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Q₂ Units of 's' in surface renewal theory

Ans 'per second' or s^{-1}



Q₂ Given $4NH_3 + 5O_2 \rightarrow 6H_2O + 4NO$
Air was supplied where O_2 was 20% excess
mole fraction of O_2 in inlet gas mixture

Solⁿ

Basis = 4 mol NH_3

O_2 theoretical = 5 mol

O_2 fed = $5 \times 1.2 = 6$ mol

Air fed = $\frac{6}{0.21} = 28.57$ mol

mole fraction of O_2 in inlet stream = $\frac{6}{28.57 + 4}$
 $= 0.1842$



Q₂ If $\frac{k_{500}}{k_{400}} = 2.5$ & $R = 8.314 \frac{J}{mol \cdot K}$, What is E_a ?

Solⁿ $\ln\left(\frac{k_2}{k_1}\right) = \frac{E_a}{R} \left(\frac{1}{T_1} - \frac{1}{T_2}\right)$

$$\ln(2.5) = \frac{E_a}{8.314} \left(\frac{1}{400} - \frac{1}{500}\right)$$

$$E_a = 15246.1 \frac{J}{mol}$$

$$= 15.24 \frac{kJ}{mol} \text{ Ans.}$$

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Q> In the question related to INCORRECT statement

Ans: "Cetane number is used for petrol"
because cetane number is a characteristic of diesel.



Q> In the question related to segmental baffles in heat exchanger

Ans: Baffles increase the turbulence in shell side and hence increase the shell side heat transfer coefficient. Also baffles support the tube bundles.



Q> In stokes regime^{terminal} velocity is proportional to??

Ans: In stokes regime the expression for terminal velocity is given by

$$v = \frac{g d_p^2 (\rho_p - \rho)}{18\mu}$$

Hence it is directly proportional to square of particle diameter.

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