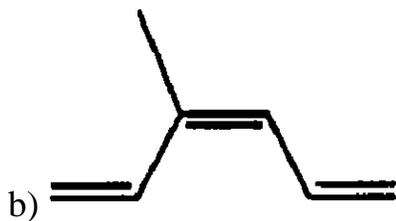
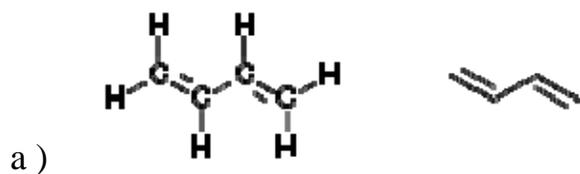
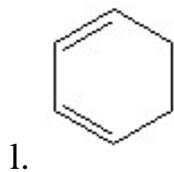
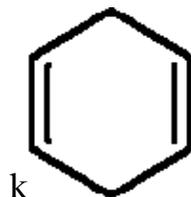
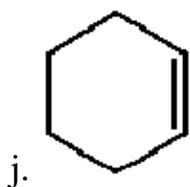
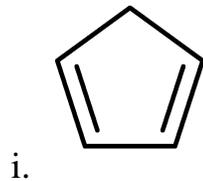
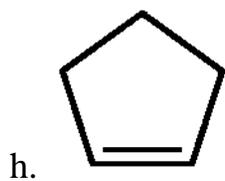
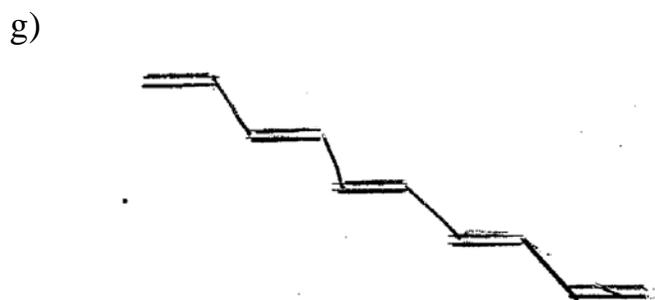
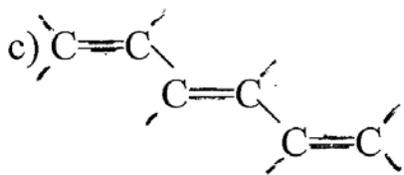


## Alkenes Study Guide

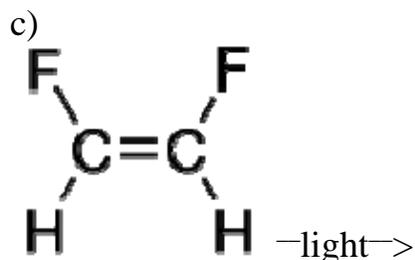
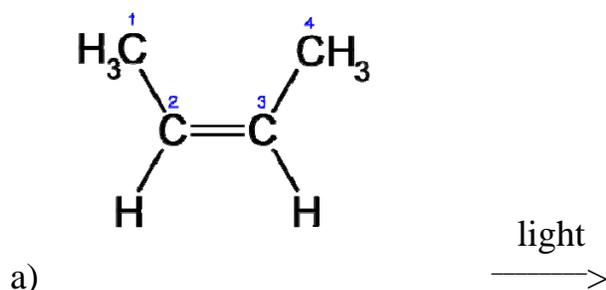
1. How many different unbranched hexenes are there? (In other words, how many different places can one put a double bond in 6 C unbranched chain?) Draw the structure for each and give the systematic name for each molecule. Be on the watch for geometric isomers.
2. Draw structural formulas for:  
a) 2,3-dimethyl-2-butene b) 1-methylcyclopentene c) cis-2-heptene, trans-2-heptene d) 3-chloro-1-cyclobutene e) cyclohexene f) 4-methyl-cis-2-pentene
3. Give the names for the following molecules:





4. Explain what is meant by the term polyunsaturated.

5. Show the complete reaction pathway for the photoisomerization of:



6. Given the structure of vitamin A, explain how the isomerization of retinal is important in vision. Also discuss the solubility of vitamin A in water and in non-polar solvents such as fat. What is the orange pigment in carrots? How is it related to vitamin A? Name the red pigment in tomatoes. How is its structure different from the pigment in carrots.?

7. a) How does retinal differ from retinol and retinoic acid in terms of chemical structure? These three molecules are three different forms of \_\_\_\_\_.

b) How does Retin A differ from Accutane in terms of a) structure b) clinical use c) adverse effects.

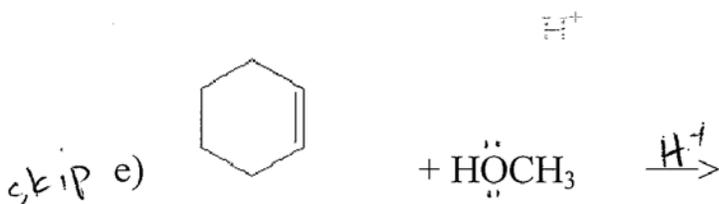
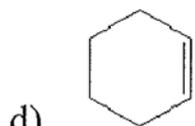
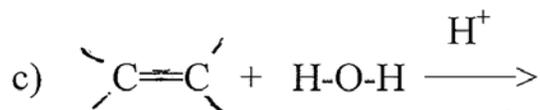
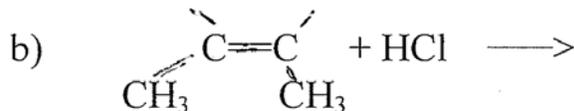
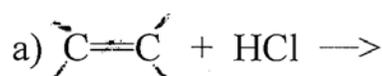
8. Retinal binds to a protein called \_\_\_\_\_ in the retinal cells of the eyes to form a complex called \_\_\_\_\_. When light of appropriate wave length strikes the retina, it causes a \_\_\_\_\_ reaction which converts \_\_\_\_\_ into \_\_\_\_\_. How does this

isomerization result in the perception of light? Where is the bacterial form of retinal found and what is its biological function?

9. Explain what neonatal jaundice is and why it occurs. Explain how phototherapy can reduce neonatal jaundice. Be sure to include a) what molecule is absorbing the light? b) what type of reaction is occurring? c) why this changes the water solubility? d) how is the solubility of bilirubin in water increased in the normal liver?

10. Give the reaction that occurs in the hydrogenation of alkenes and explain the reason it is so important in the margarine industry. Why is it done and what problems result from this reaction?

11. Show the complete reaction pathway:

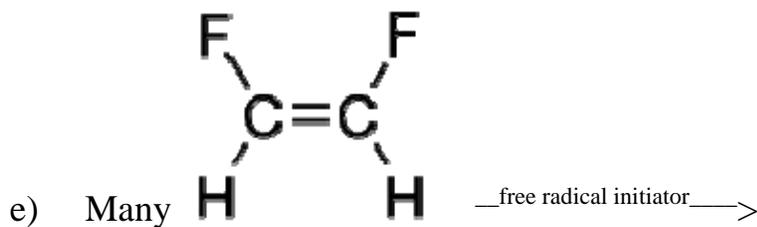
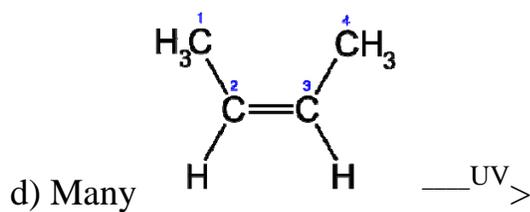
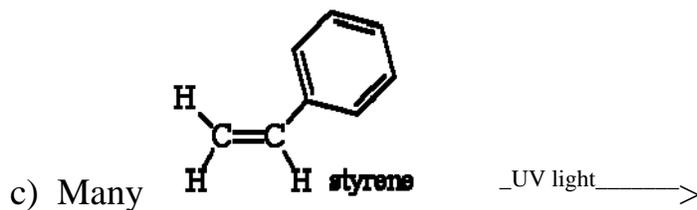
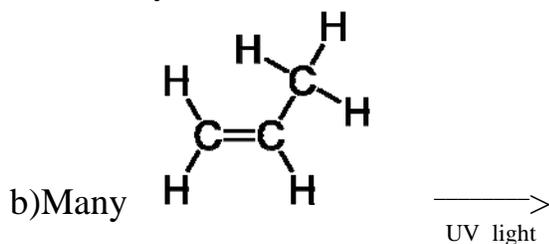
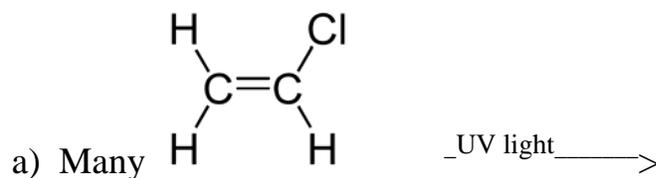


12. How do the structure of LDPE, HDPE and PEX differ? How do they differ in the way the polymer chains pack together and why? How do they differ in terms of physical properties? What sort of products are they used in?

13. How does the structure of polypropylene differ from the structure of polyethylene? What sort of products is it used in? What advantage does it have over polyethylene in terms of heat stability?

14. What polymers allow Gore-tex to breathe and how do they do so? Give a medical use of Gore-tex.

15. Given the structure of the monomer molecules below, draw the structure of the **polymer** product.



16. What properties of polyvinylidene (Saran) are particularly useful for storing food in Saran wrap?

17. What is the purpose of adding DEHP to PVC? What is the general term for molecules like DEHP? What sort of medical products have used PVC containing DEHP? What are the concerns about the use of DEHP?

18.

Discuss the role of branching and crosslinking and plasticizers in polymers

19. Polybutadiene was first made in the hopes of making synthetic \_\_\_\_\_. When and why was this regarded as important?

20. What two isomeric forms of polybutadiene can exist and how do their properties differ? Draw a representative short chain of each form.

21. How did chemists modify the original polybutadiene to give it more useful properties. What is the general and specific name for the resulting mixture?

22. How does the structure of polybutadiene differ from polyethylene?

23. What sort of products are commonly made out of polyacrylonitrile?

24. What does the term ABS stand for? Name some common products made of ABS plastic.

25. What does PMMA stand for. What are some practical everyday uses of PMMA? What are some medical uses of PMMA

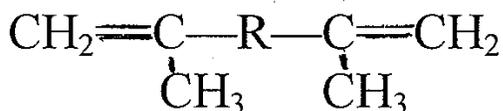
26. What problem occurs with using PMMA for hard contact lenses?

27. What materials are used for current contact lenses and how do they differ from PMMA.

28. What is meant by the term copolymer?

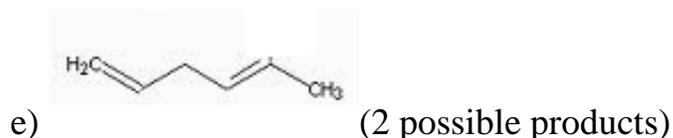
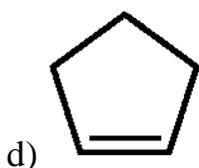
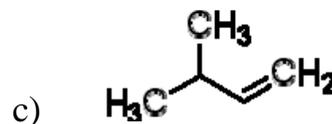
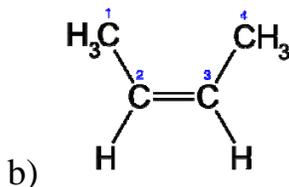
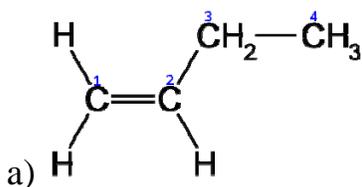
29. How is latex rubber different from gutta percha?

30. BIS-GMA (bis-phenol and glycidyl methacrylate) is mixed with inorganic materials and polymerized to form a composite material for dental pit and fissure sealants as well as fillings. What are two methods for polymerizing the BIS-GMA? How does the polymer formed in this polymerization differ from the polymers formed in question 11? Given the structure of dimethacrylate below, indicate how the presence of two double bonds in the structure accounts for this difference.



31. Discuss what chemical reaction explains 1) oils and fats going rancid 2) cell membrane damage and 2) cracking of rubber.

32. Draw the structure of the hydroperoxide product formed from the oxidation of the following molecules:



33. Draw the structure of benzene in two common notations. Draw the orbital overlap picture of benzene and label the delocalized electrons.

34. Draw the structure and give a use or medical/health fact about a) benzoic acid b) toluene c) benzene d) phenol e) benzaldehyde

35. Write the structural formula for a) paradichlorobenzene b) orthodichlorobenzene c) metabromotoluene d) ortho bromochlorobenzene e) orthochlorotoluene

36. What health effects can result from breathing benzene vapors? In what common product was benzene a major component? Where is benzene still found and why isn't it removed?

37. What health effects can result from breathing other organic solvents such as gasoline or paint stripper?

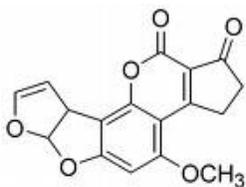
38. Draw the structure of naphthalene and explain what is meant by the term "fused rings". Name one practical use of naphthalene.

39. What was the industrial use for PCB's? What are some of the reasons they a health hazard? What does PCB stand for? Draw the generic structure of a PCB.
40. Name several industrial compounds where dioxins can be found as a contaminant. What sort of health concerns are there regarding exposure to dioxins. What problem results from acute exposure to high levels of dioxin? Name an incident where this received a lot of media exposure.
41. Describe the structure of graphite and indicate some uses of graphite. How does grapheme differ from graphite?
42. What is ethylene oxide used for and why is it so toxic?
43. What reactive molecule is vinyl chloride metabolized into and where in the body does this occur?
44. Draw the structure of benzopyrene and discuss how the formation of an epoxide group in the benzopyrene molecule results in the formation of a potent carcinogen. What functional groups in DNA can react with the reactive intermediate of the epoxide?
45. Carbamazepine (Tegretol) is a drug commonly used for treating seizures, manic depression, and other mood disorders. It is metabolized in a manner similar to that of benzopyrene, with the epoxide group being added to the double bond labeled in the middle 7-membered ring in the structure shown below. Show the epoxide and diol products that result from the metabolism of carbamazepine. What effect will these reactions have on the water solubility of carbamazepine? What health problems might be of concern based on what you've learned in this class?

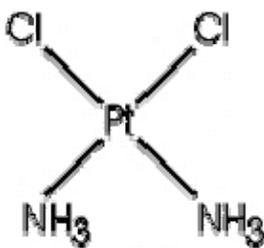


- 46.. Aflatoxin B is a potent carcinogenic toxin produced by a mold that can grow on peanuts and other grains, especially in humid conditions. The FDA and

USDA mandates that aflatoxin in our peanut butter be at a level less than 20 parts per billion(ppb)! Contamination of aflatoxin occurred in several types of Diamond brand dog food in 2005 and was apparently responsible for the death of at least 70 dogs. The aflatoxin molecule is metabolized in a manner similar to benzopyrene. This metabolism occurs primarily in the liver and aflatoxin is particularly likely to cause liver damage and liver cancer. The epoxide reaction occurs on the double bonds in the 5-membered ring on the far left of the structure shown below. Show the epoxide and diol product.



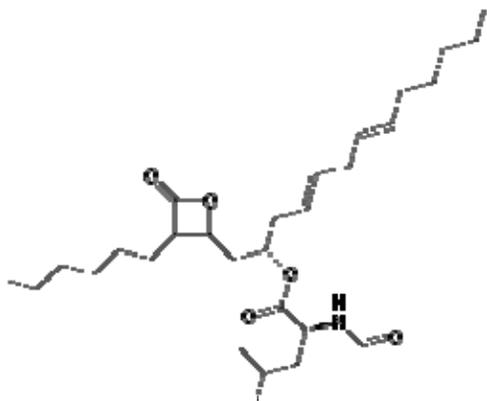
46. Cisplatin (cis-diaminedichloroplatinum) is used in chemotherapy of certain types of cancer. The cisplatin binds and crosslinks DNA, particularly replicating DNA and prevents DNA replication. The structure of cisplatin is shown below and the reason for the prefix cis should be clear. Draw the structure of transplatin, the geometric isomer of cisplatin. Only the cisplatin



**Cisplatin**

has any anti-cancer activity.

Are the double bonds in lipstatin cis or trans?



Think questions:

25. There has been an increasing concern about the use of bis-phenol A in plastics. Do some reading and find out what the reasons for these concerns are. Metal canteen advertisement below is playing on these concerns about avoiding bisphenol A exposure.

**What sort of polymers are used currently to make chewing gum?**

(25. What photochemical reaction is responsible for destroying ozone in the upper atmosphere?)