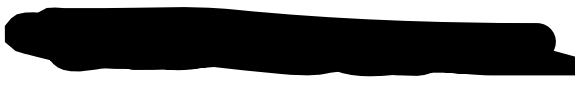


* Continue Here $[E_A - E_B]$

$$\Rightarrow \frac{P_A}{P_B} = e^{-\frac{1}{k_B \cdot T} [E_A - E_B]}$$



Final Answer for ① $\frac{P_A}{P_B} = e^{-\frac{1}{k_B \cdot T} [E_A - E_B]}$ *

(1) Consider an adsorbate system that has two possible adsorption sites that are denoted by letters A and B. Furthermore, it is known that the energy of the gas molecule that is adsorbed at site A is E_A and it is E_B for a gas molecule that is adsorbed at site B. State the ratio of the probability of observing the gas molecule at site A to the probability of observing the gas molecule at site B i.e., the value of the ratio $\frac{P_A}{P_B}$.

$$w(m) = \frac{M}{m_A! m_B!}$$

$$P_j = \frac{e^{-\frac{E_j}{k_B T}}}{\sum e^{-\frac{E_i}{k_B T}}}$$

$$P_A = \frac{\sum_{i=A}^B w(m) \cdot m_i}{\sum_{i=A}^B w(m)}$$

$$P_B = \frac{\sum_{i=B}^B w(m) \cdot m_i}{\sum_{i=A}^B w(m)}$$

$$P_j = \frac{e^{-\frac{E_j}{k_B T}}}{e^{-\frac{E_A}{k_B T}} + e^{-\frac{E_B}{k_B T}}}$$

$M \Rightarrow m_A + m_B = M$ (Total adsorption sites)
 m_A : Adsorption site for gas A (Number of)
 m_B : Adsorption site for gas B (Number of)

$w(m)$ The number of ways we can arrange gas A & B in adsorption sites A & B

$$\frac{P_A}{P_B} = \left[\frac{e^{-\frac{E_A}{k_B T}}}{e^{-\frac{E_A}{k_B T}} + e^{-\frac{E_B}{k_B T}}} \right] \cdot \left[\frac{e^{-\frac{E_A}{k_B T}} + e^{-\frac{E_B}{k_B T}}}{e^{-\frac{E_B}{k_B T}}} \right]$$

