Question Bank CRE II

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| Q. No. | Question | Marks | Year of GTU Exam |
|  | **Chapter 23-24 Fluid-Fluid Reaction Kinetics and Reactor Design (Levenspiele)** |  |  |
| 1 | Define the factors required to formulate contacting patterns. |  |  |
| 2 | Discuss with diagrams various contacting patterns for two phase system. |  |  |
| 3 | Discuss contacting patterns for two phase systems. |  |  |
| 4 | Describe with diagram various contacting patterns for two phase reacting system. |  |  |
| 5 | Derive rate equation for fluid-fluid reaction. |  |  |
| 6 | Derive the design equation for the tower for mass transfer with rapid chemical reaction. |  |  |
| 7 | Discuss kinetic regimes for mass transfer and reaction for fluid-fluid reactions. |  |  |
| 8 | Derive the rate equation for straight mass transfer (Absorption) of A in fluid-fluid reaction. |  |  |
| 9 | Describe all eight cases for mass transfer and reaction for fluid-fluid reactions with neat sketch. |  |  |
| 10 | What is film conversion parameter? State various criteria of it which is used in the study of fluid-fluid reactions. |  |  |
| 11 | With a neat diagram write about double mixed reactor used for studying kinetics of fluid –fluid reactions. |  |  |
| 12 | Derive rate expression for fast fluid-fluid reactions. |  |  |
| 13 | What is film conversion parameter? State various criteria of it which is used in the study of fluid-fluid reactions.  |  |  |
| 14 | Derive rate equation for instantaneous fluid- fluid reaction. |  |  |
| 15 | Define Enhancement factor and Hatta Modulus for fluid-fluid reactions. |  |  |
| 16 | Derive the rate equation for fluid – fluid reaction in the case of instantaneous irreversible reaction with lower concentration of constituent B. |  |  |
| 17 | Derive the rate equation for fluid – fluid reaction in the case of pseudo first order fast reaction with higher concentration of constituent B |  |  |
| 18 | Discuss the factors to consider in selecting contactors for fluid- fluid reactions. |  |  |
| 19 | Discuss the importance of solubility data for determination of kinetic regime for fluid – fluid reaction. |  |  |
| 20 | Derive the rate equation for fast reaction with high concentration of liquid reactant in fluid – fluid reaction. |  |  |
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|  | **Chapter 25-26 Solid-Fluid Reaction Kinetics and Reactor Design (Levenspiele)** |  |  |
| 1 | Derive relationship of time required for complete conversion when ash layer is rate controlling using shrinking core model. |  |  |
| 2 | Discuss the limitation of Shrinking Core Model. |  |  |
| 3 | Differentiate between Progressive Conversion Model (PCM) and Shrinking Core Model (SCM) for fluid-particle reactions. |  |  |
| 4 | Heterogeneous reaction in which a gas reacts with solid and solid particles remains unchanged in size during reaction. Establish relationship between time and conversion for shrinking core model of unchanging size in case diffusion through ash layer controls.  |  |  |
| 5 | Derive the expression for fractional conversion for the reaction between solid and fluid when particles of solid are changing in size and Diffusion through Gas film controls. |  |  |
| 6 | Derive the time-conversion-radius relationship for shrinking-core model for spherical particles of unchanging size when diffusion through gas film controls. |  |  |
| 7 | Discuss various steps involved in reaction of shrinking spherical particles. Also derive the relation between time and conversion of solid for low gas velocity, if diffusion through gas film controls where small particles are in the Stokes regime. |  |  |
| 8 | Discuss in detail different models for fluid particle reactions. |  |  |
| 9 | Give some industrial examples of fluid particle reactions. |  |  |
| 10 | Discuss the effects of temperature, time and particle size on determination of rate controlling step for fluid particle reactions. |  |  |
| 11 | Discuss about determination of rate controlling step for fluid particle reaction. |  |  |
| 12 | Describe in details the role of temperature, time, and particle size in determining the rate controlling step for fluid-particle reactions. |  |  |
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|  | **Chapter 18-19 Catalytic reactor and pore diffusion (Levenspiele)** |  |  |
| 1 | Describe with neat sketch the fixed bed reactor and fluidized bed reactor.  |  |  |
| 2 | Discuss: Bubbling bed model for fluidized bed. |  |  |
| 3 | Describe with neat sketch the fixed bed reactor and fluidized bed reactor. |  |  |
| 4 | Give merits and Demerits of fixed bed and fluidized bed reactor. |  |  |
| 5 | Distinguish between fixed bed reactor and fluidized bed reactor. |  |  |
| 6 | Discuss various resistance encountered in slurry reaction with help of diagram. |  |  |
| 7 | Discuss slurry reaction kinetics |  |  |
| 8 | Write a short note on slurry reactor. |  |  |
| 9 | Write a short note on trickle bed reactor |  |  |
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|  | **Catalyst Preparation and Characterization (Handbook)** |  |  |
| 1 | Discuss the various resistances encountered in Catalytic reaction.  |  |  |
| 2 | Discuss about Physical adsorption and chemisorptions. |  |  |
| 3 | Write short note on “Catalyst: Promoters, Inhibitors and poisons.” |  |  |
| 4 | Discuss the reactors used for finding the rate for Catalytic reaction.  |  |  |
| 5 | Discuss various Catalytic reactors used in Industry. |  |  |
| 6 | What are the applications of ‘BET Theory’? Derive the equation to be used for BET application. |  |  |
| 7 | Write steps involved in catalytic reaction and also discuss BET adsorption isotherm for the catalytic reaction. |  |  |
| 8 | Discuss about the determination of surface area of catalysts. |  |  |
| 9 | Discuss about the surface area determination of catalysts by nitrogen desorption method. |  |  |
| 10 | Define with suitable examples, Promoter, 2) Inhibitor, 3) Carrier, 4) Accelerator, 5) Activity, 6) Coking/fouling  |  |  |
| 11 | Discuss: physical adsorption and chemisorption.  |  |  |
| 12 | Discuss classification and preparation of catalyst.  |  |  |
| 13 | Discuss in brief about nature and mechanism of catalytic reactions.  |  |  |
| 14 | State and explain the steps in heterogeneous catalytic reaction with schematic diagram |  |  |
| 15 | Answer any three of the following in brief. (i) Turnover frequency and dispersion of catalyst (ii) Characteristics and selectivity of catalyst (iii) Monolithic catalyst (iv) Molecular sieves. |  |  |
| 16 | Write a brief note on experimental reactors for solid catalyzed reactions. |  |  |
| 17 | Describe the physical properties of catalyst. |  |  |
| 18 | Discuss various industrial catalytic reactors. |  |  |
| 19 | Discuss heat effects during solid catalysed reactions. |  |  |
| 20 | Write briefly about Prediction from active site theory. |  |  |
| 21 | Discuss briefly about different types of adsorption processes. |  |  |
| 22 | Write a brief note on “Experimental reactors for solid catalyzed reactions”. |  |  |
| 23 | Derive mechanism using LHHW model for the reaction, A ↔ R (single active centre) when adsorption is rate controlling step. |  |  |
| 24 | List out all the assumptions and derive Langmuir adsorption isotherm equation for catalytic reaction. Also discuss the significance for failure of Langmuir model and necessary modification. |  |  |
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