which of the following is an example of forced convection?			
	A	Heat exchange on cold and warm pipes	B	Flow of water in condenser tubes
	C	Chilling effect of cold wind on a warm body	D	Cooling of billets in the atmosphere
14.	Heat transfer takes place in liquids and gases is essentially due to			
	A	Radiation	B	Conduction
	C	Convection	D	Conduction as well as convection
15.	With increase in temperature, thermal conductivity of solid metals			
	A	Increases	B	Decreases
	C	Remains constant	D	Depends on other factors
16.	The unit of thermal diffusivity is			
	A	m ² /hr	B	m ² /hr -K
	C	Kcal/ m ² -hr	D	m/hr -K
17.	The rate of convective heat transfer between a solid boundary and adjacent fluid is given by			
	A	$Q = h (t_s - t_f)$	B	$Q = h A$
	C	$Q = (t_s - t_f)$	D	$Q = h A (t_s - t_f)$
18.	Absorptivity and reflectivity of a white body respectively are			
	A	0 and 0	B	1 and 0
	C	0 and 1	D	1 and 1
19.	Baffles are provided in heat exchangers to increase the			
	A	Fouling factor	B	Heat transfer co-efficient
	C	Heat Transfer Rate	D	None of these
20.	Ratio of inertia force to viscous force is known as			
	A	Reynolds number	B	Stanton number
	C	Peclet number	D	Grashof number
21.	The dimension of diffusion coefficient is given by			
	A	LT ⁻¹	B	L ² T ⁻¹

	C	MLT^{-2}	D	$ML^{-2}T$
22.	The Concentration of the two phases in a closed system at the Interphase is			
	A	Becomes zero	B	Changes continuously
	C	Never changes	D	Increases till the driving force becomes zero
23.	Desirable value of absorption factor in an absorber is			
	A	1	B	>1
	C	<1	D	0
24.	For steady state equimolar counter diffusion of two gases A and B, the ratio N_A/N_{A+N_B} is			
	A	0	B	$\frac{1}{2}$
	C	1	D	∞
25.	In saturated gas, the			
	A	Vapor is in equilibrium with the liquid at the gas temperature	B	Vapor is in equilibrium with the liquid at the room temperature
	C	Partial pressure of the vapor equals the vapor pressure of the liquid at room temperature	D	None of the above
26.	Ideal stages are also known as			
	A	Differential or Actual stages	B	Differential or Theoretical stages
	C	Equilibrium or Actual stages	D	Equilibrium or Theoretical stages
27.	Relative humidity is the ratio of the			
	A	Actual humidity to saturation humidity	B	Partial pressure of the vapor to the vapor pressure of the liquid at the room temperature
	C	Partial pressure of the vapor to the vapor pressure of the liquid at the gas temperature	D	None of the above
28.	The higher difference in pressure inside the tray tower cause			
	A	Weeping	B	Flooding
	C	Loading	D	Dumping
29.	In an operation, the enthalpy is similar throughout the initial and final condition such operation is			
	A	Isothermal	B	Non- Isothermal
	C	Adiabatic	D	Non-Adiabatic
30.	Azeotropic composition can be eliminated by			
	A	Changing temperature	B	Changing pressure
	C	Changing Volume	D	None of these
31.	After leaving the condenser if the liquid is at bubble point then which of the following is correct?			
	A	Same concentration of distillate and reflux	B	Different concentration of distillate and reflux
	C	No latent heat is removed	D	None of the above

32.	If q is interpreted to be the fraction of the feed stream that is liquid then for saturated liquid feed to a distillation column			
	A	$q < 0$	B	$q = 0$
	C	$q > 1$	D	$q = 1$
33.	By adding entrainer or solvent one of the component's _____ gets reduced.			
	A	Boiling Point	B	Dew Point
	C	Bubble Point	D	All of the above
34.	Inside the distillation column			
	A	Pressure remains constant	B	Pressure increases gradually from bottom to the top of the column
	C	Pressure decreases gradually from bottom to the top of the column	D	Highest temperature at the top of the column
35.	If the selectivity of the solvent used in liquid-liquid extraction is unity			
	A	Any degree of separation of solute is possible	B	No separation will occur
	C	Solvent flow rate should be very low	D	Amount of solvent required will be minimum
36.	Which of the following is used in gas absorption?			
	A	Packed Tower	B	Wetted wall tower
	C	Perforated tray tower	D	All of the above
37.	In batch distillation with constant reflux, overhead product composition			
	A	Does not vary with time	B	Increase with time
	C	Decrease with time	D	None of these
38.	In a closed thermodynamic system			
	A	No heat transfer across the boundaries	B	No mass transfer across the boundaries
	C	No mass transfer but heat across the boundaries	D	Both heat and mass transfer across the boundaries
39.	The extensive properties is/are			
	A	Pressure and temperature	B	work
	C	Viscosity, density and concentration	D	All of the above
40.	In a reversible isothermal process, the change in internal energy is			
	A	Zero	B	Negative
	C	Positive	D	None of the above
41.	For ideal gas the relation between the enthalpy change (ΔH) and internal energy change (ΔE) at constant temperature is			
	A	$\Delta H = \Delta E + PV$	B	$\Delta H = \Delta E + P\Delta T$

	C	$\Delta G = \Delta H + T\Delta S$	D	$\Delta H = \Delta E + (\Delta n)RT$
42.	$P_1 V_1^\gamma = P_2 V_2^\gamma$ (whereas $\gamma = C_p/C_v$) is valid for			
	A	Isobaric process	B	Isochoric process
	C	Isentropic process	D	Adiabatic process
43.	The specific heat of a substance at constant volume is defined as the rate of change of --- _____ with respect to _____			
	A	specific internal energy, pressure	B	heat, temperature
	C	specific internal energy, temperature	D	work, pressure
44.	What does a nozzle do?			
	A	increases the velocity of a fluid at the cost of its pressure drop	B	Increases the velocity of a fluid and also its pressure
	C	decreases the velocity of a fluid at the cost of its pressure gain	D	None of the above
45.	The equation $PV = nRT$ is best obeyed by gases at			
	A	High temperature, high pressure	B	High temperature, low pressure
	C	Low temperature, low pressure	D	Low temperature, high pressure
46.	A heat transfer process approaches reversibility as the temperature difference between two bodies approaches			
	A	Zero	B	-1
	C	1	D	Infinity
47.	Third law of thermodynamics is helpful in			
	A	Calculating absolute entropies of substance at different temperature	B	Calculating entropy changes of chemical reaction
	C	Both (a) and (b)	D	None of the above
48.	Most suitable conveyor for transportation of sticky material is			
	A	Pneumatic conveyor	B	Screw conveyor
	C	Belt conveyor	D	Apron conveyor
49.	In froth floatation, chemical agent is added to cause air adherence is called			
	A	Frother	B	Collector
	C	Modifier	D	None of the above

50.	As particle size is reduced			
	A	Capacity and effectiveness of the screen is increased	B	Screen becomes progressively easier
	C	Screen becomes progressively more difficult	D	None of the above
51.	Which of the following controllers has maximum offset,			
	A	PID – controller	B	PI- controller
	C	PD – controller	D	P - controller
52.	In under damped second order response, the value of decay ratio is equal to			
	A	Overshoot	B	(Overshoot) ²
	C	(Overshoot) ⁻²	D	1
53.	U – tube manometer filled with mercury is an example of			
	A	Under damped second order system	B	Non- Oscillatory second order system
	C	Oscillatory second order system	D	Critically damped second order system
54.	Transportation lag is a characteristic of			
	A	First order system	B	Second order system
	C	Third order system	D	All higher order other than first order system
55.	The bode stability criterion is applicable when			
	A	Gain and phase curves decrease continuously with frequency	B	Gain curve increases and phase curve decreases with frequency
	C	Gain and phase curves both increase with frequency	D	Gain curve decreases and phase curve increases with frequency
56.	A special case of proportional control is on-off control, when its gain (Kc) is			
	A	Negative value	B	Very low
	C	Zero	D	Very high
57.	If 'n' is the order of reaction, the unit of rate constant is			
	A	1 / (time) (concentration) ⁿ⁻¹	B	(time) ⁻¹ (concentration) ⁿ⁻¹
	C	(time) (concentration) ⁿ⁻¹	D	(time) ⁿ⁻¹ (concentration)
58.	Half-life period of a chemical reaction is			
	A	Half of residence time of a reaction	B	Half of the space time of a reaction

	C	The time required to reduce the concentration of the reacting substance to half of its initial value	D	All of the above
59.	For a first order reaction, the rate constant as a function of half life is given as _____			
	A	$0.6931 \times k$	B	$0.6931/k$
	C	0.6931	D	$k/0.6931$
60.	For the parallel reaction $P \rightarrow Q$ and $P \rightarrow R$, of rate constants k_1 and k_2 respectively, both reactions of order 1, the rate expression is given as _____			
	A	$-r_A = k_1 C_p + k_2 C_p$	B	$-r_A = k_1 C_p - k_2 C_p$
	C	$-r_A = k_1 C_p$	D	$-r_A = k_2 C_p$
61.	For a reaction $2A + B \rightarrow 2C$, the rate of equation is given as $-r_A = k C_A^2 C_B$.			
	A	the order with respect to A is 1 and the order overall is 1	B	the order with respect to A is 2 and the order overall is 2
	C	the order with respect to B is 2 and the order overall is 2	D	the order with respect to A is 2 and the order overall is 3
62.	When the concentration of reactant molecules is increased, the rate of reaction increases. The best explanation is: As the reactant concentration increases,			
	A	the order of reaction increases	B	the frequency of molecular collisions increases.
	C	the rate constant increases	D	the average kinetic energy of molecules increases
63.	The rate determining step of a series of reactions is the one _____			
	A	That does not contribute to the reaction	B	The slowest
	C	The Fastest	D	None of the above
64.	The combination of ideal reactors among the following is _____			
	A	Plug flow reactor and mixed flow reactor	B	Plug flow reactor and batch reactor
	C	Batch reactor and mixed flow reactor	D	Batch reactor only
65.	The design equation for Batch reactor in differential form is _____			
	A	$dX_A/dt = -r_A V$	B	$N_{A0} = -r_A V$
	C	$N_{A0} dX_A/dt = -r_A V$	D	$N_{A0} dX_A/dt = -r_A$
66.	A space velocity of 6 hr^{-1} means _____			
	A	Takes 6 hours to treat one reactor volume of feed	B	Reaction time is 6 hours
	C	Feed is fed at 6 hrs interval	D	6 reactor volumes of feed is fed into the reactor per hour
67.	Which of the following is true for fluidized catalytic beds?			
	A	They come under the category of batch reactors	B	They cannot be used for multi-phase chemical reactions
	C	The bulk density is a function of the flow rate through the bed	D	There is no pressure drop
68.	Joint efficiency (J) for a seamless pipe is			
	A	< 0.5	B	1
	C	0.85	D	1.5

69.	Floating head heat exchangers are used for			
	A	Heat transfer between corrosive fluids	B	Co-current heat transfer systems
	C	Counter-current heat transfer systems	D	Cases where temperature difference between the shell and the tube is more ($> 50^{\circ}\text{C}$)
70.	Within elastic limit of a given material, the ratio of unit lateral to the unit axial elongation is a constant called			
	A	Poisson's ratio	B	Modulus of elasticity
	C	Modulus of rigidity	D	None of the above
71.	Poly Vinyl Chloride (PVC) is a			
	A	Chemically active material	B	Fibrous material
	C	Thermoplastic material	D	Thermosetting material
72.	Epoxy resin			
	A	Is a good adhesive	B	Is an elastomer
	C	Cannot be used for surface coatings	D	Is a polyester
73.	Nature of polymer obtained in free radical polymerization is			
	A	Narrow molecular weight distribution	B	Broad molecular weight distribution
	C	Generally isotactic structure	D	Medium molecular weight distribution
74.	Cracking is			
	A	An exothermic reaction	B	An endothermic reaction
	C	Favored at low temperature	D	None of the above
75.	Flash point of a liquid petroleum fuel gives an idea about its			
	A	Nature of boiling point diagram	B	Volatility
	C	Explosion hazards characteristics	D	All of the above
76.	Which of the following has the lowest cetane number?			
	A	Olefins	B	Naphthene
	C	Aromatics	D	i-paraffins
77.	Visbreaking			
	A	Is carried out at atmospheric pressure	B	Produces gasoline only
	C	Uses natural gas as feed	D	Produces fuel oil of lower viscosity
78.	The most important property for a jet fuel is its			
	A	Freezing point	B	Calorific value
	C	Flash Point	D	Viscosity
79.	Reforming converts			
	A	Naphthenes into olefins	B	Naphthenes into aromatics

	C	Olefins into paraffins	D	Naphthenes into paraffin
80.	Octane number of n-heptane is assumed to be			
	A	100	B	70
	C	0	D	∞
81.	Which of following is characteristic equation of a square matrix $A = \begin{bmatrix} 1 & 0 \\ 1 & 2 \end{bmatrix}$?			
	(a) $\lambda^2 - 3\lambda + 2 = 0$		(b) $\lambda^2 + 3\lambda - 2 = 0$	
	A	Only (a)	B	Only (b)
	C	Both (a) and (b)	D	None of these
82.	System of linear equation $AX = B$ is said to be inconsistent if			
	(a) $\text{Rank}(A) = \text{Rank} [A : B]$		(b) $\text{rank} (A) \neq \text{rank} [A : B]$	
	A	Only (a)	B	Only (b)
	C	Both (a) and (b)	D	None of these
83.	If c, is an Eigen value of matrix A then in general which of following is correct?			
	(a) c^2 is Eigen value of A^2		(b) c^{-1} is Eigen value of A^{-1}	
	A	Only (a)	B	Only (b)
	C	Both (a) and (b)	D	None of these
84.	If at $x = a$, function $y = f(x)$ has local maxima then in general which of following is correct?			
	(a) $f'(a) = 0$		(b) $f''(a) < 0$	
	A	Only (a)	B	Only (b)
	C	Both (a) and (b)	D	None of these
85.	If $u(x,y) = \cos(xy)$ then which of following is correct			
	(a) $u_x(x,y) = -\sin(xy)$		(b) $u_x(x,y) = -x\sin(xy)$	
	A	Only (a)	B	Only (b)
	C	Both (a) and (b)	D	None of these
86.	$\int_{-1}^1 x dx = \underline{\hspace{2cm}}$			
	A	0	B	$\frac{1}{2}$
	C	1	D	None of these
87.	Rotation of a rigid body is calculated by finding _____ of vector function			
	A	Gradient	B	Divergence

	C	Curl	D	Differentiation
88.	What is the length of the curve $\vec{r}(t) = (\cos t)\hat{i} + (\sin t)\hat{j}$ from $t = 0$ to $t = \pi$			
	A	$\frac{\pi}{2}$	B	π
	C	$\frac{\pi}{4}$	D	None of these
89.	If A and B are two events in sample space S, then in general which of following is correct? (a) $P(A \cup B) = P(A) + P(B) + P(A \cap B)$ (b) $P(A \cup B) = P(A) + P(B)$			
	A	Only (a)	B	Only (b)
	C	Both (a) and (b)	D	None of these
90.	Simpson 1/3 rd Method is use for (a) solution of differential equation (b) calculation of definite integral			
	A	Only (a)	B	Only (b)
	C	Both (a) and (b)	D	None of these
91.	Which of following is wave Equation?			
	A	$\frac{\partial u}{\partial t} = c^2 \frac{\partial^2 u}{\partial x^2}$	B	$\frac{\partial^2 u}{\partial t^2} = c^2 \frac{\partial^2 u}{\partial x^2}$
	C	$\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$	D	none of these
92.	Solution of $\frac{d^2 y}{dx^2} = y$ is _____			
	A	$y = ae^x + be^{-x}$	B	$y = a \cos x + b \sin x$
	C	$y = (a + bx)e^x$	D	None of these
93.	Which of following is solution of $y'' - y' + 6y = 0$ (a) e^{3x} (b) e^{-2x}			
	A	Only (a)	B	Only (b)
	C	Both (a) and (b)	D	None of these
94.	Laplace transform of a function $f''(t)$ is _____			
	A	$s^2 \bar{f}(s) - sf(0) - f'(0)$	B	$\int_0^\infty e^{st} f'(t) dt$
	C	$s^2 \bar{f}(s) - sf'(0) - f(0)$	D	None of these
95.	Which of following is correct for Laplace Transform (a) $L(\sin at) = \frac{s}{s^2 + a^2}$ (b) $L(\cos at) = \frac{s}{s^2 + a^2}$			
	A	Only (a)	B	Only (b)

	C	Both (a) and (b)	D	None of these
96.	Which of following is harmonic function (a) $u(x,y) = x^2 - y^2$ (b) $u(x,y) = 2xy$			
	A	Only (a)	B	Only (b)
	C	Both (a) and (b)	D	None of these
97.	Which of following is correct (a) Sequence $u_n = \frac{n!}{n^n}$ is divergent (b) $\sum_{n=1}^{\infty} \frac{n!}{n^n}$ is convergent			
	A	Only (a)	B	Only (b)
	C	Both (a) and (b)	D	None of these
98.	If $f(z) = u(x,y) + iv(x,y)$ is an analytic function then which of following is correct (a) $u_x = -v_y$ (b) $u_{xx} + u_{yy} = 0$			
	A	Only (a)	B	Only (b)
	C	Both (a) and (b)	D	None of these
99.	For complex valued function $f(z) = \frac{z+i}{(z-3)(z+4)^3}$ which of following is correct (a) 3 is a singular point (b) $f(z)$ has a simple pole at $z = 3$			
	A	Only (a)	B	Only (b)
	C	Both (a) and (b)	D	None of these
100.	$\oint_C \frac{e^z}{z-4} dz = \text{_____}$, where C is a unit circle.			
	A	1	B	$2\pi i e^4$
	C	e^4	D	None of these

_____x_____