KATHMANDU UNIVERSITY
End Semester Examination
February/March, 2019

Marks Scored:

Level : B.E.
Year : III

Course : CHEG 301
Semester : I

Exam. Roll No. :

Time: 30 mins.

F. M. : 10

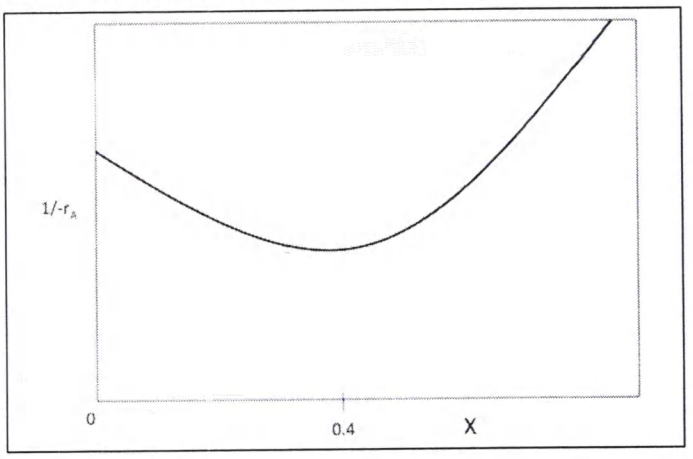
Registration No.:

Date : 17 FEB 2019

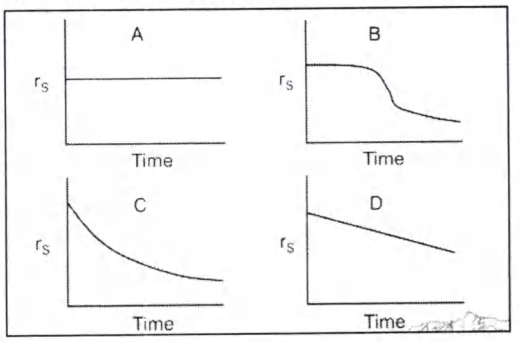
SECTION "A"
[20 Q. × 0.5=10 marks]

Attempt ***ALL*** questions. Tick the most appropriate answer.

1. Which reactor type will require the lowest volume to achieve a conversion of 40%?
   (a) CSTR
   (b) PFR
   (c) Batch reactor
   (d) Need more data



2. Which plot represents the rate vs time for the batch isothermal 1st –order reaction?
   (a) A
   (b) B
   (c) C
   (d) D



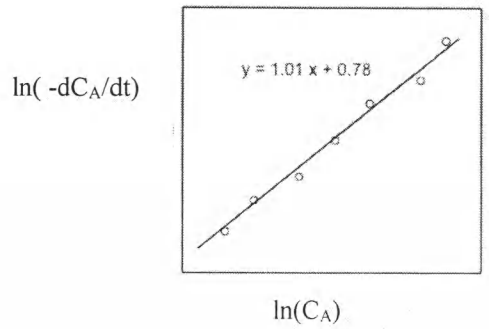
3. Which of the following is not the example of a rate law?
   (a) $r_A = \frac{k}{C_A}$ (b) $-r_A = kC_A$ (c) $r_A^2 = kC_A$ (d) $-r_{A=}k\frac{dC_A}{dt}$

4. If, $-r_A = k_A C_A^m C_B^n$ then what is the correct unit of rate constant for $-r_A = k_A C_A^2$?
   (a) S^{-1} (b)mol $dm^{-3}S^{-1}$ (c) $dm^3 mol^{-1}S^{-1}$ (d) $dm^6 mol^{-2}S^{-1}$

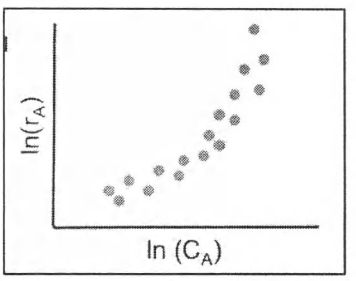
5. As the value of the activation energy approaches zero, the value of the rate constant approaches:
   (a) Zero
   (b) A large constant number A (Frequency factor)
   (c) Infinity
   (d) None of these

6. Which of the following statement is false?
   (a) A PFR is equivalent to an infinite number of CSTRs in series.
   (b) The space time in a CSTR is equivalent to the batch time in a batch reactor.
   (c) A PFR may be thought of in terms of an infinitesimally small batch reactor that moves down a pipe.
   (d) A CSTR is equivalent to a PFR with infinite recycle ratio.

7. From the following plot, what is the reaction order with respect to A?
   (a) 0 (b) 0.78 (c) 0.5 (d)1



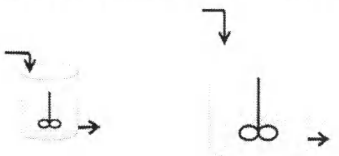
8. What does the rate data in the plot suggest about the system?
   (a) The reaction is fractional order in A
   (b) The experiment had a problem
   (c) A power rate law model is not appropriate
   (d) None of these



9. Suppose a 1st –order reaction is running in a differential catalytic reactor at 1% conversion. If the inlet flow rate is doubled, the production rate of the product approximately
   (a) Doubles (b) Stays the same (c) Halves (d) None of these

10. Which change cannot increase the rate -r$_A$?
    (a) Raise temperature (b) Use better catalyst
    (c) Switch to better reactor (d) Change solvent in liquid phase reaction

11. What does the flow rate of products out of the reactor usually increase with increasing volume in a CSTR when the inlet flow rate remains constant?



    (a) Larger volumes increase the amount of time the fluid spends in the reactor on average
    (b) Larger volumes increase the concentration of reactants
    (c) Larger reactors are easier to mix
    (d) None of these

12. For an elementary reaction $A+2B \xrightarrow{k} 3C$

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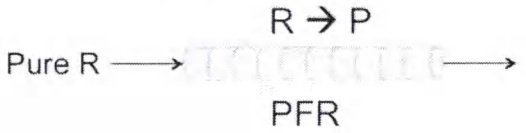
(a) Rate of appearance of C is equal to rate of disappearance of A
(b) Rate of disappearance of A is equal to rate of disappearance of B
(c) Rate of appearance of C is equal to rate of disappearance of B
(d) Rate of appearance of C is 3 times rate of disappearance of A

13. Consider the reaction network below. If the overall selectivity of W and P is 4.0, what is the overall yield of P?

(a) 0.20 (b) 0.75
(c) 0.80 (d) 4.0

14. Consider an isothermal plug flow reactor with a zero-order reaction.



Suppose the inlet flow of R doubles, how does the rate change?
(a) Doubles (b) Decreases to half its value
(c) Does not change (d) None of these

15. For a reaction that is half-order in "A". Which of the following variables when plotted versus time yields a straight line?

(a) C_A (b) $(C_A)^{1/2}$ (c) $\ln(C_A)$ (d) $(C_A)^{-1/2}$

16. Which of the following rate laws are **NOT** examples of the power law models?
(a) $-r_A = k_1 C_A$
(b) $-r_A = k_1/C_A$
(c) $-r_A = k_1 \frac{C_A^3}{(1+k_2 C_A^2)}$
(d) All of the above are examples of power law rate laws.

17. A catalyst
(a) Initiates a reaction
(b) Lowers the activation energy of reacting molecules
(c) Is capable of reacting with any one of the reactants
(d) Cannot be recovered chemically unchanged at the end of a chemical reaction

18. Rate of a chemical reaction is not influenced by the
(a) Catalyst
(b) Temperature
(c) Reactant concentration
(d) Number of molecules of reactants taking part in a reaction

19. The rate constant of a first order reaction depends on the
(a) Time (b) Temperature
(c) Concentration of the reactant (d) Concentration of the product

20. The space-velocity is the proper performance measure of flow reactors. The space velocity has the units of

(a) Time (b) $(\text{Time})^{-1}$ (c) Velocity (d) $(\text{Velocity})^{-1}$