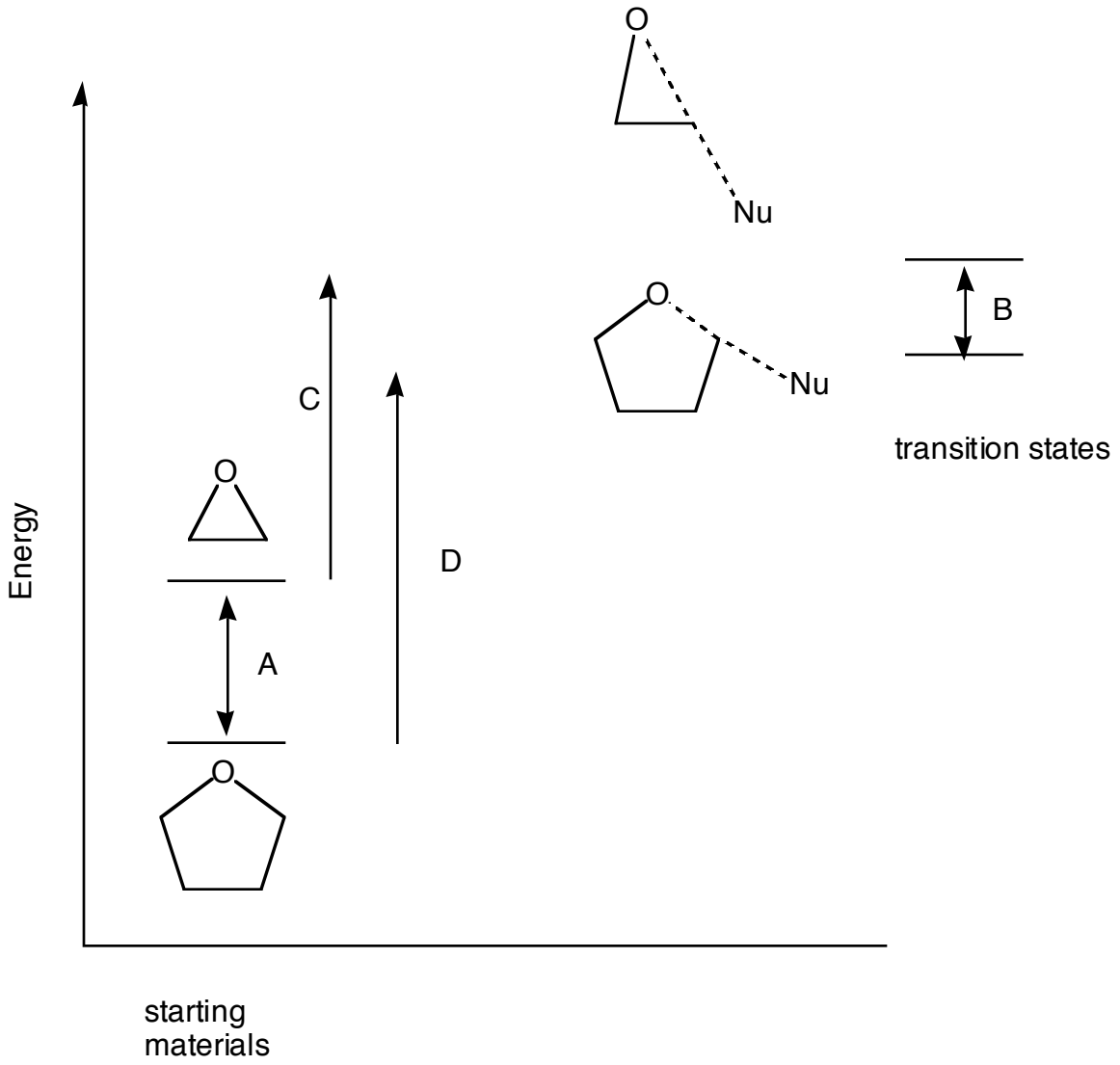
Answers to Problem 51, Chemistry 301X-2006

Here is the diagram:



A > B, therefore D > C

The starting epoxide has both torsional and angle strain, and thus is higher than the almost-strain free five-membered ring. In the transition states, the bond angles are somewhat opened as the ring bond is breaking. Thus angle strain is reduced and the TS for epoxide opening lies closer to the TS for opening the five-membered ring (distance A vs. B).

Thus, the energy required for opening the epoxide (arrow C) will be less than that for opening the five-membered ring (arrow D).