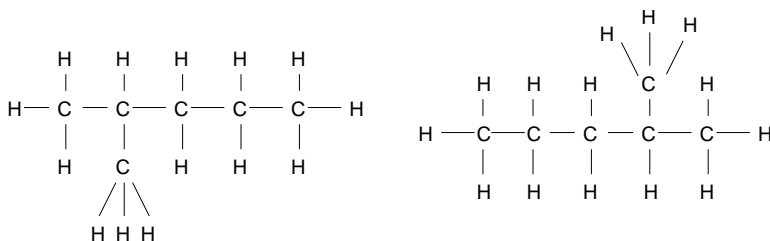
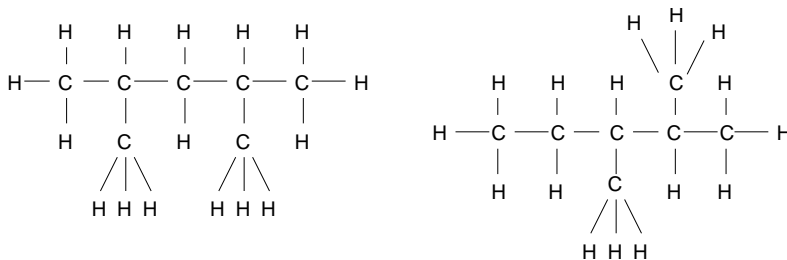


Chemistry 105
Sample Questions for Exam 3

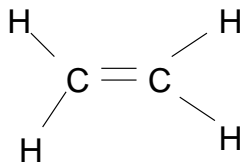
1. There are two different structural isomers of butane, C_4H_{10} . Draw them.
2. What is the difference between an alkene and an alkane?
3. How do the properties of alkanes change as the number of carbons increases?
4. Are the following compounds isomers, identical, or neither?



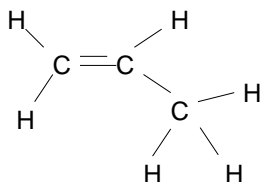
5. Are the following compounds isomers, identical, or neither?



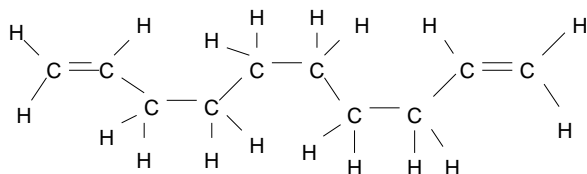
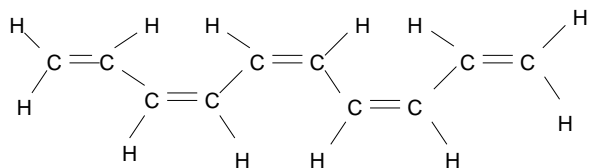
6. What is the difference between the ground electronic state and an excited electronic state of a molecule?
7. Name two common photosynthetic pigments found in plants.
8. Methane, CH_4 , is a tetrahedral molecule. Based on this information, what hybridization would you expect the carbon atom to have?
9. Describe the carbon-carbon bonding in ethylene using the hybridization model:



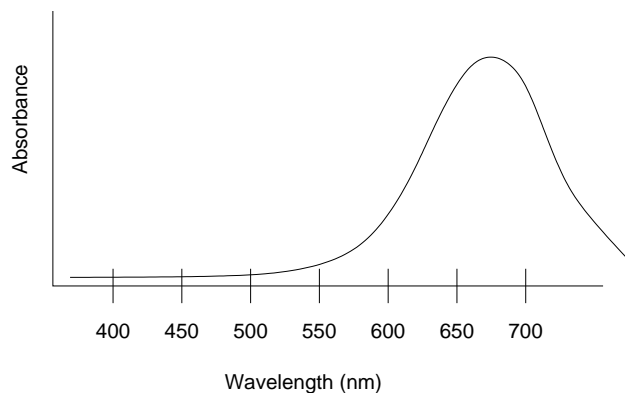
10. What is a molecular orbital? How does the concept of a molecular orbital relate to atomic orbitals?
11. Describe the hybridization of each of the carbons in the following molecule:



12. A double bond consists of:
- One “sigma” (σ) bond
 - One “pi” (π)
 - Two “sigma” (σ) bonds
 - Two “pi” (π) bonds
 - One “sigma” (σ) and one “pi” (π) bond
13. Describe the process of fluorescence.
14. How does the process of phosphorescence differ from fluorescence? What consequences does this have for the timescale on which phosphorescence happens?
15. Consider the description of early theories of organic dyes from discussion 10. Which of the following molecules do you think would be more likely to absorb light in the visible region of the spectrum and why?



16. Given the following spectrum of a substance dissolved in water, what colors of light does the solution absorb? What color might you expect the solution to be?



17. Why must indigo be reduced to leucoindigo in order to dye fabric?
18. What is chromatography used for?

19. Essay Questions: Here are a selection of essay questions that may appear on the exam. In general, you will be given a choice of at least two questions to answer for each essay.
- (a) Why are tree leaves green in the spring and summer, but turn bright colors (red, orange, yellow) in the fall?
 - (b) Describe how indigo was obtained prior to the availability of the synthetic version and describe at least two ways indigo was used.
 - (c) Describe why organic molecules containing double bonds are more likely to be brightly colored than those containing only single bonds.
 - (d) Describe the concept of resonance and its consequences using a model molecule like benzene.
 - (e) In general terms, describe bioluminescence and more specifically, the process that makes fireflies glow.
 - (f) How do fluorescent whitening agents work? (How do they make white clothes so bright?)