

Moorpark College Chemistry 11
Spring 2009

Instructor: Professor Torres

Examination #3: Section Three
March 19, 2009

Name: _____ (print)

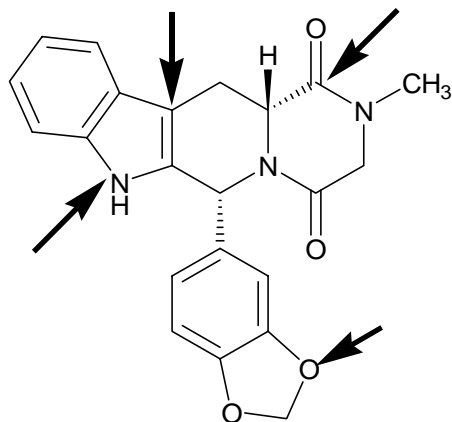
Name: _____ (sign)

*alkene < alkyne < amine < alcohol < ketone < aldehyde < amide < acyl halide < ester
< carboxylic acid*

Directions: Make sure your examination contains NINE total pages (including this cover sheet) when instructed to do so. Answer all the questions in the spaces provided.

Question	Points
1. (46 pts.)	
2. (10 pts.)	
3. (18 pts.)	
4. (14 pts.)	
5. (12 pts.)	
TOTAL (100 points)	

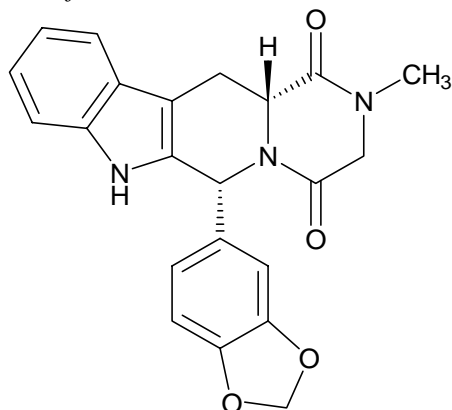
1. (46 pts. total) *Tadalafil* (sold under the trade name *Cialis*[®]), is an orally-administered prescription drug used to treat erectile dysfunction.



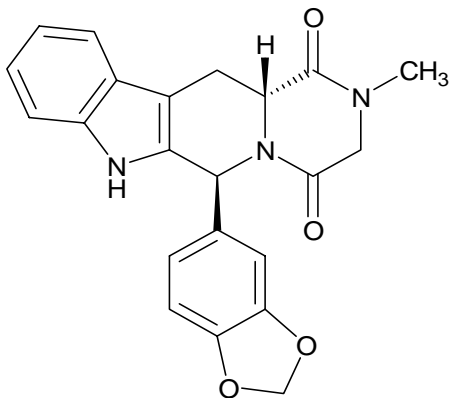
Answer the questions below relating to this drug:

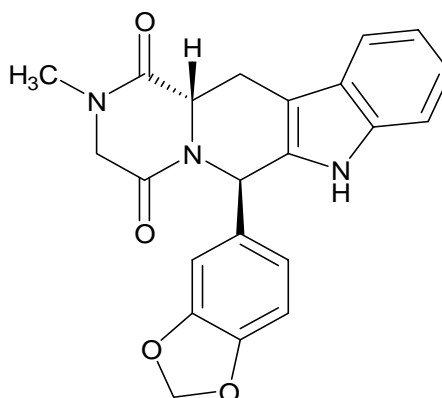
- A. (4 pts.) Identify the functional groups labeled with arrows in the structure above. If any alcohols or amines are present, determine if they are primary, secondary, or tertiary.
- B. (2 pts.) Circle one answer in each row so that your entire answer best describes the H-N-C bond angles in *Tadalafil*:
- | | | |
|-----------------|------------------|-----------------|
| a bit less than | exactly equal to | a bit more than |
| 60° | 90° | 109.5° |
| 120° | 180° | |
- C. (4 pts.) The molecular formula of *Tadalafil* is _____.
- D. (2 pts.) Add, subtract, or otherwise change NO MORE THAN 3 ATOMS in *Tadalafil* to create a new molecule that contains a carboxylic acid. You may remove other functional groups if necessary.

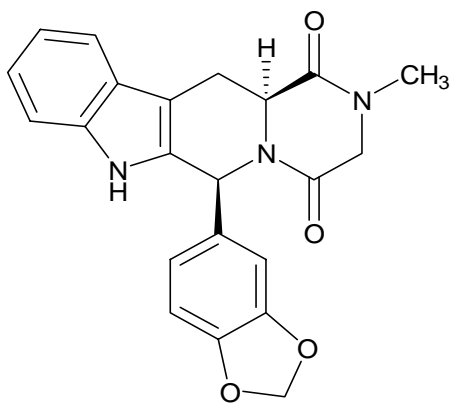
- E. (6 pts.) On the structure below, clearly label all the stereocenters (if any) present in *Tadalafil* as either *R* or *S*.

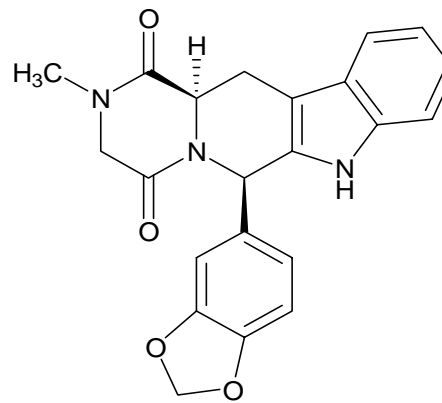


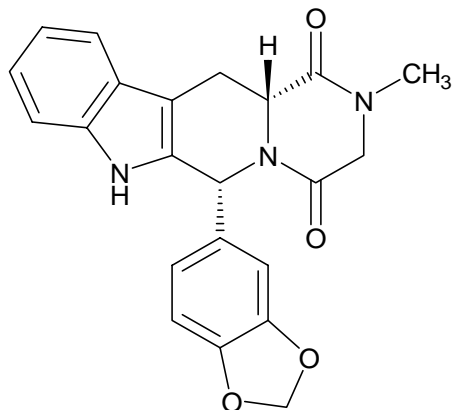
- F. (8 pts.) Compare each molecule below with *Tadalafil* (above). In the box below each molecule, write “identical”, “enantiomer”, “diastereomer”, or “none of these”.



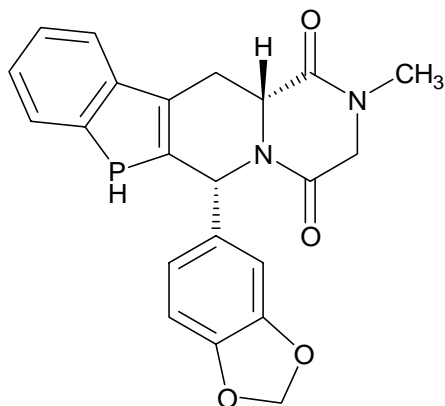






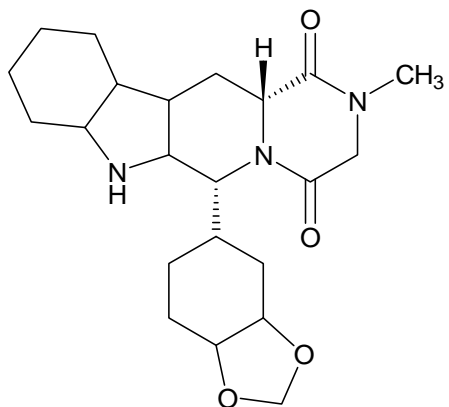


- G. (8 pts. total; 4 pts. each) For each of the following molecules below, circle whether you would expect it to have a HIGHER or LOWER boiling point than *Tadalafil* (shown above). Briefly explain your answer.



would have a (CIRCLE ONE) higher lower boiling point than *Tadalafil*.

EXPLANATION:

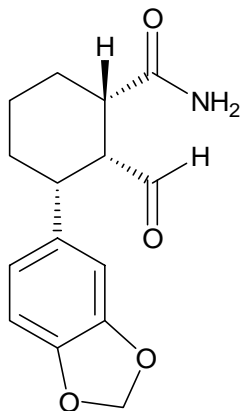


would have a (CIRCLE ONE) higher lower boiling point than *Tadalafil*.

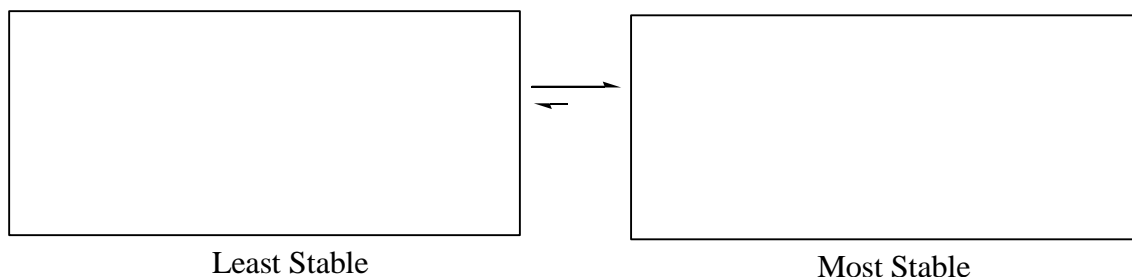
EXPLANATION:

- H. (1 pt.) What is the maximum number of stereoisomers possible for *Tadalafil*?

- I. (8 pts.) In pharmaceutical research, structural analogs of drugs are often made in order to see if they have similar biological properties. Below is a structural analog of *Tadalafil* called **Molecule A**.



In the boxes below, draw the most stable and least stable chair conformations of **Molecule A**:



Least Stable

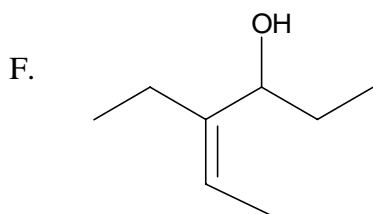
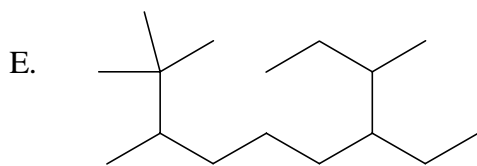
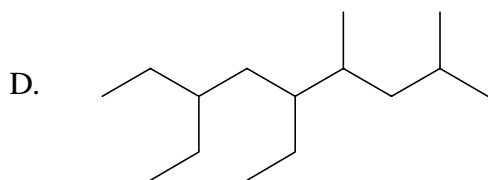
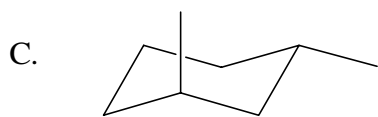
Most Stable

- J. (3 pts.) Write **T** for True or **F** for false beside each statement below:
- 1) _____ *Tadalafil* is an optically active compound that rotates plane polarized light.
 - 2) _____ Enantiomers of *Tadalafil* possess identical melting and boiling points.
 - 3) _____ A racemic mixture is either dextrorotatory or levorotatory.
2. (10 pts.) Draw four constitutional isomers with the molecular formula C_3H_9N using bond-line notation, and label any potential amines as primary, secondary, or tertiary.

3. (18 pts. total; 3 pts. each) **NOMENCLATURE!** Use the appropriate IUPAC notation to name/draw each of the organic structures below:

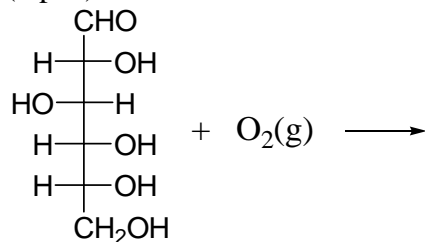
A. 4,4-diethyl-2-heptyne

B. *m*-diiodobenzene

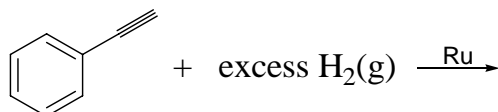


4. (14 pts. total) **REACTIONS AND MECHANISMS!** Predict the MAJOR product(s) for the reactions listed below, and give the appropriate curved arrow notation where requested. Write NR if no reaction occurs.

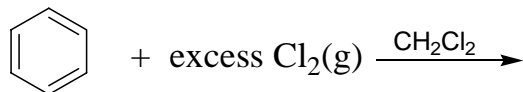
A. (2 pts.)



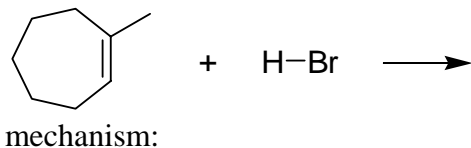
B. (2 pts.) **Figure It Out!**



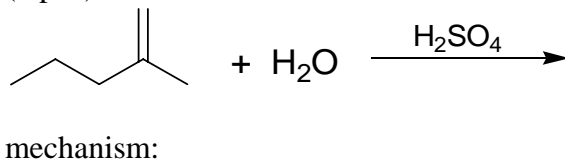
C. (2 pts.)



D. (4 pts.)

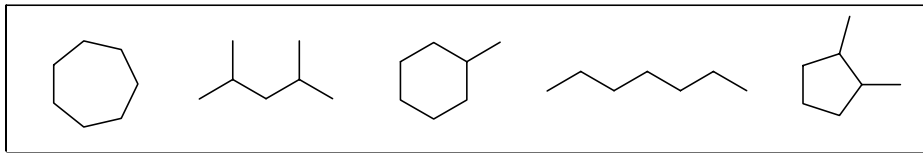


E. (4 pts.)



5. (12 pts. total) **SHORT ANSWERS!**

A. (7 pts.) Arrange the following compounds in order of expected increasing boiling point, and briefly explain your ordering:



B. (5 pts.) Determine whether the descriptions below refer to *Captopril*, *Ibuprofen*, or *Thalidomide* by writing the drug name on the lines provided.

_____ - teratogenic; responsible for abnormal birth defects

_____ - effective for the treatment of high blood pressure and congestive heart failure

_____ - found to be useful in the treatment of leprosy and may also be useful in the treatment of AIDS

_____ - its S-enantiomer is active as a pain and fever reliever

_____ - both enantiomers are active sedatives