Consider the reaction: $2B \rightarrow C + 3D$. In one experiment it was found that at 300 K the rate constant is 0.134 L/(mol·s). A second experiment showed that at 450 K, the rate constant was 0.569 L/(mol·s). Determine the activation energy for the reaction.

at 300 K: $k_{300} = Ae^{\frac{-E_a}{RT}}$

at 450 K: $k_{450} = Ae^{\frac{-E_a}{RT}}$

$\ln \frac{k_{450}}{A} = \frac{-E_a}{RT}$

$\ln(k_{450}) - \ln(A) = \frac{-E_a}{RT}$ $where \ \ln(A) = \ln(k_{300}) - \frac{-E_a}{RT}$

so that

$\ln(k_{450}) - [\ln(k_{300}) - \frac{-E_a}{RT}] = \frac{-E_a}{RT}$

$\ln(\frac{k_{450}}{k_{300}}) = \frac{E_a}{R}(\frac{1}{T_{300}} - \frac{1}{T_{450}})$

plug and solve for Ea, Ea = 10.8 kJ