

Problem Set No. 3 (8.5.2012)

1. Draw a qualitative energy profile of the conformations of (*E*)-1,3-pentadiene?
2. a) Which $^1\text{H-NMR}$ signals do you expect for *N*-formylmorpholine at room temperature, which at 100 °C?

b) What is the C-N rotation barrier in compounds such as *N,N*-benzylmethylthioformamide?
3. Draw the two eclipsed Newman projections of butanal along the CO-CH₂ bond! Which one is energetically more favourable?
4. Try to draw cyclobutane in a Newman projection! What is the ring strain of cyclobutane and why is it strained?

5. Draw *trans*-1,3-dimethylcyclohexane in a normal chair conformation and in a Newman projection! How many gauche interactions can you identify?

6. The A-value of (*i*-propyl)cyclohexane is 9.0 kJ/mole. What does it mean? Calculate the ratio of the two chair conformers at room temperature!

7. Give an example of a compound with a negative hyperconjugate effect and explain this phenomenon by the MO model!