Study Guide Questions

1. Define the terms covalent, polar covalent and ionic bonds in terms of a) concepts b) differences in electronegativity values between two atoms (Δ EN).
2.Be able to determine what sort of bond (covalent, polar, ionic) in the following bonds without referring to notes.

a)C-H b)C-O c)C-N d)N-H e)C-Cl f)O-H g) S-H

3. Be able to draw the Lewis dot for C, N, O, S, F, Cl, Br and I without referring to a periodic table.

4. Draw a picture showing how the p orbitals of two F atoms overlap in diatomic F_2. Is the molecular orbital formed σ or π?

5. Draw a picture showing how hydrogen bonds are formed between water molecules. Draw a picture showing how the p orbitals of two O atoms overlap to form a sigma bond and a pi bond. Which type of bond(sigma or pi) is more strongly attracted to the positively charged nuclei? Which pair is more reactive?

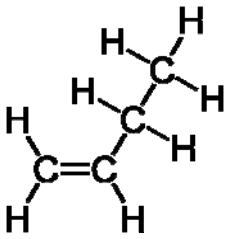
6. Give the names of the alkanes containing 1-10 C atoms.

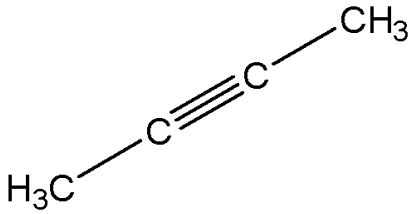
7. What is the molecular shape of the methane molecule, CH_4? Draw a picture using the "wedge and dash" notation. Do the same for the ethane molecule. What is the bond angle in each of these molecules? What is the name of this geometry?

8. The ammonia molecule, NH_3, can accept a hydrogen ion from a water molecule to form the ammonium ion, NH_4^{+1}. The geometry of the ammonium ion is analogous to that of the methane molecule. What is that geometry? Draw a picture of the ammonium ion using "wedge and dash" notation.

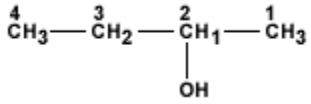
9. Name the geometry of ethane (C_2H_6), ethene (C_2H_4), and ethyne(acetylene). What are the bond angles in each case? In which molecule is there free rotation around the bond between the two C atoms?

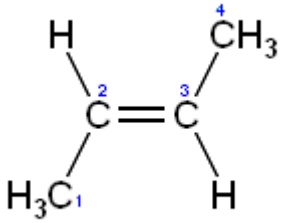
10. Describe the molecular shape and geometry around each C atom of the molecules shown below.

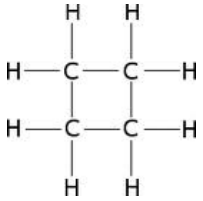


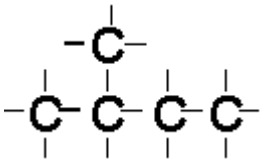


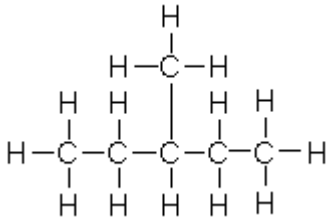
11.a)Write the line-bond notation for the following molecules:

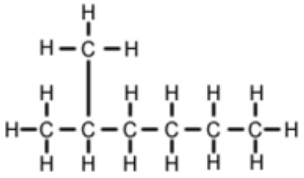


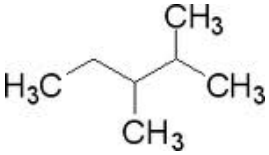


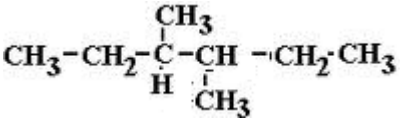


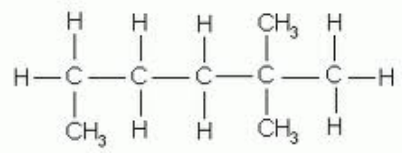












(Watch out, the longest unbranched chain is NOT 5 C atoms!)

b) Write the line-bond notation for the following molecules:

butane hexane octane decane

12.Write the expanded structural formulas for all isomers with following formulas. You should be able to draw the number of isomers given in parentheses.

a) $C_2H_3Br_3$(2) b) C_3H_7Cl(2) c)$C_3H_6Cl_2$ (4) d)$C_3H_5Cl_3$(5) e)C_3H_8O(3) f)C_4H_{10}(2) g)C_5H_{12}(3) h) $C_4H_{10}O$(6)

13. Draw all the possible isomers with the formula $C_2H_2F_2$. Indicate two that are geometric isomers of each other and two which are structural isomers of each other. Please note that the same structure can be a structural isomer of one molecule and a geometric isomer of another molecule.

14. What is the difference between a structural isomer and a geometric isomer? Draw 2 structural isomers with the formula C_3H_6 and 2 structural isomers with the formula $C_3H_4Cl_2$.

15. Explain the various uses for DES. Explain why the concept of cis and trans isomers relates to DES. Which geometric isomer is the active one?

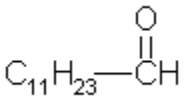
16. Draw all the different isomers that are possible when two F atoms are substituted on a three-membered cyclopropane ring.

17. Write structures for all the isomers with the following formulas. The number of isomers you should be able to find is given in parentheses.

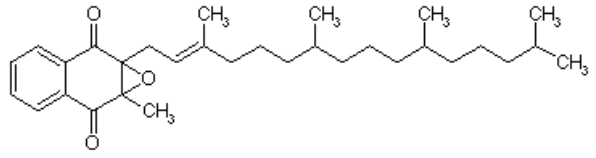
a) C_3H_9N (4) b)$C_4H_{11}N$(7) c) C_3H_5F(7;there are more) d) $C_3H_4Cl_2$(10)

You will need to have a double bond or a ring in c) and d).

18. Label the functional groups in the following molecules



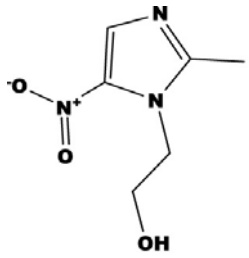
(One of the ingredients in Chanel#5 perfume)



C05849

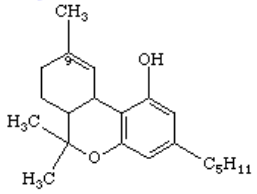
Vitamin K derivative

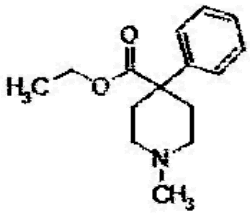
19. Label the functional groups in the following drug molecules



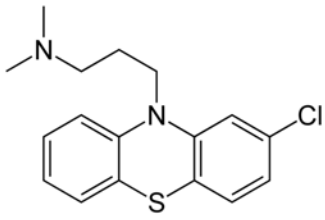
Metronidazole (Flagyl)

tetrahydrocannabinol

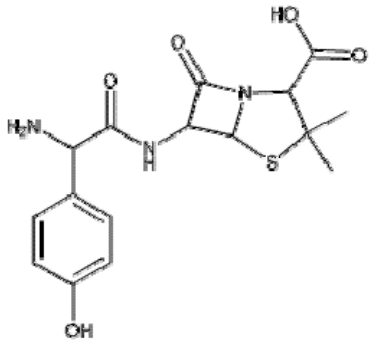




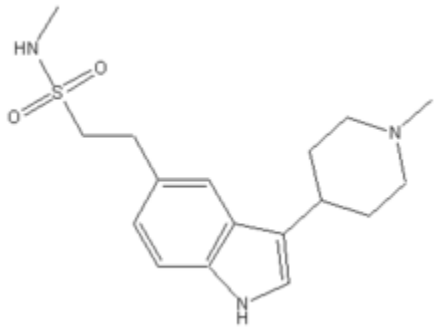
Meperidine
Demerol)



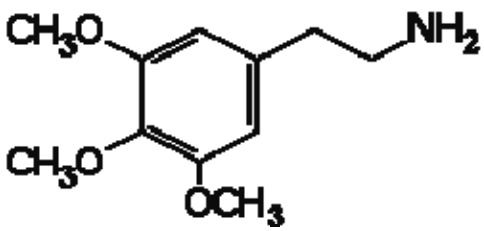
chloropromazine



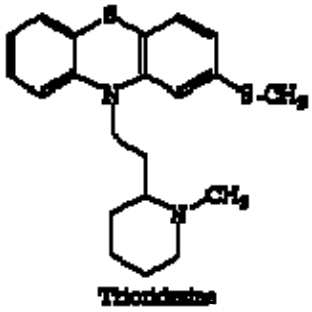
Chemical Formula: $C_{16}H_{19}N_3O_5S$ Amoxicillin

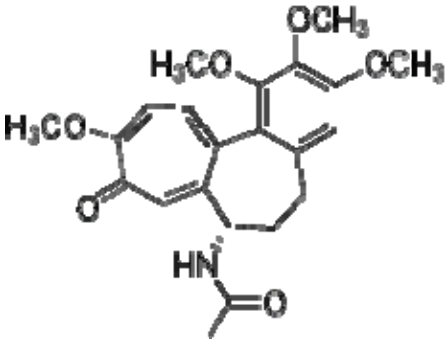


Naratriptan(Amerge)

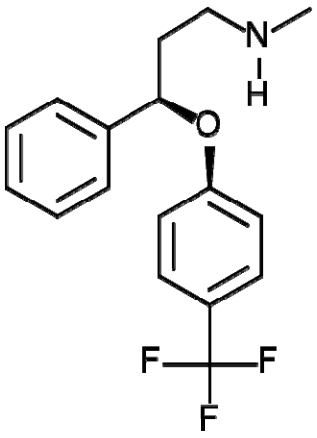


Mescaline

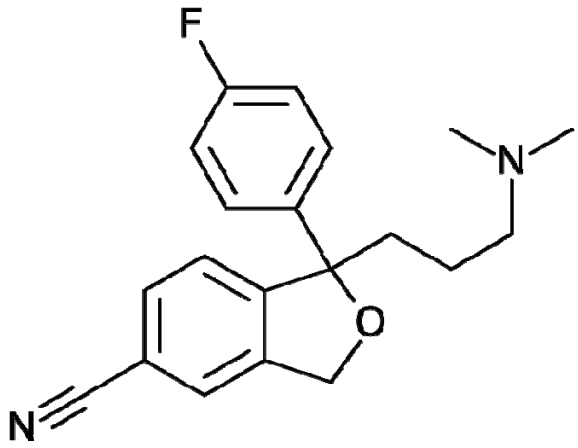




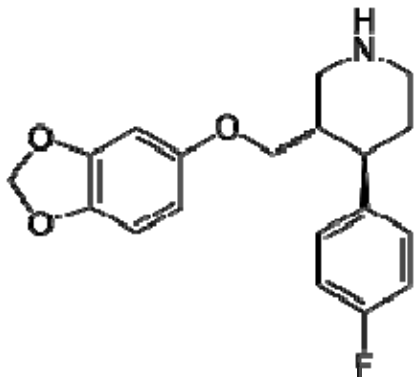
Colchicine



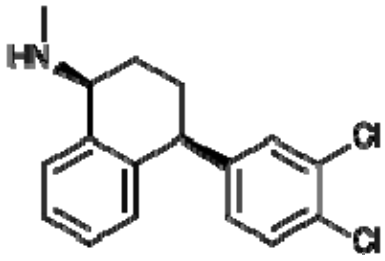
Fluoxetine(Prozac)



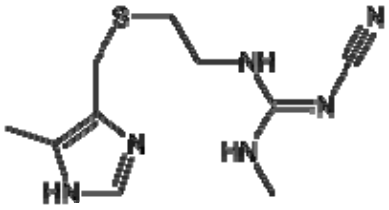
escitalopram(Lexapro)



Paroxetine(Paxil)

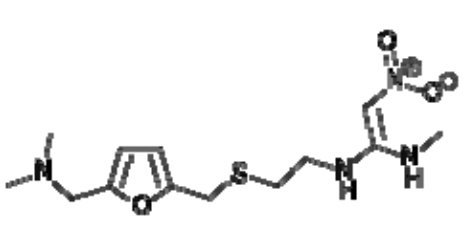


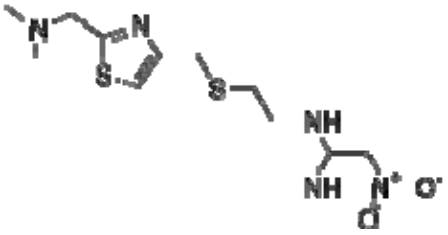
Sertraline(Zoloft)



Cimetidine(Tagamet)

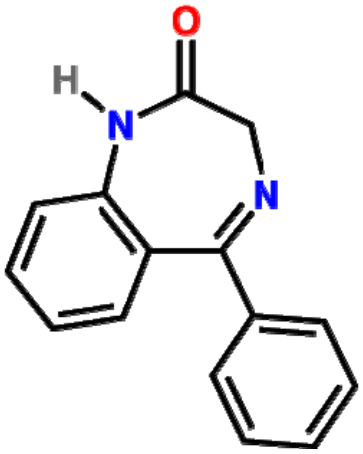
Grapefruit flavor



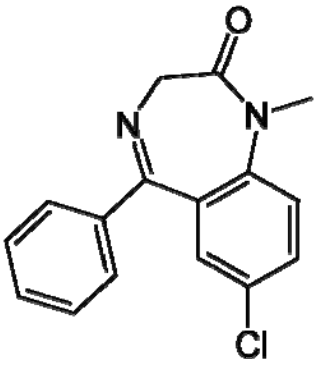


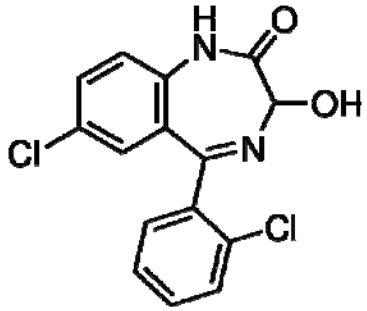
Ranitidine (Pepcid)

nizatidine(trade name Axid)



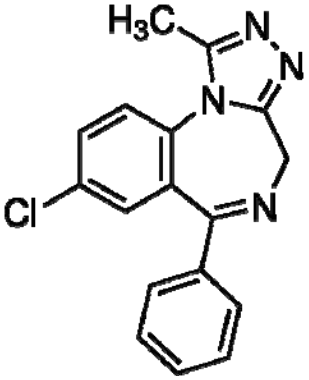
Benzodiazepine





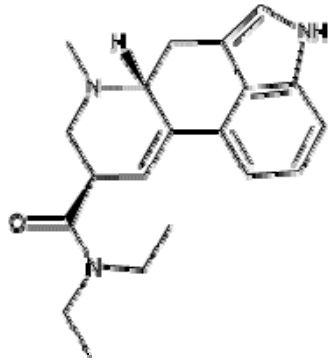
Diazepam(Valium)

lorazepam(Ativan)

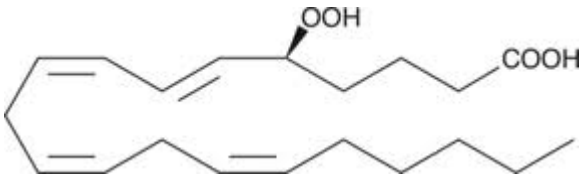


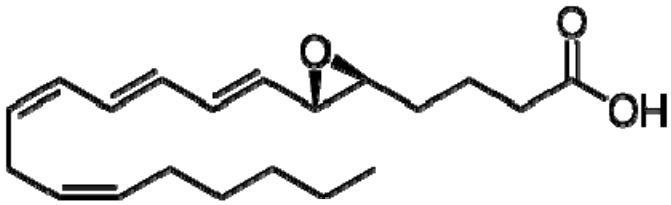
alprazolam(Xanax)

Can you see why the drugs Valium, Ativan and Xanax are all classified in the same family? (the benzodiazepine class of sedative drugs)?

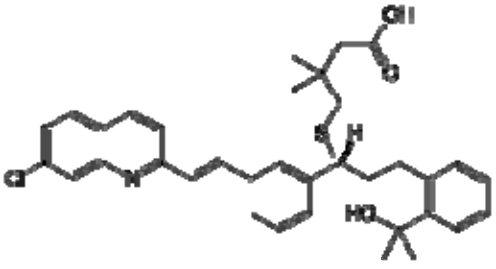


LSD
LSD is the abbreviation for lysergic acid diethylamide. Can you find the amide group in the structure above?

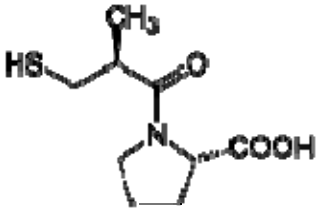




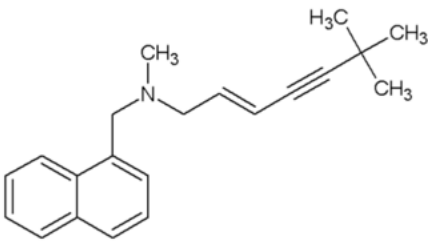
Leukotriene A4



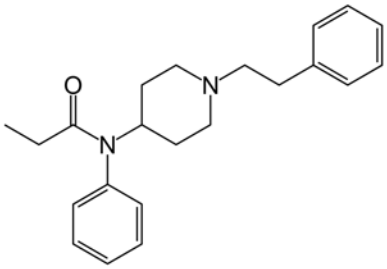
montelukast(Singulair)



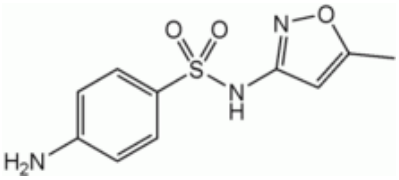
captopril(ACE inhibitor)



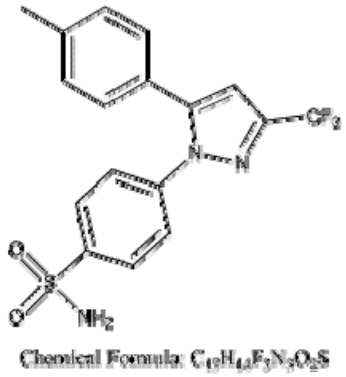
Terbinafine(Lamisil)



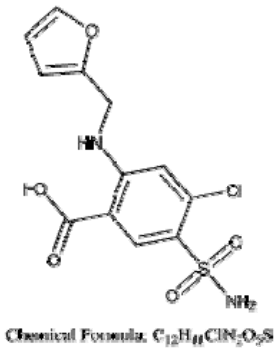
Fentanyl



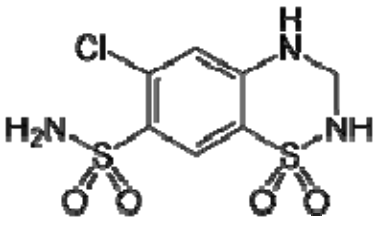
Sulfamethoxazole(SMX)



celecoxib(Celebrex)



furosemide(Lasix)



Hydrochlorothiazide(HCTZ)

Do an internet search and find out what 5 of the above drugs are commonly used for.

Identify the functional groups in prochlorperazine(structure below) and find out its main clinical uses.