Multiple Choice

1. Choose the order that has the following compounds correctly arranged with respect to *increasing* solubility in water. (class quiz)

   ![Compound Images]

   A. i, ii, iii
   B. ii, iii, i
   C. iii, ii, i
   D. i, iii, ii
   
   **Answer:** A

2. Choose the answer that has identified the *most stable isomer* in the following pairs of bromomethylcyclohexanes. (workshop 4)

   ![Compound Images]

   A. i and iii
   B. i and iv
   C. ii and iii
   D. ii and iv

   **Answer:** A

3. Choose the answer that shows an alcohol and its enantiomer. (textbook 5.41)

   ![Compound Images]

   A. i
   B. ii
   C. iii
   D. iv

   **Answer:** A
4. Choose the best description of the following compounds at room temperature.

   A. identical
   B. enantiomers
   C. diastereomers
   D. constitutional isomers
   E. none of the above

5. Knowing that the energy difference between the following thiols is 3.8 kJ/mol choose the approximate $K_{eq}$ for the following conformational equilibrium at room temperature. (lecture quiz)

   A. 0.01  B. 0.13  C. 1  D. 5.4  E. 321  F. 1021

6. Relative to the chair conformation, the boat conformation of cyclohexane is destabilized by: (lecture quiz)
   i. angle strain
   ii. steric strain
   iii. torsional strain

   A. i  B. ii  C. iii  D. i and ii  E. i and iii  F. ii and iii

7. Rank these dimethylcyclohexane conformers in order of stability. (lecture quiz)

   A  B  C  D  E  F

   A. i ii iii  B. i iii ii  C. ii i iii  D. iii i ii  E. iii i i  F. iii ii i

8. The chair form of cyclohexane is more stable than the configuration in which all of the carbons lie in a plane. What types of strain are responsible for the energy difference? (lecture quiz)

   i. angle strain
   ii. steric strain
   iii. torsional strain

   A. i  B. ii  C. iii  D. i and ii  E. i and iii  F. ii and iii
9. How many stereo centers does this core structure from paclitaxel have? (lecture quiz)

![Structure of Paclitaxel]

A. 1  B. 3  C. 5  D. 7  E. 9  F. 11

10. Which of the following compounds are meso? (lecture quiz)

![Compounds i, ii, iii, iv]

A. i only  B. iii only  C. iv only  D. ii and iii  E. iii and iv  F. i and iv

Short Answer

11. Give the structure of 7-chlorobicyclo[2.2.1]heptane. 5 pts (textbook 4.24)

![Structure of 7-chlorobicyclo[2.2.1]heptane]

12. Draw the most stable conformation of trans-1-tert-butyl-3-methylcyclohexane. 5 pts (textbook 4.43)

![Structure of trans-1-tert-butyl-3-methylcyclohexane]

13. Give the structure of a compound consistent with the following properties. 5 pts (textbook 5.53)

   a. Molecular formula = C₃H₆O₂
   
   b. Optically active (rotates the plane of polarized light)
   
   c. Infrared absorptions in both the 3200-3550 and the 1630-1780 cm⁻¹ regions
14. Give a reactant that would produce the product shown below. 5 pts (workshop 4)

\[
\text{H}_2 \quad \text{Pd/C} \quad \overset{\text{only product}}{\longrightarrow} \]

15. Compound A (C₅H₈O) is not chiral and has an infrared absorption at 1704 cm⁻¹. Compound A reacts with methyllithium to give a racemic mixture of two chiral compounds. Hydrogenation of the racemic mixture gives compound B (C₆H₁₄O) which, like compound A is not chiral.

Give the structures of A and B. 10 pts

16. Treatment of compound D with base (HO⁻) gives its enantiomer, compound E. This reaction involves an intermediate structure. (lecture quiz) 10 points

a. Give the structure of this intermediate.

b. Using the curved arrow formalism show how the reactants are transformed to the intermediate and how the intermediate is transformed into the final product.
17. Two stereoisomers are produced in the following reaction. 10 pts (workshop 6)

a. Give the number of stereoisomers possible for the reactant F. 4 stereoisomers

b. Give the structures of the two products of the following reaction.

c. State whether the two products you have drawn are constitutional isomers, diastereomers or enantiomers.