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CHEMICAL ENGINEERING REFRESHER PROGRAM

CHEMICAL REACTION ENGINEERING SET 1

1. This pertains to the time needed to process a reactor volume of feed at the reactor inlet condition.
   a. circulation time
   b. reaction time
   c. residence time
   d. space time

2. Which of the following homogeneous reactions utilize a gaseous catalyst?
   a. Wulf process
   b. visbreaking
   c. Monsanto process
   d. oxo process

3. Which of the following is not a noncatalytic process?
   a. calcination
   b. Andrussow process
   c. uranium ore chlorination
   d. magnetic roasting

4. What Hatta number value of an absorption system can be considered as an extremely slow reaction?
   a. less than 0.5
   b. less than 0.3
   c. greater than 0.3
   d. greater than 0.5

5. This is an empirical model for the growth of microorganisms
   a. Monod equation
   b. Briggs-Haldane model
   c. Michaelis-Menten kinetics
   d. Whiteman model

6. This catalyst has an extruded structure with lengthwise channels and is used for vehicle emissions control.
   a. monolith
   b. granule
   c. packing
   d. wire gauze

7. This type of polymerization reaction has a monomer dissolved in a non-reactive solvent that contains a catalyst or initiator.
   a. suspension polymerization
   b. emulsion polymerization
   c. solution polymerization
   d. bulk polymerization

8. What reactor type is conventionally used to produce gaseous hydrogen from methane and steam?
   a. fluidized bed
   b. multi-tubular
   c. fixed bed
   d. batch

9. What heat transfer configuration of a bioreactor should be considered if its peak temperature must be tightly controlled?
   a. tank with external heat exchanger
   b. jacketed tank
   c. tank with internal coils
   d. tank with internal tubes

10. Which of the following is false regarding design of stirred tank reactors?
    a. The conventional height-to-diameter ratio is 3.
    b. A single impeller is used when ratio of liquid height to diameter is greater than 1.
    c. Four equally spaced baffles are standard.
    d. Impeller diameter is usually less than 80% of the tank diameter.

11. This catalytic reactor has temperature uniformity, good heat transfer, and the ability to continuously remove catalyst for regeneration.
    a. packed bed
    b. fixed bed
    c. moving
    d. fluidized bed

12. For the reaction A $\rightarrow$ (k_1) B $\rightarrow$ (k_2) C with $k_1 = 0.25\ hr^{-1}$ and $k_2 = 0.3\ hr^{-1}$. The initial concentration of both B and C is 0.25 lbmol/ft^3 while A is 1 lbmol/ft^3. What is the concentration of B in lbmol/ft^3 after 1 hour in the batch reactor?
    a. 0.525
    b. 0.25
    c. 0.375
    d. 0.75

13-15. The liquid-phase bromination (B) of 2,4,6-trimethylacetophenone (A) is: A + B $\rightarrow$ C + D with a rate of $-r_A = 0.0434C_AC_B$ in M/s. A battery of three identical CSTR's with equal volumes in series will be used. The volumetric flow rate of the feed is 1 L/s while the initial concentration of feed A is 0.05 M and B is 0.06 M. The required conversion is 80%.

13. What is the overall conversion of the first CSTR?
    a. 36.4%
    b. 48.7%
    c. 21.9%
    d. 52.8%

14. What is the overall conversion of the second CSTR?
    a. 49.2%
    b. 53.1%
    c. 77.7%
    d. 69.4%

15. What is the volume of the third CSTR?
    a. 613 L
    b. 316 L
    c. 428 L
    d. 248 L