



PUNJAB TECHNICAL UNIVERSITY JALANDHAR

Max. Marks: 90

Time: 90 Mins.

Entrance Test for Enrollment in Ph.D. Programme

Important Instructions

- Fill all the information in various columns, in capital letters, with blue/black ball point pen.
- Use of calculators is not allowed. Use Blue/Black ball point pen for attempting the questions.
- All questions are compulsory. No negative marking for wrong answers.
- To attempt a question, make a tick mark (✓) at the right option/answer.
- Each question has only one right answer.
- Questions attempted with two or more options/answers will not be evaluated.

Subject (Engg./Arch./Pharm./Mgmt./Sciences) ENGINEERING.....

Discipline / Branch CHEMICAL.....

Name

Father's Name

Roll No. Date : 10-07-2010.....

Signature of Candidate

Signature of Invigilator

- Q.1 Entropy change of a system is zero in
 (a) Reversible process (b) Adiabatic process
 (c) Reversible adiabatic process (d) Isothermal process
- Q.2 The equation of state for a certain gas is given by $P(V - b) = RT$, where b is a positive constant. The Joule – Thomson coefficient of this gas would be
 (a) Positive (b) Negative (c) Zero (d) Positive within the inversion point
- Q.3 Which one of the following is incorrect?
 (a) $dU = T dS - P dV$ (b) $dH = T dS - V dP$
 (c) $dA = -S dT - P dV$ (d) $dG = -S dT + V dP$
- Q.4 Which one of the following is incorrect with reference to partial molar properties?
 (a) They are intensive properties (b) They are always positive
 (c) They represent contribution of individual components to total solution property
 (d) They vary with composition of the solution
- Q.5 A solution exhibiting positive deviation from ideality
 (a) Always forms a minimum boiling azeotrope
 (b) Always forms a maximum boiling azeotrope
 (c) Has a total vapour pressure that is less than that predicted by Raoult's law
 (d) When formed from its constituents there is an absorption of heat
- Q.6 The equilibrium constant is independent of
 (a) The pressure at equilibrium (b) The temperature at equilibrium
 (c) The number of moles involved in the stoichiometric equation for the reaction
 (d) The temperature & pressure at the equilibrium

Q.7 An exothermic gas-phase reaction proceeds according to the equation



The equilibrium conversion for this reaction :

- (a) Increases with an increase in temperature
 - (b) Decreases on dilution with an inert gas
 - (c) Decreases with an increase in pressure
 - (d) Is affected by the presence of a catalyst
- Q.8 Which of the following is true for virial equation of state?
- (a) Virial coefficients are universal constants
 - (b) Virial coefficient B represents three-body interactions
 - (c) Virial coefficients are functions of temperature only
 - (d) For some gases, virial equations & ideal gas equation are the same
- Q.9 Assume that benzene is insoluble in water. The normal boiling points of benzene & water are 353.3 K & 373.2 K respectively. At a pressure of 1 atm, the boiling point of a mixture of benzene & water is
- (a) 353.3 K (b) < 353.3 K (c) 373.2 K (d) > 353.3 K but < 373.2 K
- Q.10 Reactions with high activation energy are
- (a) Very temperature sensitive
 - (b) Temperature insensitive
 - (c) Always irreversible
 - (d) Always reversible
- Q.11 Integral method for analysing the kinetic data is used
- (a) When the data are scattered
 - (b) For testing specific mechanisms with simple rate expressions
 - (c) Both (a) & (b)
 - (d) None of the these
- Q.12 Space time in flow reactor is
- (a) Usually equal to the residence time
 - (b) The reciprocal of the space velocity
 - (c) A measure of its capacity
 - (d) Both (a) & (b)
- Q.13 For multiple reactions, the flow pattern within the vessel affects the
- (a) Size requirement
 - (b) Distribution of reaction products
 - (c) Both (a) & (b)
 - (d) Neither (a) nor (b)
- Q.14 The performance of a cascade of CSTR's can be improved by adding
- (a) A P.F. reactor in series
 - (b) A P.F. reactor in parallel
 - (c) More CSTR's in series
 - (d) More CSTR's in parallel
- Q.15 Mean residence time is equal to the space time when
- (a) The feed rate is measured at temperature & pressure in the reactor
 - (b) The temperature, pressure & the density of reaction mixture remains constant throughout the reactor
 - (c) There is no change in number of moles in gaseous reaction
 - (d) All (a), (b) & (c)
- Q.16 When the reaction occurs in the diffused controlled region, the apparent activation energy as measured is only
- (a) Twice the true value
 - (b) Half the true value
 - (c) The true value
 - (d) None of these

- Q.17 Which of the following is an autocatalytic reaction?
 (a) Photochemical reactions (b) Microbial fermentation reaction
 (c) Enzyme fermentation reaction (d) Ammonia synthesis reaction
- Q.18 The exit age distribution of fluid leaving a vessel is used to know the
 (a) Activation energy of a reaction (b) Reaction mechanism
 (c) Extent of non-ideal flow in the vessel (d) None of these
- Q.19 In physical terms, Schmidt number means
 (a) Thermal diffusivity/mass diffusivity
 (b) Thermal diffusivity/momentum diffusivity
 (c) Momentum diffusivity/mass diffusivity
 (d) Mass diffusivity/thermal diffusivity
- Q.20 Flooding in a column results due to
 (a) High pressure drop (b) Low pressure drop
 (c) Low velocity of the liquid (d) High temperature
- Q.21 Boiling point diagram is
 (a) Not affected by pressure (b) Affected by pressure
 (c) A plot of temperature vs. liquid composition
 (d) A plot of temperature vs. vapour pressure
- Q.22 Relative volatility does not change appreciably with change in
 (a) Temperature (b) Vapour pressure of either component
 (c) Total pressure (d) None of these
- Q.23 For a binary mixture with low relative volatility
 (a) Use steam distillation (b) Use molecular distillation
 (c) Use high pressure distillation (d) An azeotrope may be formed during distillation
- Q.24 When the feed to a distillation column is a saturated liquid, slope of the feed line is
 (a) 0 (b) 1 (c) ∞ (d) None of these
- Q.25 Heat sensitive materials with very high latent heat of vaporisation may be Economically separated using
 (a) Liquid extraction (b) Distillation (c) Evaporation (d) Absorption
- Q.26 Rate of leaching increases with increasing
 (a) Temperature (b) Viscosity of solvent (c) Pressure (d) Size of the solid
- Q.27 Moisture contained by a substance in excess of the equilibrium moisture is called
 (a) Unbound moisture (b) Free moisture (c) Critical moisture (d) Bound moisture
- Q.28 Fourier's law of heat conduction applies to
 (a) Isothermal surface (b) Non-isothermal surface
 (c) Both (a) & (b) (d) None of these
- Q.29 Which is most suitable for cold viscous feed?
 (a) Forward feed (b) Backward feed (c) Mixed feed (d) Parallel feed

- Q.30 When vaporisation takes place directly at the heating surface, it is called
 (a) Film boiling (b) Nucleate boiling (c) Vapour binding (d) None of these
- Q.31 LMTD for counter flow & parallel flow heat exchanger will be the same, when
 (a) A cold fluid is heated to a certain temp. by condensing steam (isothermal fluid)
 (b) The outlet temp. of both the hot & cold fluid are same
 (c) The outlet temp. of hot fluid is less than the outlet temp. of the cold fluid
 (d) None of these
- Q.32 It is not preferable to use superheated steam in evaporators because of its very
 (a) High temperature (b) High pressure (c) Low film coefficient (d) None of these
- Q.33 In a shell & tube heat exchanger, the floating tube bundle head arrangement is used
 (a) In low range of temperature difference
 (b) In high range of temperature difference
 (c) Because of its low cost (d) To prevent corrosion of the tube bundles
- Q.34 Economy of a multiple effect evaporator depends upon
 (a) Heat balance consideration (b) Rate of heat transfer
 (c) Both (a) & (b) (d) Neither (a) nor (b)
- Q.35 In a heat exchanger, one transfer unit means
 (a) A section of the exchanger in which change in temperature of one stream equals the average driving force in the section
 (b) The size of the exchanger in which heat transfer rate is 1 kcal/hr
 (c) Both (a) & (b) (d) None of these
- Q.36 The range of electromagnetic spectrum important in heat transfer by radiation is
 (a) 0.38 – 0.78 micron (b) 0.5 – 50 microns
 (c) 100 – 1000 microns (d) 5 – 50 microns
- Q.37 Poise is converted into stoke by
 (a) Multiplying with density (gm/cc) (b) Dividing by density (gm/cc)
 (c) Multiplying with specific gravity (d) Dividing by specific gravity
- Q.38 The momentum correction factor for the velocity distribution of laminar flow is
 (a) 1.3 (b) 1.66 (c) 2.5 (d) None of these
- Q.39 Boundary layer separation is caused by
 (a) Reduction of pressure below vapour pressure
 (b) Reduction of pressure gradient to zero
 (c) An adverse pressure gradient
 (d) Reduction of boundary layer thickness to zero
- Q.40 The velocity profile for turbulent flow through a closed conduit is
 (a) Logarithmic (b) Parabolic (c) Hyperbolic (d) Linear
- Q.41 Power required for mixing newtonian fluids is a function of
 (a) Speed of impeller, diameter of impeller & viscosity
 (b) Density & viscosity of fluid only
 (c) Density of fluid, viscosity of fluid & impeller diameter only
 (d) None of these

- Q.42 Function of air vessel provided in a reciprocal pump is to
 (a) Reduce discharge fluctuation.
 (b) Reduce the danger of cavitation.
 (c) Avoid the necessity of priming.
 (d) Increase the pump efficiency.
- Q.43 Vena-contracta formed during flow of a liquid through an orificemeter has
 (a) Minimum liquid cross-section
 (b) More diameter compared to orifice diameter
 (c) Minimum velocity of fluid stream (d) None of these
- Q.44 Which of the following is the most common for pumping either raw sewage or sludge?
 (a) Electromagnetic pump (b) Centrifugal pump
 (c) Reciprocating pump (d) Gear pump
- Q.45 The pressure head of a flow meter remains constant for
 (a) Venturimeter (b) Orificemeter (c) Rotameter (d) Pitot tube
- Q.46 The terminal velocity of a small sphere settling in a viscous fluid varies as the
 (a) First power of its diameter (b) Inverse of the fluid viscosity
 (c) Inverse square of the diameter (d) None of these
- Q.47 The Navier-stokes equations deal with the law of conservation of
 (a) Mass (b) Energy (c) both (a) & (b) (d) Momentum
- Q.48 For steady ideal fluid flow, the Bernoulli's equation states that the
 (a) Velocity is constant along a stream line
 (b) Energy is constant throughout the fluid
 (c) Energy is constant along a stream line but may vary across stream lines
 (d) None of these
- Q.49 Paper pulp is an example offluid
 (a) Dilatant (b) Bingham plastic
 (c) Newtonian (d) Pseudoplastic
- Q.50 Water hammer in a pipeline results from
 (a) Bursting of pipelines due to closure by a valve
 (b) A rapid pressure change due to a rapid change in the rate of flow
 (c) A pressure increase due to closure of a valve resulting in decrease in rate of flow
 (d) None of these
- Q.51 The opening of 200 mesh screen (Taylor series) is
 (a) 0.0074 cm (b) 0.0074 mm
 (c) 0.0047 cm (d) None of these
- Q.52 Soft and non-abrasive materials can be made into fines by
 (a) Attrition (b) Compression
 (c) Cutting (d) None of these

- Q.53 Filter medium resistance is that offered by the
 (a) Filter cloth (b) Embedded particles in the septum
 (c) Filter cloth & the embedded particles collectively
 (d) None of these
- Q.54 Trommels separate a mixture of particles depending on their
 (a) Size (b) Density
 (c) Wettability (d) Electrical & magnetic properties
- Q.55 Separation of particles of various sizes, shapes & densities by allowing them to settle in a fluid is called
 (a) Classification (b) Froth floatation
 (c) Thickening (d) None of these
- Q.56 Permanent hardness of water is due to presence of calcium & magnesium
 (a) Bi-carbonates (b) Sulphates & chlorides
 (c) Carbonates (d) None of these
- Q.57 Black liquor is converted into the white liquor by
 (a) Evaporation & burning the concentrate followed by causticisation products
 (b) Multi-effect evaporation only
 (c) Selective liquid extraction
 (d) Extractive distillation
- Q.58 Flexible foam (for mattresses) is usually made of
 (a) PVC (b) Silicone (c) Polyurethane (d) Polyamides
- Q.59 A good quality coal should have
 (a) Low fusion point of ash (b) High ash content
 (c) High sulphur content (d) None of these
- Q.60 DDT stands for
 (a) Diethyl – diphenyl – trichloromethane
 (b) Dichloro – diphenyl – trichloromethane
 (c) Diphenyl – dichloro – trichloromethane
 (d) Dichloro – diphenyl – trichloroethane
- Q.61 Thermoplastic materials
 (a) Soften on application of heat (b) Are crosslinked molecules
 (c) Are solvent insoluble (d) None of these
- Q.62 Deaeration of water in its treatment is necessary as it
 (a) Minimizes its turbidity (b) Minimizes its corrosiveness
 (c) Helps in controlling its taste & odour (d) None of these
- Q.63 Percentage of alcohol in beer may be around
 (a) 27 – 32% (b) 18 – 23% (c) 2 – 8% (d) 1 – 4%
- Q.64 Teflon is
 (a) A monomer (b) Poly tetrafluoroethylene
 (c) Phenol formaldehyde (d) An inorganic polymer

- Q.65 Use of chlorine in treatment of sewage
 (a) Helps in grease separation (b) Increases the biological oxygen demand
 (c) Causes bulking of activated sludge (d) Aids in flocculation
- Q.66 Main constituents of natural rubber is
 (a) Polystyrene (b) Polybutadiene
 (c) Polychloroprene (d) Polyisoprene
- Q.67 When the damping coefficient is unity, the system is
 (a) Overdamped (b) Critically damped
 (c) Underdamped (d) Highly fluctuating
- Q.68 Response of a linear control system for a change in set point is called
 (a) Frequent response (b) Transient response
 (c) Servo problem (d) Regulator problem
- Q.69 Pirani gauge is used for
 (a) Measurement of very high pressure
 (b) Measurement of high vacuum
 (c) Liquid level under pressure
 (d) Liquid level at atmospheric pressure
- Q.70 Which of the following controllers has maximum offset?
 (a) P- controller (b) P – I controller
 (c) P – D controller (d) P – I – D controller
- Q.71 Carbon content in steel is
 (a) 5 – 10% (b) 4 – 6% (c) 0.1 – 2% (d) 0
- Q.72 Most common stainless steel type 316 which is highly corrosion resistant contains
 (a) 6 – 13% Cr, 10 – 14% Ni & 2 – 3% Mo
 (b) 20 – 22% Cr & 8 – 10% Ni
 (c) 2 – 4% Cr, 22% Ni & 2 – 4% Mo
 (d) None of these
- Q.73 Power required for agitation depends upon the
 (a) Height & properties of the liquid
 (b) Agitator type & speed of agitation
 (c) Size of agitator & the tank
 (d) All (a), (b) & (c)
- Q.74 In the case of a shell & tube heat exchanger, the logarithmic mean temp. Difference
 (a) is always more than arithmetic mean value & the geometric mean value
 (b) is always less than arithmetic average value
 (c) is always less than arithmetic mean value but more than geometric mean value
 (d) None of these
- Q.75 High pressure fluid in a shell & tube heat exchanger should preferably be routed through the
 (a) Tubes to avoid the expense of high pressure shell construction
 (b) Shell side for smaller total pressure drop
 (c) Shell side if the flow is counter-current & tube side if the flow is co-current
 (d) Shell side for large overall heat transfer co-efficient

- Q.76 Optimum economic pipe diameter for fluid flow is determined by the
 (a) viscosity of the fluid (b) density of the fluid
 (c) total cost consideration (pumping cost plus fixed cost of the pipe)
 (d) None of these
- Q.77 Which of the following efficiencies can be greater than 100% ?
 (a) Overall plate efficiency (b) Murphree plate efficiency
 (c) Point efficiency (d) None of these
- Q.78 In a condenser, the cooling water is passed in the tube side in a pass arrangement,
 Because
 (a) It reduces heat transfer area (b) More thinner tubes can be used
 (c) Pressure drop is reduced (d) It makes condenser compact
- Q.79 The wall thickness for a large high press. pipeline is determined by consideration of
 (a) Axial tensile stress in the pipe (b) Circumferential pipewall tension
 (c) Forces exerted by static & dynamic action at bends
 (d) Temperature stresses
- Q.80 Which tube arrangement in a heat exchanger would give highest heat transfer rate?
 (a) Square pitch (b) Heat transfer rate is independent of tube arrangement
 (c) Triangular pitch (d) Diagonal square pitch
- Q.81 The slope of operating line in the rectifying section of a distillation column is unity
 if the reflux ratio is
 (a) 0 (b) ∞ (c) 1 (d) Minimum
- Q.82 A solution with reasonable permanent pH is called
 (a) Ideal solution (b) Non-ideal solution
 (c) Buffer solution (d) Colloidal solution
- Q.83 In osmosis through a semi-permeable membrane, diffusion of
 (a) Solvent is from high concentration to low concentration region
 (b) Solvent is from low concentration to high concentration region
 (c) Solute takes place (d) None of these
- Q.84 Fuel for a nuclear reactor is
 (a) Uranium (b) plutonium (c) Radium (d) None of these
- Q.85 Fuel for a fast breeder reactor is
 (a) Plutonium (b) Uranium (c) Radium (d) None of these
- Q.86 Depreciation calculated by which of the following methods is maximum?
 (a) Diminishing balance method (b) Straight line method
 (c) Sum of the years digits method (d) Sinking fund method
- Q.87 “Break - even point” is the point of intersection of
 (a) Fixed cost & total cost (b) Total cost & sales revenue
 (c) Fixed cost & sales revenue (d) None of these
- Q.88 One torr is equal to
 (a) 1 Pascal (b) 1 ata (c) 1 mm Hg (d) 1 mm water column

- Q.89 “Encyclopaedia of Chemical Technology” has been
- (a) Authored by Kirk Othmer
 - (b) Edited by Perry & Chilton
 - (c) Edited by Kirk Othmer
 - (d) None of these
- Q.90 Runga – Kutta method is used to solve
- (a) Ordinary differential equation of nth order
 - (b) Simultaneous non – linear equation
 - (c) Linear differential equation
 - (d) None of these