

TE Petrochemical

NSM–(2012/2015 course)

Question Bank

- 1) If the curve passing through (1, 1), (2, 4), (3, 7) is given by  $y = y_0 + u\Delta y_0$ , then the value of  $y$  at  $x = 1.5$  is \_\_\_\_\_
- a. 2.5
  - b. 1.5
  - c. 1
  - d. 2
- 2) By using Newton's Backward difference formula the value of  $y$  when  $x = 2.5$  is

X	0	1	2	3
Y	0	1	4	9

- A. 3.5
- B. 12.5
- C. 6.25
- D. 2.33

- 3) A curve passes through the set of points

x	1	1.5	2	2.5	3	3.5	4
y	2	2.4	2.7	2.8	3	2.6	2.1

Using Simpson's  $1/3$ rd rule the value of  $\int_1^4 y dx$  is

- A. 7
- B. 6.8
- C. 7.8
- D. 8

- 4) At the end of second iteration , the real root of  $(17)^{1/3}$  by using Newton-Raphson method is

( Given that initial approximation is 2 and root value at the end of first iteration is 2.75)

- A. 2.7500
- B. 2.582645
- C. 2.571332
- D. 2

- 5) The next iterative value of the root of  $3x + \sin x - e^x = 0$  using Newton- Raphson method , if the initial guess is 0

- A. 0.1
- B. 0.3333
- C. 0.3602
- D. 0.4589

6) The first approximate real root of the equation  $x^3 - 5x - 7 = 0$  which lies in between 2 and 3, using method of false position is

- A. 2.8
- B. 2.114
- C. 2.6429
- D. 2.987

7) Given

X	0	1	2
y	2	3	4

The value of  $\int_0^2 y dx$ , using trapezoidal rule for the given data is \_\_\_\_\_

8) If  $f(x) = x^2$ ,  $\Delta x = 1$ , the value of  $\Delta(f(x))$  is equal to \_\_\_\_\_

9) How many real roots are there of the equation  $x^2 - 10 = 0$ ?

10)  $3 \frac{dy}{dx} + 5y^2 = \sin x$ ,  $y(0.3) = 5$  and using a step size of  $h=0.3$ , the value of  $y_1(0.6)$  using Euler's method is most nearly

- a) -7.4704
- b) -7.5704
- c) -7.6704
- d) -7.3704

11) While solving by Gauss-Seidel method, which of the following is the first Iterative solution for the system;  $x-2y=1$ ,  $x+4y=4$ ?

- a) (1, 0.75)
- b) (0.1, 0.75)
- c) (1, 0)
- d) (0, 1.75)

12) The two regression lines are  $x=19.13 - 0.87y$  &  $y= 11.64-0.50x$  then  $\bar{x}$  is

- a) 3.673
- b) 0.6595
- c) 15.935
- d) none of these

13) Using Euler's modified method, obtained  $y_1^{(1)}$  of the equation  $\frac{dy}{dx} = x + y$  with initial conditions  $y = 1$  at  $x = 0$  ( $h = 0.2$ ).

- a) 1.24
- b) 1.21

c) 1.13

d) 1.41

14) To solve the ordinary differential equation

$$3 \frac{dy}{dx} + 3xy^2 = \sin x, \quad y(0) = 5,$$

by Runge – Kutta method 4<sup>th</sup> order method, you need to rewrite the equation as

a)  $\frac{dy}{dx} = 3(\sin x - xy^2), y(0) = 5$

b)  $\frac{dy}{dx} = \frac{1}{3}(\sin x - 3xy^2), y(0) = 5$

c)  $\frac{dy}{dx} = \frac{1}{3}\left(-\cos x - \frac{xy^3}{3}\right), y(0) = 5$

d)  $\frac{dy}{dx} = \frac{x}{y}(\sin x + xy^2), y(0) = 5$

15) Normal equations for fitting of straight line  $y=mx+c$ , using least square solution for the following data are----

x	0	1	2
y	1	2	3

16) The null hypothesis  $H_0$  is accepted when

a) Calculated value < Tabular value

b) Calculated value > Tabular value

c)  $H_1$  is accepted      d) none of these

17) If  $\text{Cov}(X, Y) = 5$ ,  $b_{yx} = 3.14$  then  $\sigma_x$  is-----

18) For leptokurtic curves,

a)  $\beta_2 < 3$       b)  $\beta_2 = 3$       c)  $\beta_2 > 3$       d)  $\beta_2 = 1$

20) Maximize  $z = 2x + 3y$

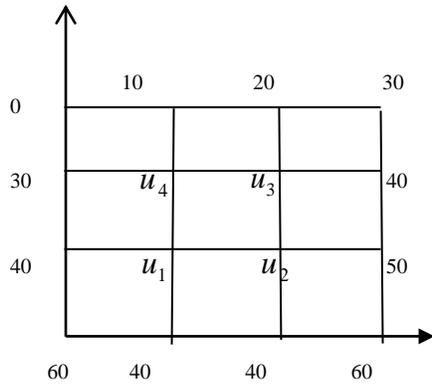
Subject to  $x + 2y \leq 3$

$$y \leq 1$$

$x, y \geq 0$

The number of basic variables involved to solve it by using simplex method are-----

20) For the equation  $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$  using Finite difference approximation method, the equation of  $u_2$  with reference to following grid. [  $h = k = 1$  ] is



**TE PETROCHEMICAL**  
**TRANSPORT PHENOMENA 2012/15**  
**PRACTICE MCQ**

**When the hydrodynamic boundary layer thickness ( $\delta$ ), which is the distance from the surface at which the local velocity ( $u$ ) reaches 99% of the free-stream velocity, then**

$$(\delta / x) = 5 / (Re_x)^{1/2}$$

$$(\delta / x) = 5 / (Re_x)^{1/2}$$

$$(\delta / x) = 10 / (Re_x)^{1/2}$$

$$(\delta / x) = 10 / (Re_x)^{1/2}$$

**Prandtl number is the ratio of**

thermal diffusivity ( $\alpha$ ) to absolute viscosity ( $\mu$ )

absolute viscosity ( $\mu$ ) to thermal diffusivity ( $\alpha$ )

kinematic viscosity ( $\nu$ ) to thermal diffusivity ( $\alpha$ )

thermal diffusivity ( $\alpha$ ) to kinematic viscosity ( $\nu$ )

**Assume a turbulent flow of a fluid on a flat plate. A very thin region near the plate surface is called as**

laminar buffer layer

laminar sublayer

laminar turbulent layer

none of the above

**The layer through which the momentum and energy transfer take place via the movement of macroscopic lumps of matter from one region to another is called as**

the laminar sublayer

the buffer layer

the turbulent layer

none of the above

**The rate of energy transferred by convection to that by conduction is called**

Stanton number

Nusselt number

Biot number

Peclet number

**The unit of overall coefficient of heat transfer is**

$W/m^2K$

$W/m^2$

$W/mK$

$W/m$

**The product of Reynolds number and Prandtl number is known as**

Stanton number

Biot number

Peclet number

Grashoff number

**The unit of overall coefficient of heat transfer is**

$kcal/m^2$

$kcal/hr\ ^\circ C$

$kcal/m^2\ hr\ ^\circ C$

$kcal/m\ hr\ ^\circ C$

**The ratio of Nusselt number and the product of Reynold's number and Prandtl number is equal to**

Stanton number

Biot number

Peclet number

Grashoff number

**The rate of heat flow through a body is  $Q = [kA (T_1 - T_2)]/x$ , . The term  $x/kA$  is known as**

Thermal coefficient

Thermal resistance

Thermal conductivity

None of these

**TE PETROCHEMICAL**

**REACTION ENGINEERING- I (2012-2015)**

1. Which of the following is not a unit of reaction rate?
  - A. Moles formed/ (surface of catalyst) (time)
  - B. Moles formed/volume of reactor) (time)
  - C. Mole formed/volume of catalyst) (time)
  - D. None of these
2. There is no correspondence between stoichiometry and the rate equation in case of a/an \_\_\_\_\_ reaction.
  - A. Elementary
  - B. Multiple
  - C. Autocatalytic
  - D. Non-elementary
3. The rate constant of a reaction is a function of the
  - A. Time of reaction
  - B. Temperature of the system
  - C. Extent of reaction
  - D. Initial concentration of the reactants
4. Chemical kinetics can predict the \_\_\_\_\_ of a chemical reaction.
  - A. Feasibility
  - B. Rate
  - C. Heat of reaction
  - D. All of these
5. The unit of frequency factor in Arrhenius equation is
  - A. Same as that of rate constant
  - B. Same as that of activation energy
  - C. Dimensionless
  - D. None of these
6. With increase in temperature, the equilibrium \_\_\_\_\_ rises in case of endothermic reaction.
  - A. Constant
  - B. Conversion
  - C. Can't say

D. None of these

7. For a zero-order reaction concentration of product increases with

- A. Increase in initial concentration
- B. Increase in reaction time
- C. Increase in total pressure
- D. Decrease in total pressure

8. The dimensions of rate constant for reaction  $3A \rightarrow B$  are (lit/gm mole)/min. Therefore, the reaction order is

- A. 0
- B. 1
- C. 2
- D. 3

9. The excess energy of reactants in a chemical reaction required to dissociate into products is termed as the \_\_\_\_\_ energy.

- A. Activation
- B. Potential
- C. Binding
- D. Threshold

10. The conversion of a reactant, undergoing a first order reaction, at a time equal to three times the half-life of the reaction is

- A. 0.875
- B. 0.5
- C. 0.425
- D. Data insufficient to calculate

11. The integral method of analyzing kinetic data

- A. is easy to use and is recommended when testing specific
- B. mechanisms, or relatively simple rate expression
- C. is used when the data are scattered
- D. all of these answers.

12. For constant-density systems, the performance equations are identical for

- A. batch reactor and back mix reactor
- B. batch reactor and plug flow reactor
- C. plug flow reactor and back mix reactor
- D. batch reactor, plug flow reactor and back mix reactor.

13. Autocatalytic reactions are best carried out in a
- A. CSTR
  - B. CSTR in series
  - C. Plug flow reactor
  - D. Recycle reactor
14. The concentration of A in a first order reaction,  $A \rightarrow B$ , decreases
- A. Linearly with time
  - B. Exponentially with time
  - C. Very abruptly towards the end of the reaction
  - D. Logarithmically with time
15. Which of the following is a characteristic of an ideal plug flow reactor?
- A. Axial dispersion
  - B. Flat velocity profile
  - C. Uniform mixing
  - D. None of these

**TE Petrochemical Engineering**  
**312402 Applied Hydrocarbon Thermodynamics (2015 Pattern)**  
**Practice MCQ Questions**

1. A gas mixture that follows \_\_\_\_\_ law is called an ideal gas solution.
  - a. Fourier
  - b. Stanton
  - c. Amagat
  - d. Nusselt
  
2. Henry's law is closely obeyed by a gas, when its \_\_\_\_\_ is extremely high.
  - a. Pressure
  - b. Solubility
  - c. Temperature
  - d. None of these
  
3. The properties of a solution are \_\_\_\_\_ properties of its components.
  - a. Additive
  - b. Non-additive
  - c. multiplicative
  - d. exponential
  
4. Activity coefficient approaches \_\_\_\_\_ as 'x' approaches zero.
  - a. zero
  - b. infinity
  - c. unity
  - d. -3
  
5. Chemical potential is the index of \_\_\_\_\_
  - a. Partial molar property
  - b. Fugacity
  - c. Activity
  - d. Chemical equilibrium
  
6. What is Mach number?
  - a. Speed of object \* speed of sound
  - b. Speed of object / speed of sound
  - c. Speed of object + speed of sound
  - d. Speed of object - speed of sound
  
7. Normal shock waves are \_\_\_\_\_ to the local flow.
  - a. parallel
  - b. perpendicular
  - c. same
  - d. independent
  
8. If  $T < T_c$  then the substance to the right of the saturated vapour line is called \_\_\_\_\_
  - a. Vapour

- b. Liquid
  - c. Gas
  - d. Solid
9. Retrograde phenomena is a typical behaviour of \_\_\_\_\_ systems.
- a. gas condensate
  - b. gas
  - c. liquid
  - d. All of these
10. \_\_\_\_\_ are large highly polar components made up of condensed aromatic and naphthenic rings
- a. Asphaltenes
  - b. paraffins
  - c. naphthenes
  - d. hydrates
11. Conversion \_\_\_\_\_ better than the equilibrium condition at a given set of conditions.
- a. cannot be
  - b. can be
  - c. is always
  - d. None
12. \_\_\_\_\_ is defined as the degree to which the reaction has advanced.
- a. Reaction Coordinate
  - b. Reaction ordinate
  - c. Reaction axis
  - d. Reaction rate
13. Increase in temperature favours \_\_\_\_\_ reaction.
- a. endothermic
  - b. exothermic
  - c. both
  - d. neither
14. Supplying excess reactant other than the limiting reaction \_\_\_\_\_ conversion
- a. increases
  - b. decreases
  - c. may decrease
  - d. has no effect on
15. Oxidative breakup of nutrients in an organism is \_\_\_\_\_
- a. exothermic
  - b. endothermic
  - c. both
  - d. neither

**TE Petrochemical Engineering**  
**312402 Applied Hydrocarbon Thermodynamics (2012 Pattern)**  
**Practice MCQ Questions**

1. Which among the following is an assumption of the compressible flow?
  - a. Resistance to flow of object
  - b. No-slip condition
  - c. known mass flow rate
  - d. resistance to flow of heat
  
2. Which among the following is an example of a converging-diverging nozzle?
  - a. De Laval nozzle
  - b. High velocity nozzle
  - c. Magnetic nozzle
  - d. Vacuum nozzle
  
3. Vapour pressure = dew point = bubble point is true for \_\_\_\_\_
  - a. Unary system
  - b. Binary system
  - c. ternary system
  - d. any system
  
4. The state at which solid, liquid and vapour coexist is called \_\_\_\_\_
  - a. Critical point
  - b. Triple point
  - c. melting point
  - d. bubble point
  
5. Entropy is a \_\_\_\_\_ property
  - a. Reference
  - b. Energy
  - c. Derived
  - d. None
  
6. Fugacity of a component in ideal solution is directly proportional to the mole fraction in solution. This is \_\_\_\_\_
  - a. Raoult's law
  - b. Lewis Randall rule
  - c. Henry's law
  - d. Dalton's law
  
7. Henry's law is obeyed by \_\_\_\_\_
  - a. Concentrated solutions
  - b. Dilute solutions
  - c. Ideal solutions only
  - d. Any solution
  
8. The most widely used method for the measurement of partial molar property is \_\_\_\_\_

- a. Analytical method
  - b. Graphical method
  - c. Tangent-intercept method
  - d. Compressibility factor method
9. Chemical potential is the index of \_\_\_\_\_
- a. Partial molar property
  - b. Fugacity
  - c. Activity
  - d. Chemical equilibrium
10. For a single homogeneous substance, degrees of freedom = \_\_\_\_\_
- a. 2
  - b. 3
  - c. 4
  - d. 1
11. Minimum boiling azeotropes show \_\_\_\_\_ deviations from ideality.
- a. Positive
  - b. negative
  - c. equal
  - d. None
12. The criteria for vapour liquid equilibria is that the fugacity in \_\_\_\_\_ phase is equal to fugacity in \_\_\_\_\_ phase.
- a. liquid, vapour
  - b. solid, vapour
  - c. solid, liquid
  - d. solid, solid
13. \_\_\_\_\_ gives the rate at which the desired conversion is attained.
- a. Thermodynamics
  - b. Reaction kinetics
  - c. Reaction stoichiometry
  - d. None
14. Standard free energy is \_\_\_\_\_ to the temperature.
- a. almost equal
  - b. inversely proportional
  - c. equal
  - d. directly proportional
15. Decrease in temperature favours \_\_\_\_\_ reaction.
- a. endothermic
  - b. exothermic
  - c. both
  - d. neither

**T.E PETROCHEMICAL  
MASS TRANSFER 1, MASS TRANSFER 2  
(2012/2015)  
PRACTICE MCQ**

**In distillation columns, the number of bubble caps per tray primarily depends upon the**

1. allowable liquid velocity.
2. allowable gas velocity.
3. allowable gas and liquid velocities.
4. feed composition.

**In distillation, overhead product contains**

1. only one component
2. two components
3. any number of components
4. only saturated liquid

**With increase in pressure, the relative volatility for a binary system**

1. increases.
2. decreases.
3. remains same.
4. either (1) or (2), depends on the system.

**: Low viscosity absorbent is preferred for reasons of**

1. rapid absorption rates and good heat transfer characteristics.
2. improved flooding characteristics.
3. low pressure drop on pumping.
4. all (a), (b) and (c).

**: Mass transfer co-efficient ( $K$ ) and diffusivity ( $D$ ) are related according to film theory as**

1.  $K \propto D$
2.  $K \propto D$
3.  $K \propto D^{1.5}$
4.  $K \propto D^2$

**Which of the following liquid-vapor contacting devices provides maximum contact surface area for a particular duty ?**

1. Sieve plate column
2. Bubble cap column
3. Randomly packed column
4. Wetted wall column

**The equipment frequently used for adiabatic humidification-cooling operation with recirculating liquid is**

1. natural draft cooling tower
2. induced draft cooling tower
3. spray chamber
4. none of these

**Chemisorption (chemical adsorption) is**

1. same as “Van der Waals” adsorption.
2. characterised by adsorption of heat.
3. an irreversible phenomenon.
4. a reversible phenomenon.

**The rate of solid-liquid extraction is limited by the**

1. phase change of the solute as it dissolves in the solvent.
2. diffusion of the solute through the solvent in the pores to the outside of the particle.
3. diffusion of the solute from the solution in contact with the particle to the main bulk of the solution.
4. all ‘1’, ‘2’ & ‘3’.

**Raoult’s law applies to the**

1. all liquid solutions
2. non-ideal solution only.
3. non-volatile solute.
4. solvents.