

Problem Set No. 3 (30.4.2013)

1. a) Why shows N,N-dimethylacetamide three methyl signals in the NMR spectrum?

- b) What is the C-N rotation barrier in compounds such as N,N-benzylmethylthioformamide?

- c) Which ^1H -NMR signals do you expect for *N*-formylmorpholine at room temperature, which at 100 °C?

2. Draw the two eclipsed Newman projections of butanal along the CO-CH₂ bond! Which one is energetically more favourable?

3. Try to draw cyclobutane in a Newman projection! What is the ring strain of cyclobutane and why is it strained?

4. a) Draw the complete energy profile of cyclohexane!

b) Draw suitable Newman projections of the chair, boat and twistboat conformations!

5. The A-value of (*t*-butyl)cyclohexane is 20 kJ/mol. What does it mean? Calculate the ratio of the two chair conformers at room temperature using the equation connecting ΔG with the equilibrium constant ($\Delta G = -R \cdot T \cdot \ln K$)!

6. a) Draw the structure of 4-methylcyclohexene in its favourable half-chair conformation!

b) Draw (S)-*trans*-cyclooctene!

7. a) Draw the most stable conformation of $\text{CH}_3\text{CH}_2\text{OCH}_2\text{OCH}_2\text{CH}_3$!

b) Try to explain the exo- and endo-anomeric effect for 2-methoxytetrahydropyran and for α -D-glucose as examples!