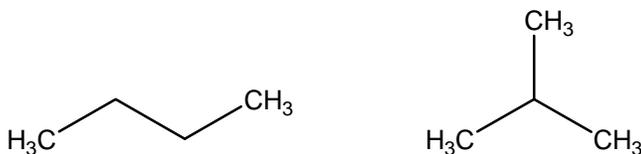


Spring 2009 CH302 Worksheet 10 – Organic Chemistry Answer Key

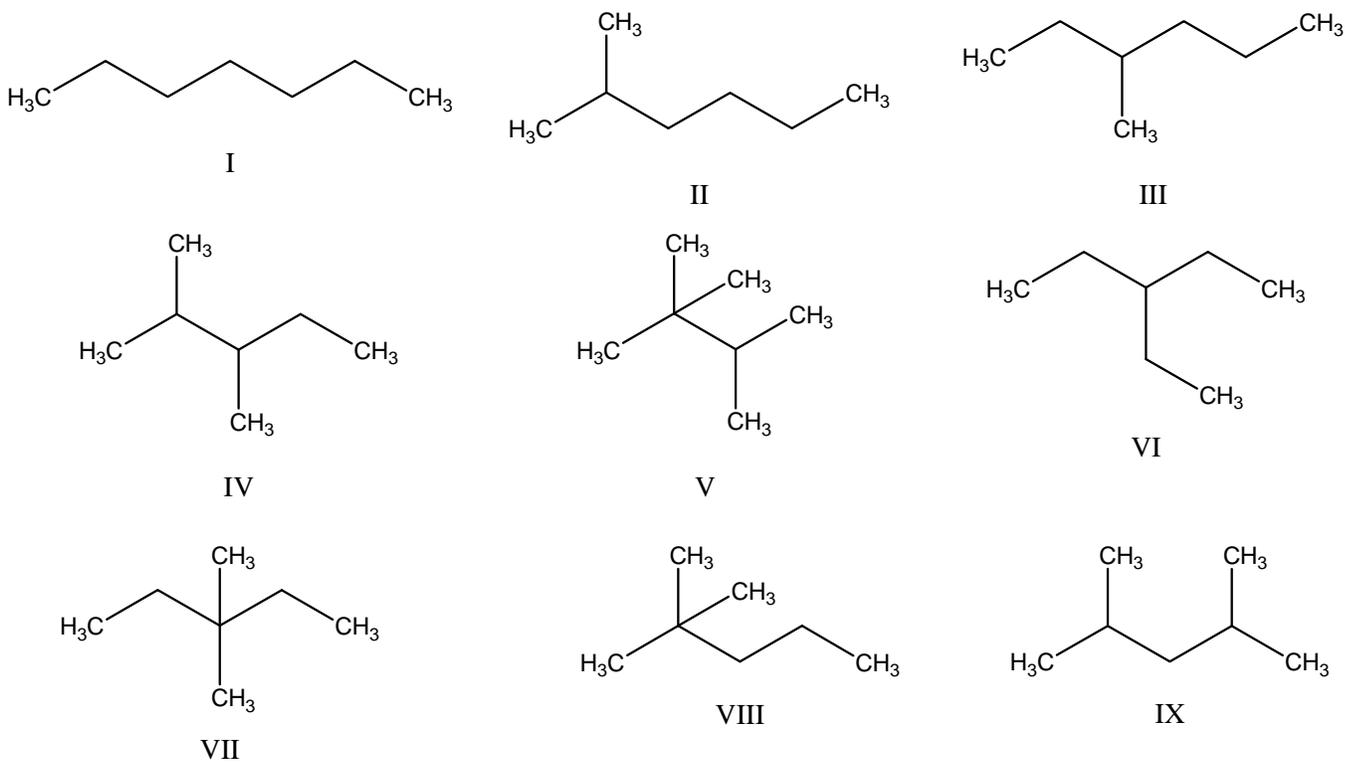
1. How many structural isomers does  $C_4H_{10}$  have? Draw them. **2**



2. Name them.

**butane, trimethylmethane**

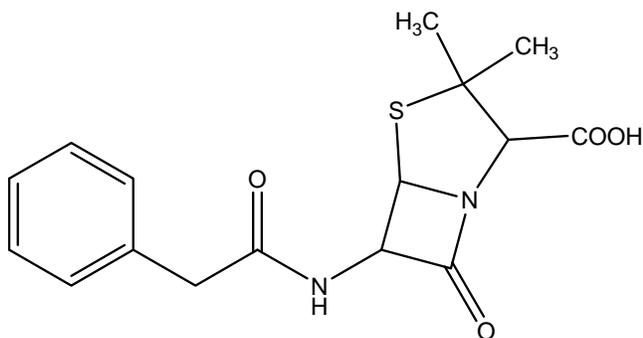
3. How many structural isomers does  $C_7H_{16}$  have? Draw them. **9**



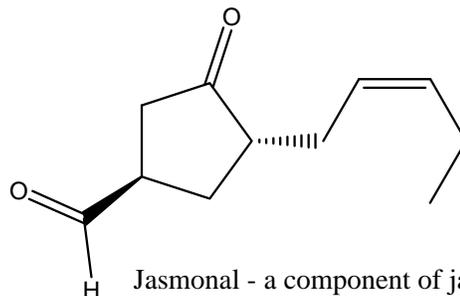
4. Name them.

**In order from I-IX: Heptane, 2-Methylhexane, 3-Methylhexane, 2,3-Dimethylpentane, 2,2,3-Trimethylbutane, 3-Ethylpentane, 3,3-Dimethylpentane, 2,2-Dimethylpentane, 2,4-Dimethylpentane**

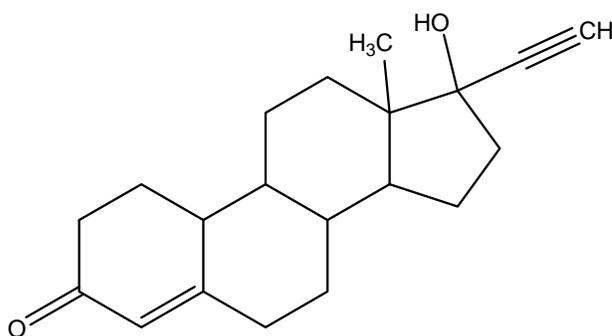
5. Circle and name the functional groups in these famous compounds.



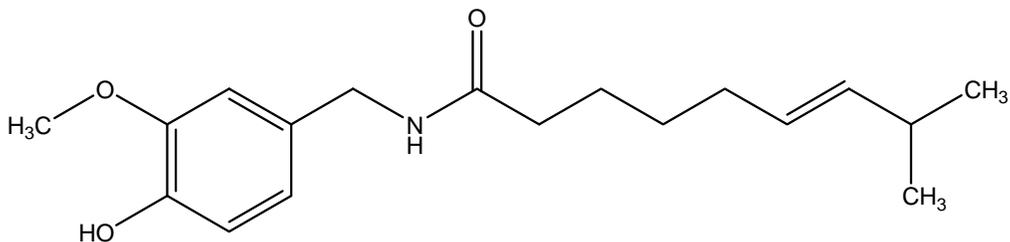
Penicillin G



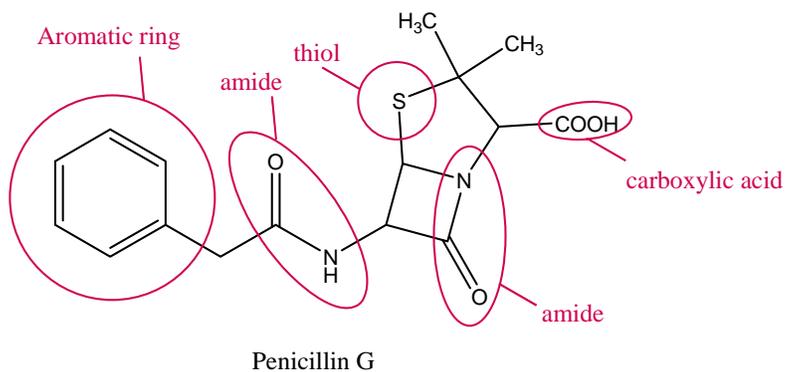
Jasmonal - a component of jasmine oil



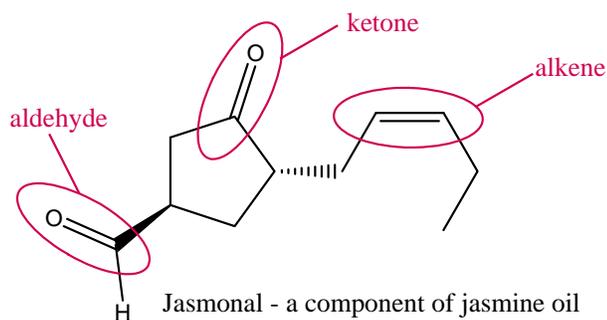
Norethindrone - active ingredient in Enovid (the first "pill")



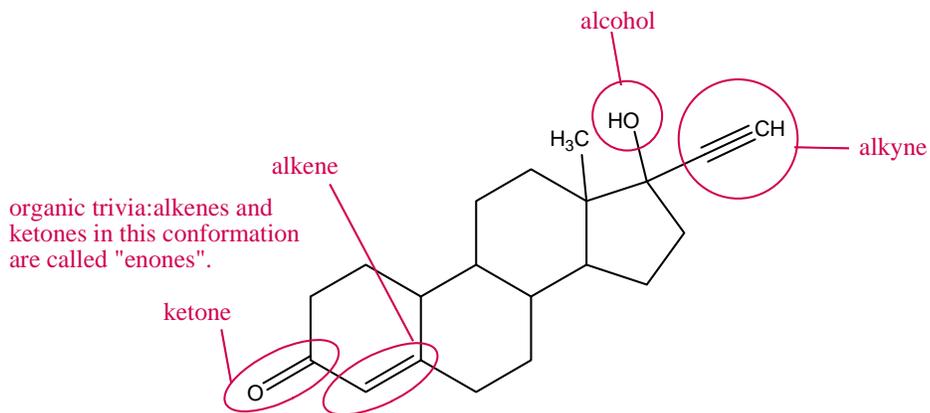
Capsaicin - "heat" causing molecule in chili peppers



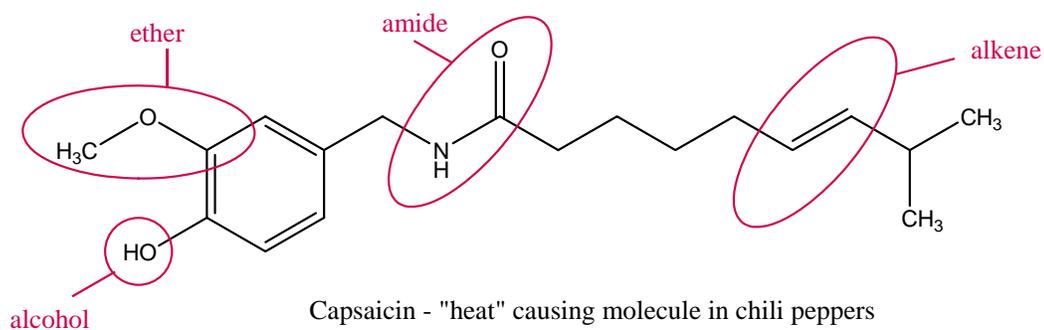
Penicillin G



Jasmonal - a component of jasmine oil

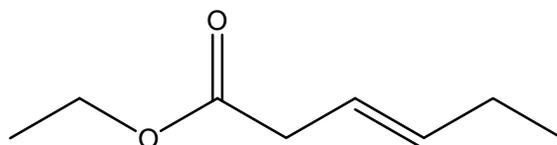


Norethindrone - active ingredient in Enovid (the first "pill")

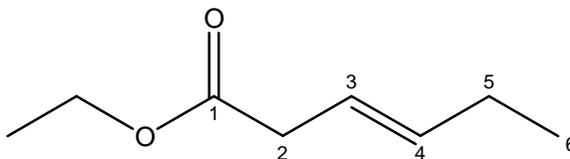


Capsaicin - "heat" causing molecule in chili peppers  
(there is also an aromatic ring, though not highlighted)

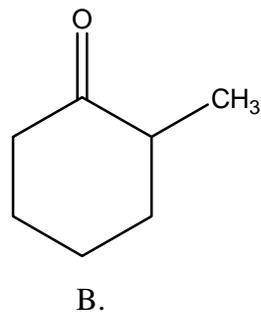
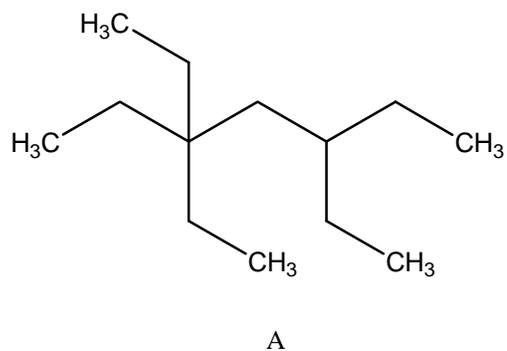
6. Provide the IUPAC name.



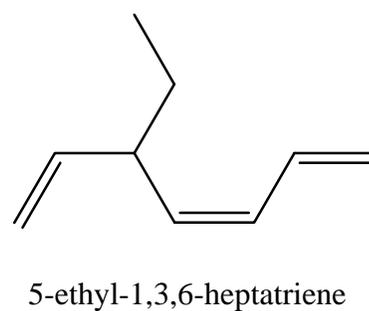
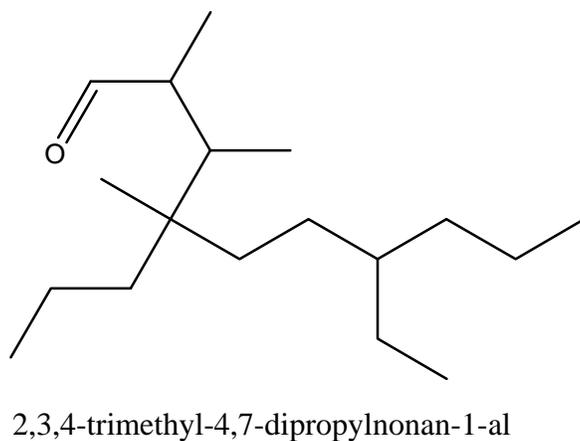
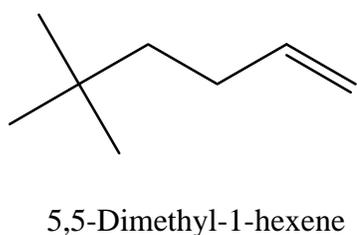
**3-pentene ethyl ester** The three indicates where the alkene starts in the molecule. This is a pentene ester, and the ester contains an ethyl group, making it the ethyl ester



7. Draw the following:
- 3,3,5-Triethylheptane
  - 2-Methylcyclohexanone

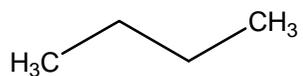


8. Draw the following:
- 5,5-Dimethyl-1-hexene
  - 2,3,4-trimethyl-4,7-dipropylnonan-1-al
  - 5-ethyl-1,3,6-heptatriene.

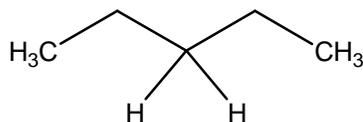


9. Name the following.
- $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_3$
  - $\text{CH}_2(\text{CH}_2\text{CH}_3)_2$
  - $\text{CH}_2(\text{OH})\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}(\text{CH}_2\text{CH}_3)\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_3$

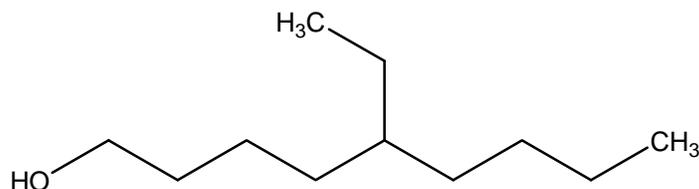
**It helps to draw these out so that you can identify the longest chain and functional groups.**



a. Butane

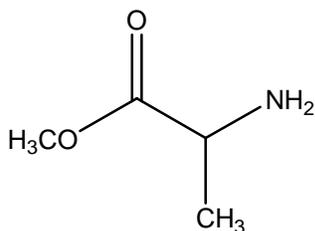


b. Hexane (a CH<sub>2</sub> with two ethyl groups hanging off of it.)

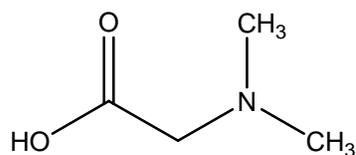


c. 5-ethylnonanol

10. Proteins are biological polymers made of amino acids. What type of linkage forms these polymers? Draw the product that would result from these two amino acids reacting together to form a peptide. What type of reaction is this?

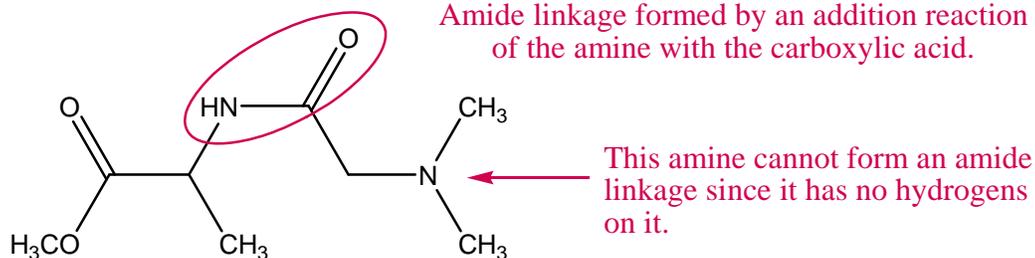


Alanine methyl ester



*N,N*-dimethylglycine

**Remember that these react based on acid/base chemistry. The amine will react with the acid to make an amide bond and release water.**



11. What levels of structure organization are possible for proteins and what do these each describe?

**Primary structure: the amino acid sequence in the peptide chain.**

**Secondary structure: the 3D orientation of these chains (helices and sheets are most common of secondary structures)**

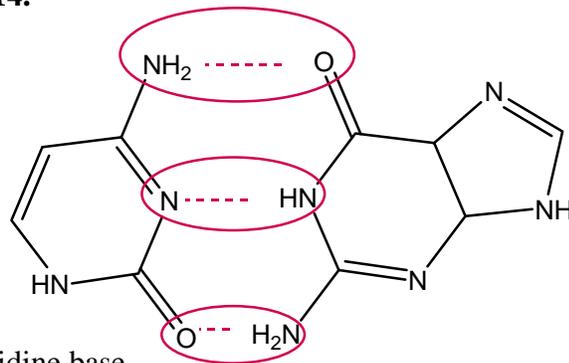
**Tertiary structure: Folding that occurs within the protein as sheets and helices adopt lowest energy conformation.**

**Quaternary structure: structure obtained when multiple proteins/peptides fold and bind to each other. An example of this is hemoglobin which has four separate protein subunits.**

12. Draw and name the four DNA bases.

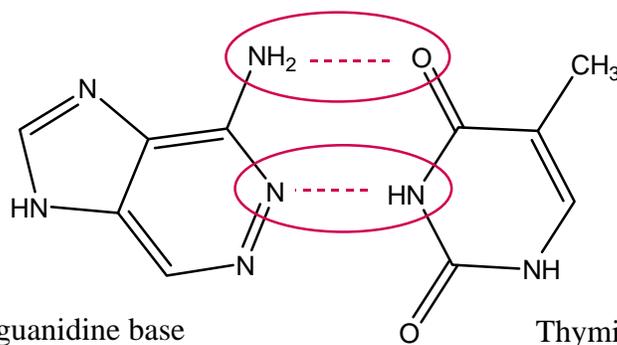
13. Which are the guanines and which are the pyrimidines?

14. What is responsible for the helical structure of DNA? Draw a circle around the H-bonds between base pairs. **Hydrogen bonding, refer to below graphic for rest of answer to # 12-14.**



Cytosine - pyrimidine base

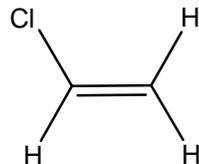
Guanine - guanine base



Adenine - guanine base

Thymine - pyrimidine base

15. What is the monomer and formula in the famous polymer that comprises irrigation pipes (PVC, polyvinyl chloride)? **Vinyl chloride, CH(Cl)CH<sub>2</sub>**



16. What types of polymers are there (4 general classes)? Draw examples with A,B notations.

**Simple polymer- AAAAAAAAAA**

**Block polymer- AAABBBAAABBBAAA**

**Alternating polymer- ABABABABABA**

**Graft polymer-**

	AAAAAAAAAAAA	AAAAAAAAAAAA
B	B	B
B	B	B
B	B	B
B	B	B

17. What is a nucleoside? What is a nucleotide?

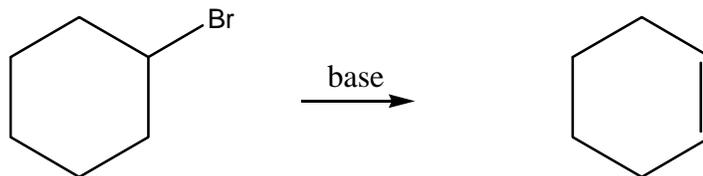
**A nucleotide is a base attached to a sugar (deoxyribose).**

**A nucleotide is a phosphate attached to a nucleoside.**

18. What is a fatty acid? What is the difference between saturated and unsaturated?

**Fatty acids are carboxylic acids with long hydrocarbon chains attached to them. Saturated fatty acids contain only sp<sup>3</sup> hybridized carbons in the hydrocarbon chain. As a result, these can pack easily and are usually solid. (think: Crisco). Unsaturated fatty acids contain double bonds. These cause “kinks” in the carbon chains, so they cannot pack as tightly as saturated fats can. (Think: olive oil).**

19. What type of reaction is shown below? **Elimination**, HBr is eliminated from the cyclohexane.



20. What type of reaction generates this ether? **Substitution**, bromine replaced by methanol.

