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Question Paper Code: 96901

B.E./B.Tech. DEGREE EXAMINATION, MAY 2022

Sixth Semester

Chemical Engineering

19UCH601 – CHEMICAL REACTION ENGINEERING II

(Regulations 2019)

Duration: Three hours

Maximum: 100 Marks

PART A - (10 x 1 = 10 Marks)

1. Pores with diameter less than 2nm (20 \AA) are called CO1- R
(a) mesopores (b) micropores (c) macropores (d) millipore
2. Adsorption data are frequently reported by CO1- R
(a) Adsorption isotherms (b) Catalyst deactivation
(c) Sigmoidal curve (d) none of the above
3. When a catalyst increases the rate of a chemical reaction, the value of CO1- R
the rate constant
(a) Remains constant (b) increases (c) decreases (d) become infinite
4. For a solid –catalyzed first order reaction $A \rightarrow P$, the pore diffusion CO1- U
offers negligible resistance to reaction if the thiele modulus
of the reaction is
(a) Greater than 5 (b) Greater than 1 (c) Greater than 10 (d) Less than 0.5
5. Find the time required for 98% conversion of a particle for film CO2- App
diffusion controls with molar density 0.0198 g/mol with a radius of
0.5 cm with reacting moles of 0.25 moles of B whose mass transfer
coefficient is 10 cm/s with $C_{Ag} = 1.396 \times 10^{-5} \text{ mol/cm}^3$.
(a) 92.663 s (b) 100 s (c) 55.5 s (d) 76.8 s
6. Find the time required for complete burning of graphite particle when CO2- App
chemical reaction controls with the following data $\rho_B = 0.183$
 mol/cm^3 , $R = 0.5 \text{ cm}$, $b = 1$, $k = 20 \text{ cm/s}$ and $C_{Ag} = 8.31 \times 10^{-7}$.
(a) 5505.4 sec (b) 4000.6sec (c) 100.8 sec (d) one of the above

7. SO₂ can be absorbed in absorbers using -----as solvent. CO1- U
 (a) Dimethyl aniline (b) NaOH (c) Na₂CO₃ (d) K₂CO₃
8. CO₂ can be absorbed in absorbers using _____ solvent. CO1- U
 (a) Ethanol amines (b) NaOH H₂SO₄ (c) Copper Ammonium salts (d) H₂SO₄
9. The molecular weight of enzymes will be CO1- U
 (a) > than 1000 (b) 2 (c) 10 (d) 20
10. Which of the following reactor arrangements causes fast CO1- U
 deactivation?
 (a) Mixed flow for fluid (b) plug flow for fluid
 (c) fluidized bed reactor (d) batch for fluid and solid

PART – B (5x 2= 10 Marks)

11. What are heterogeneous reactions? CO1- U
12. Draw the plot of effectiveness factor versus Thiele modulus and suggest the CO1- R
 information inferred.
13. What are the three contacting patterns used for gas-solid non catalytic CO1- U
 reactions?
14. What are multiphase reactors? Give examples. CO1- R
15. What is meant by catalyst regeneration? CO1- U

PART C - (5 x 16 = 80 Marks)

16. (a) Explain in detail about the sol gel method in preparation of CO1- U (16)
 catalyst.

Or

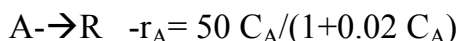
- (b) Discuss in detail about the molecular (or) non dissociated CO1- U (16)
 adsorption.

17. (a) Derive the expressions for internal diffusion that takes place in a CO1- U (16)
 single cylindrical pore with first order reactions and discuss about
 Thiele modulus and effectiveness factor

Or

- (b) Calculate the amount of catalyst needed in a packed bed reactor to CO2- App (16)
 achieve 25 % conversion of 1000 m³/hr of pure gaseous A (C_{AO} =
 1000 mol/m³)

for:



18. (a) Find the expression for fraction of B unconverted for mixed flow of a size mixture of particles of unchanging size with uniform gas composition CO1- U (16)
- Or
- (b) Discuss in detail on shrinking core model and progressive conversion model and derive expression for diffusion through the layers. CO1- U (16)
19. (a) Discuss in detail the design considerations of various types of gas-liquid reactors. CO1 -U (16)
- Or
- (b) Explain the mechanism and operation involved in a countercurrent flow (plug flow G +Plug flow L) contacting patterns for G/L contactors. CO1 -U (16)
20. (a) Derive expressions for concentration-time behavior of the integrated M-M equation in a mixed flow fermentor. CO1- U (16)
- Or
- (b) Discuss about the inhibition of enzyme reactions by a foreign substance with the kinetic expression for competitive and non competitive inhibition. CO1- U (16)

