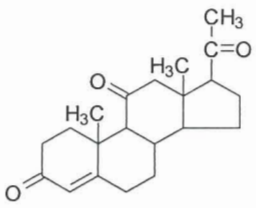
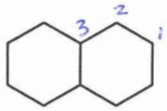
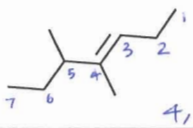
Name: ANSWER KEY SUNY ONEONTA

CHEM. 226 Exam 1 September 19, 2012 10:00am-10: 50am

Attempt all the questions within the spaces provided, showing your steps clearly for partial credit.

1.	The following steroid has four (4) pi (π) bonds and five (5) sp^2 hybridized carbon atoms. 	(T)	F
2.	*tert*-butyl iodide is the same as 2-iodo-2-methylpropane.	(T)	F
3.	The order of stability of carbocation intermediates in electrophilic alkene addition reactions is; methyl >1° > 2° > 3°	T	(F)
4.	 2,2-dimethylpropane and *n*-pentane are constitutional isomers and 2,2-dimethylpropane has a higher boiling point than *n*-pentane	T	(F)
5.	Monobromination of the bicyclic compound shown below in the presence of light results to the formation of two possible products only. 	T	(F)
6.	The carbon atom of the carbocation is sp^2 hybridized, has trigonal planar geometry and has an empty p-orbital.	(T)	F
7.	The IUPAC name of the alkene shown below is 3,4-dimethyl-4-heptene  4, 5-dimethyl-3-heptene	T	(F)
8.	The alkene 2-methyl-2-pentene can exist as *cis-trans* isomers	T	(F)

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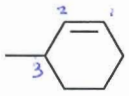
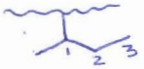
9.	The following substituted cyclohexane compounds can be classified as constitutional isomers  These are actually Conformers of trans-1,2-Dimethylcyclohexane	T	(F)
10.	The correct IUPAC name for compound shown below is 1-methyl-2-cyclohexene  3-methylcyclohexene.	T	(F)

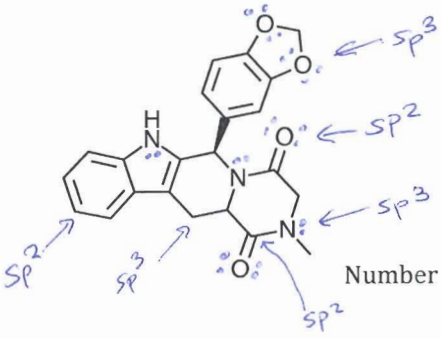
11. Another name for a *sec*-butyl alkyl group is: 3pts

 1-methylpropyl

12. The most stable conformation of *trans*-1-tert-butyl-2-methylcyclohexane is the one in which the substituent groups occupy what positions on a chair conformation? 4pts

tert-butyl equatorial, methyl equatorial

13. Cialis is a commonly used drug, how many pairs of non-bonding electrons does the following active molecule in Cialis have?



Number of non-bonding electron pairs 11 pairs. 3pts

Identify and show two uniquely hybridized Carbons, Nitrogen and Oxygen atoms in the molecule. 6pts

NB: for Carbon and Oxygen there are sp^2 and sp^3 hybridized atoms in the molecule, while for Nitrogen all of them in this molecule are sp^3-hybridized.

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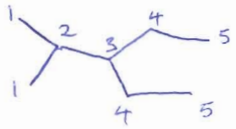
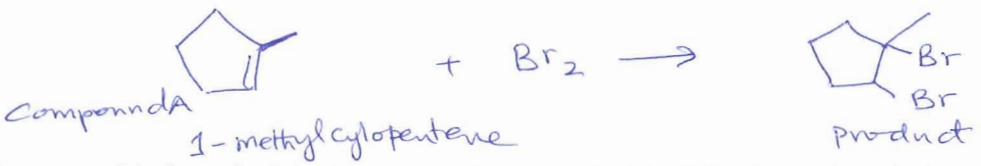
14. How many monochlorinated alkyl halides are formed by the photochemical monochlorination of 3-ethyl-2-methylpentane? 4pts



5

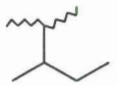
15. When compound A is reacted with one equivalent of bromine, the product was found to be 1,2-dibromo-1-methylcyclopentane. Determine the Identity and draw the structural formula of compound A. 4pts



1-methylcyclopentene

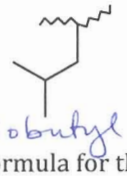
product

16. Give the name of the branched alkyl group attached to each of the following carbon chains, where the squiggly lines denote the carbon chain. 8pts



sec-butyl

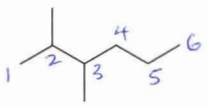
iso propyl

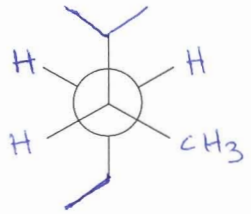


Isobutyl

tert-butyl

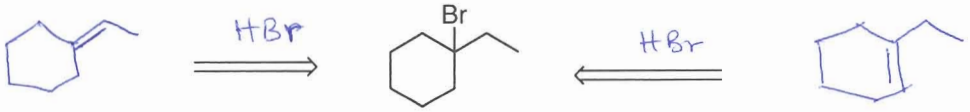
17. Fill in the Newman projection formula for the most stable conformation of 2,3-dimethylhexane. View the molecule between C_3 and C_4. 4pts





Staggered conformation preferred

18. The 1-bromomo-1-ethylcyclohexane shown below may be prepared by hydrohalogenation of two suitable alkenes, draw the structures of these alkenes? 6pts



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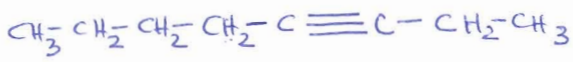
19. Explain why the following names are incorrect and give a correct name and structure in each case. 9pts

a) 5-octyne



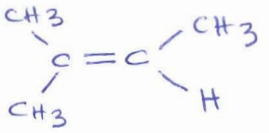
3-octyne.

Should have been numbered from the opposite side

b) 2-methylcyclopentene

should be 1-methyl cyclopentene

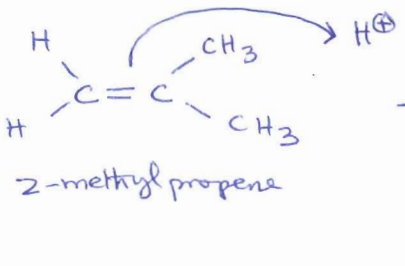
c) *trans*-2-methyl-2-butene



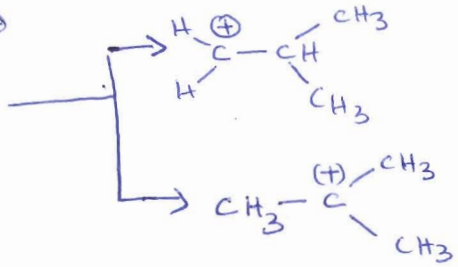
2-methyl-2-butene

Cannot have cis/trans isomerism since carbon 2, has identical methyl groups attached on it

20. When 2-methylpropene reacts with water in the presence of an acid catalyst, only one product alcohol is observed: *tert*-butyl alcohol (2-methyl-2-propanol) Draw the structures of the two possible intermediate carbocations that could form from the protonation of the 2-methylpropene. Which is more stable explain? 6pts



2-methyl propene

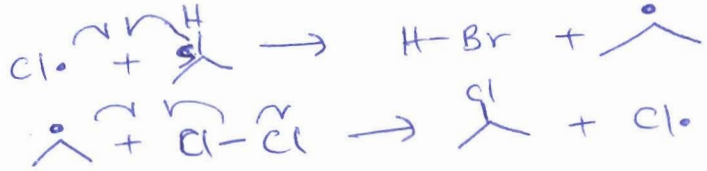


tertiary carbocation more stable than 1° due to hyperconjugation

21. Write all the steps in the free-radical chain reaction mechanism for the monochlorination of propane represented in the equation below. What is the name and structure of the trace by-product would you expect as a consequence of the chain-terminating steps. 11pts

Initiation step:

Propagation steps:



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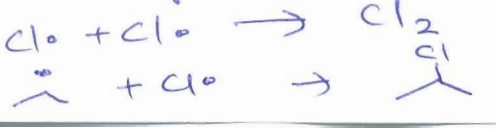
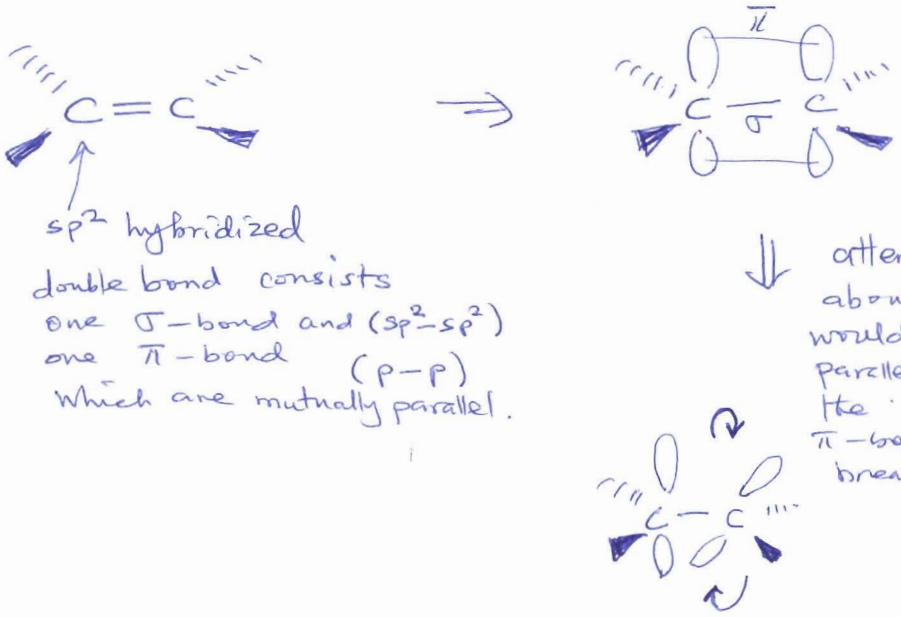
termination steps.



trace product

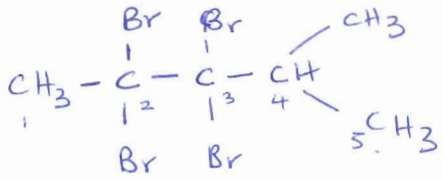
2,3-dimethyl butane

22. Using appropriate illustrations, explain why rotation about a carbon-carbon double bond is restricted. 6pts



23. A student performed an experiment to identify whether a compound B was saturated on unsaturated. The student found out that it took exactly two equivalents of bromine to react completely with compound B, and the product was identified as 2,2,3,3-tetrabromo-4-methylpentane. Provide the structure and identity (name) for compound B. 6pts

Product



Since two equivalents of Bromine was required, the unsaturated ~~Br~~ hydrocarbon was likely to be an alkyne or a diene., but since the product, has bromination only between two carbon-carbon atoms 2,2,3,3- it confirms that the reactant was an alkyne. with the structure

4-methyl-2-pentyne

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