First Year - Semester I
FUNCHEM Tutorial Organic Chemistry

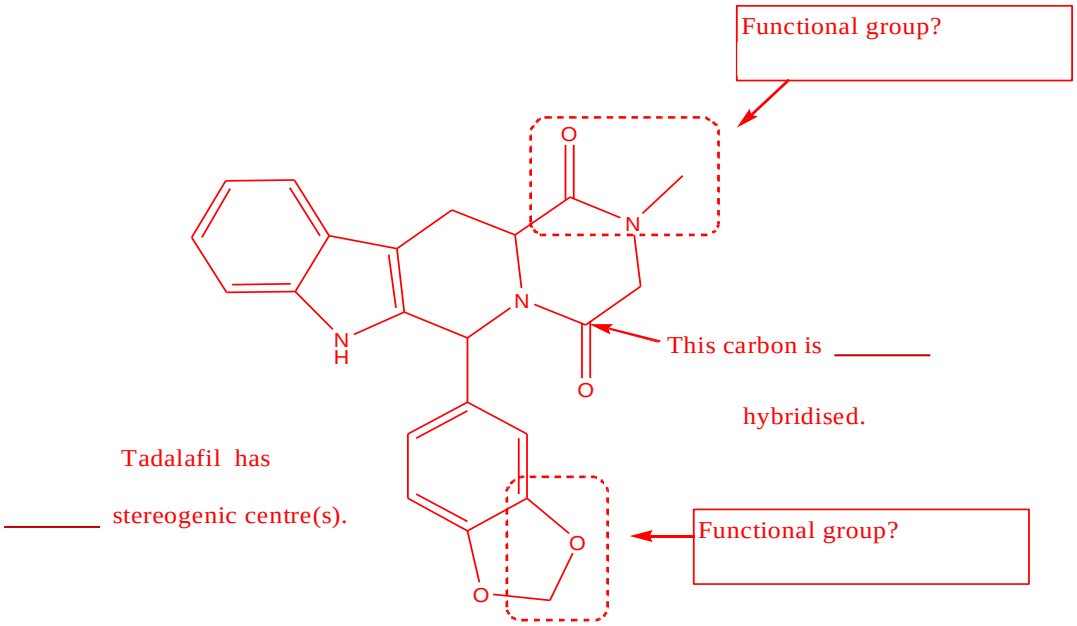
Based on material covered in the following lectures:

1. Introduction to organic chemistry I - functional groups, isomers (geometric, structural & optical).
2. Introduction to organic chemistry II.
3. Alkanes I: Structural isomers and homologous series in organic chemistry.
4. Alkanes II: Free radical chain reactions; an example of an organic reaction mechanism.

Short Answer Questions

1. Tadalafil, the structure of which is shown below, is a drug used to treat male erectile dysfunction and is currently undergoing clinical trials for the treatment of pulmonary hypertension.

(i) Complete the boxes and sentences below in relation to Tadalafil.

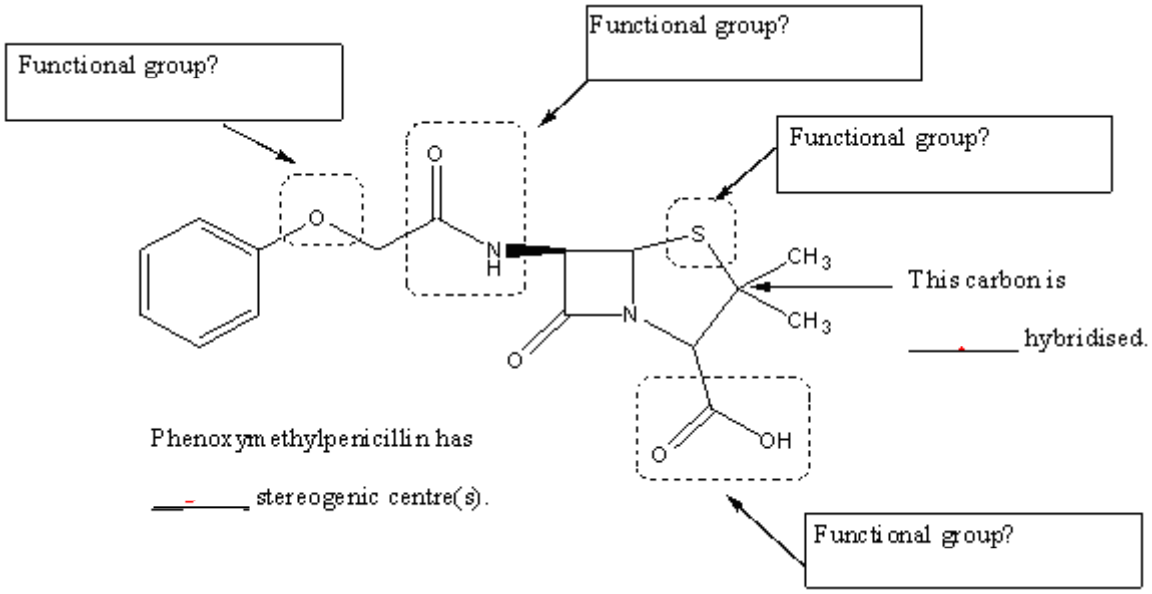


(ii) Cyclic molecules are commonly found in many classes of biomolecules including proteins, lipids and carbohydrates. State which of propane or cyclopropane is the more reactive molecule and why.

(iii) Draw and name the geometric isomers of 1-ethyl-2-methylcyclohexane.

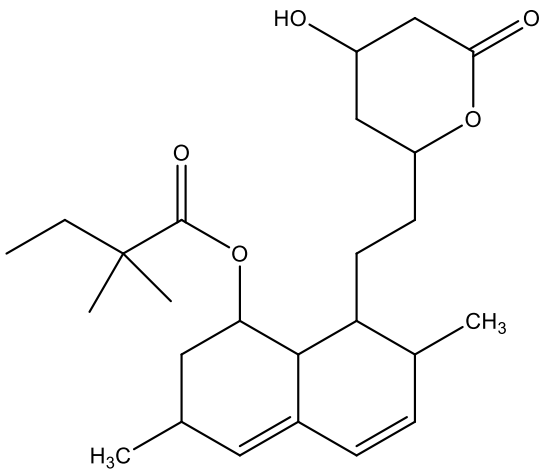
2. Phenoxymethylpenicillin, administered as its potassium salt, was the first reliable orally-active penicillin.

(i) Complete the boxes and sentences in relation to phenoxymethylpenicillin, the structure of which is shown below.

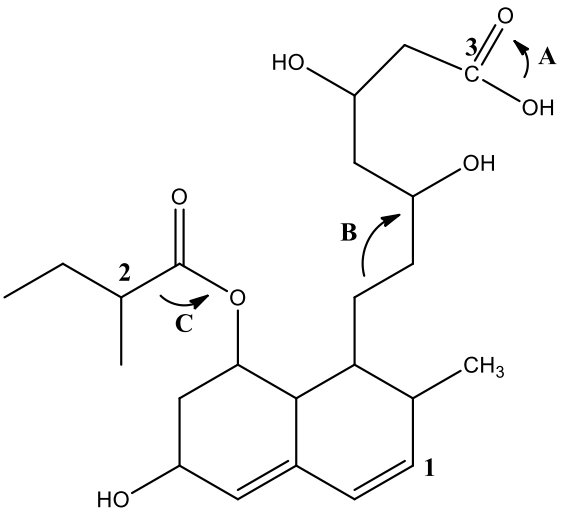


(ii) Different functional groups undergo different types of reactions. In the free radical substitution reaction for the monochlorination of propane in light, state which of 1-chloropropane or 2-chloropropane is the major reaction product and why.

3. The cholesterol lowering agents called statins, such as simvastatin (Zocor) and pravastatin (Pravachol) are among the most widely prescribed drugs in the world.



Simvastatin
(Zocor)



Pravastatin
(Pravachol)

(i) Clearly circle and label 3 different functional groups in simvastatin and state 3 main differences between the two agents.

(ii) In relation to Pravastatin, what are the hybrid orbitals used by the carbon atoms labelled 1,2 and 3?

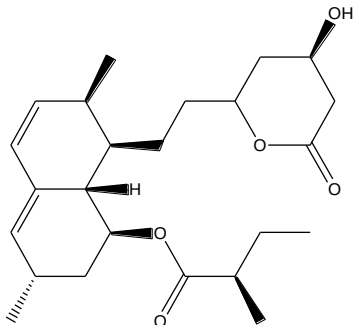
(iii) Give approximate values for the bond angles A, B and C.

(iv) How many carbon atoms in pravastatin are sp^2 hybridised?

(v) How many stereogenic centres, if any, are present in pravastatin?

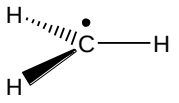
Multiple Choice Questions

1. Lovastatin, structure shown below, used to lower blood cholesterol levels, contains how many sp^2 hybridised carbons?



A. 2
B. 5
C. 6
D. 9
E. 15

2. Free radicals play an important role in a number of biological processes. Which of the following free radicals is the most stable?



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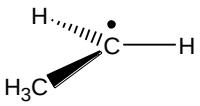

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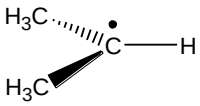

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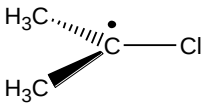

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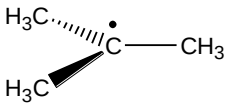
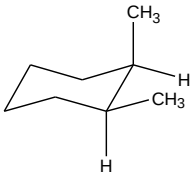


E.

3. Alkanes form the backbone of many drug molecules. Which of the following cyclohexane structures has the *cis*-configuration?



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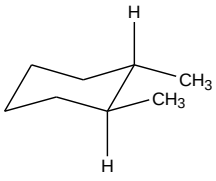

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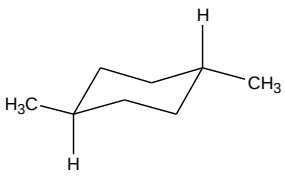

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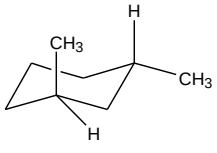

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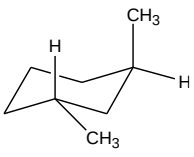

E.