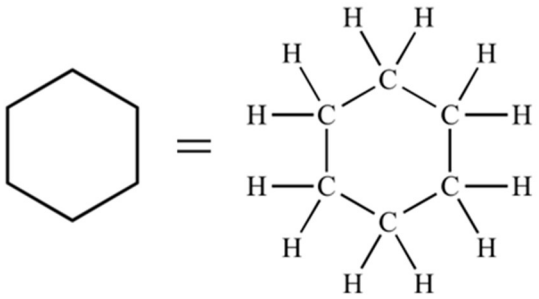
ORGANIC CHEM Classwork name:

You will do all of this, which will take 3 class periods plus some time at home. Watch for the patterns. When you need to draw molecules, have table R open, and make sure your functional groups get drawn perfectly. When circling functional groups, only circle what's in the 2nd column of table R. Count your bonds and your carbons every single time. This is BIG, but you are bigger (and smarter). Do not slack off, this will take effort.

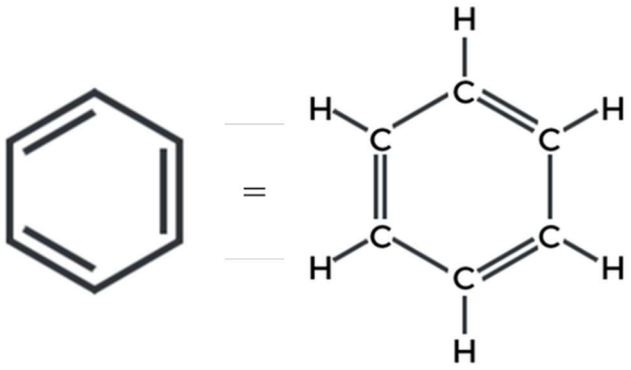
YOU MUST USE A PENCIL.

Large Organic Molecules

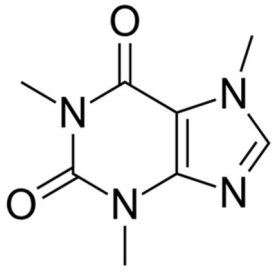
are big, and repetitive. Organic chemists have created short cuts to draw them. In medicines and common molecules like caffeine, what at first glance appears to be complex are easily decipherable. A hexagon means 6 carbons in a ring shape. Each corner is a carbon atom. Carbon atoms make 4 bonds; the hydrogen atoms are invisible. Count and add them with your mind. Double bonds and even triple bonds are obvious. Look at these examples and think!



This is cyclohexane
6 carbon atoms single bonded in a hexagon ring shape.
The hexagon is the "shortcut" diagram.
The cyclohexane formula is C_6H_{12}



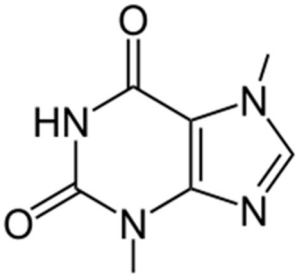
This is benzene
6 carbon atoms that have alternating single and double bonds.
The fancier hexagon is the 'shortcut' diagram.
The benzene formula is C_6H_6



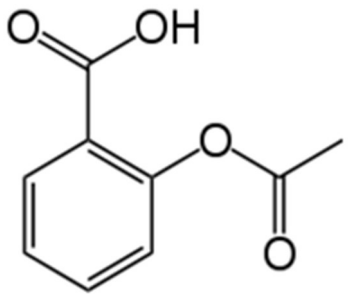
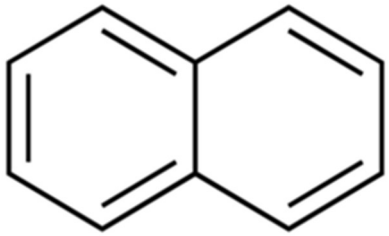
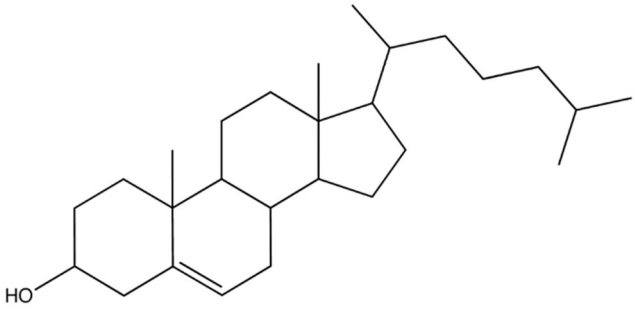
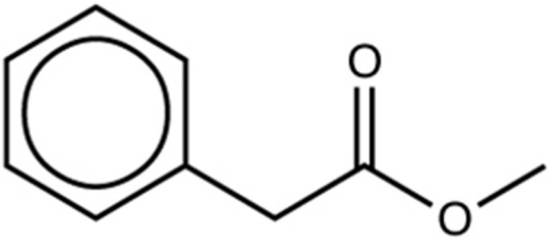
On the left is theophylline or
caffeine

On the right is theobromine or
chocolate

See any similarities?



Caffeine is $C_8H_{10}N_4O_2$	Chemical Formulas	Chocolate is $C_7H_8N_4O_2$

Aspirin (acetylsalicylic acid) for headaches.	
Naphthalene is the stuff in moth balls that smells so bad that your nose can detect it at levels of just 0.08 PPM!	
This large molecule that looks like chicken wire with a tiny —OH group bottom left is cholesterol, which clogs your arteries when you're old like your teacher.	
Here is methyl phenylacetate which is chem-talk for HONEY. The hexagon ring with the circle means that the single and double bonds alternate (resonate, like benzene).	

Aspirin is $C_9H_8O_4$

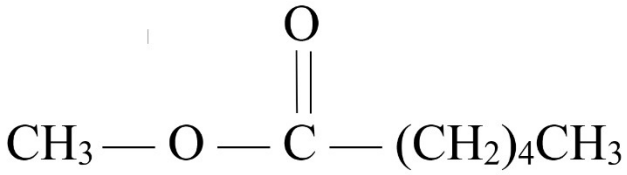
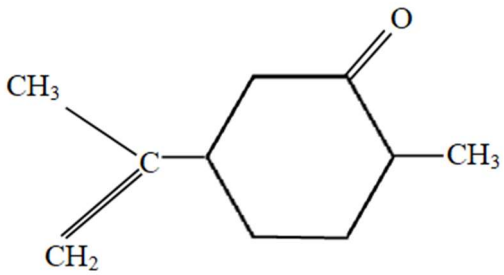
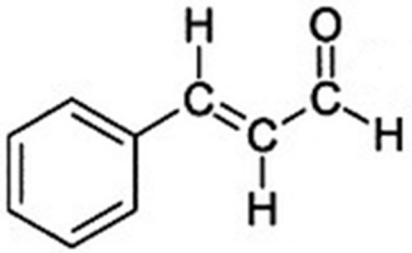
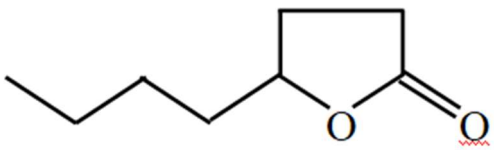
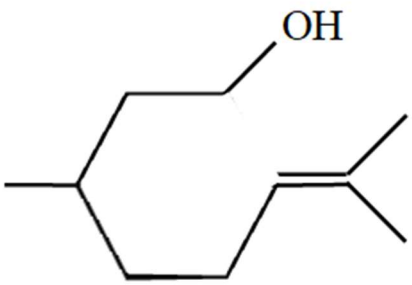
Naphthalene is $C_{10}H_8$

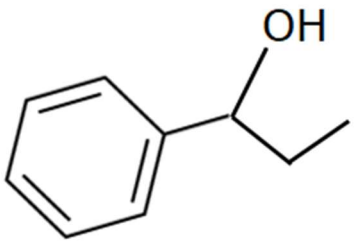
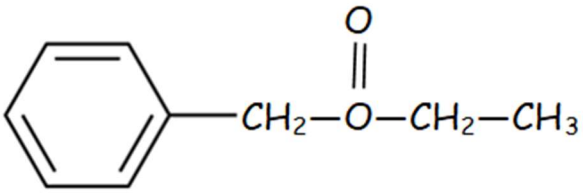
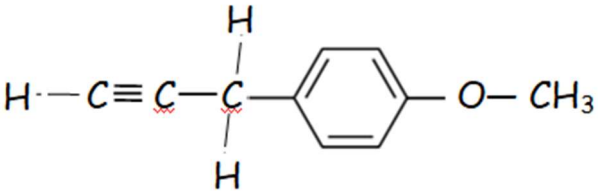
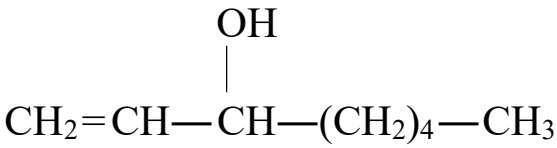
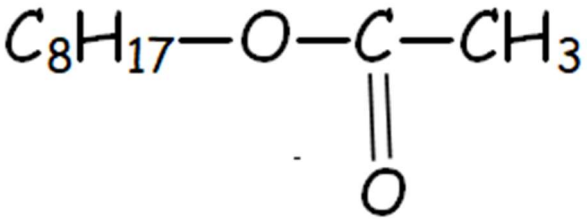
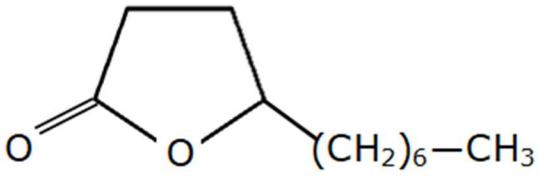
Cholesterol is $C_{27}H_{46}O$

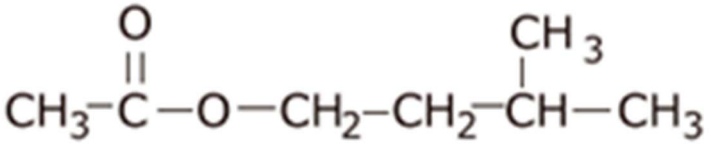
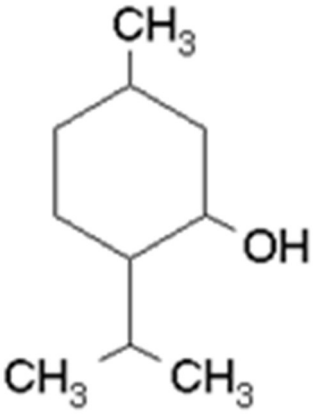
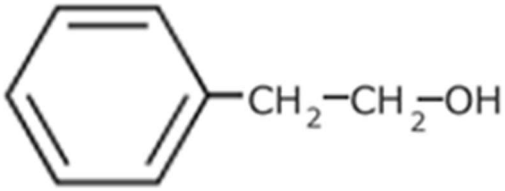
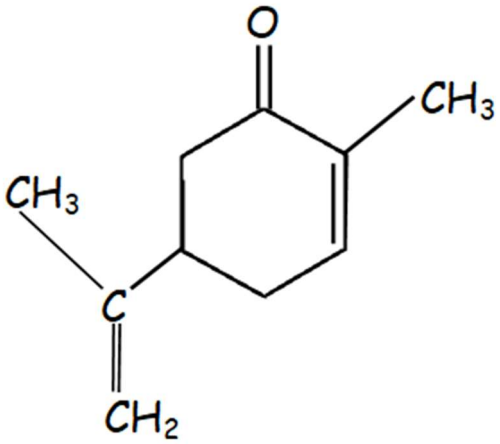
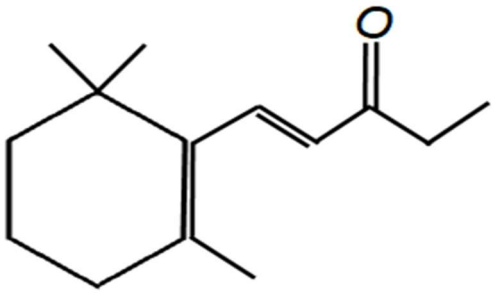
Honey is $C_9H_{10}O_2$

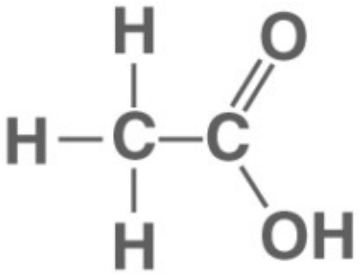
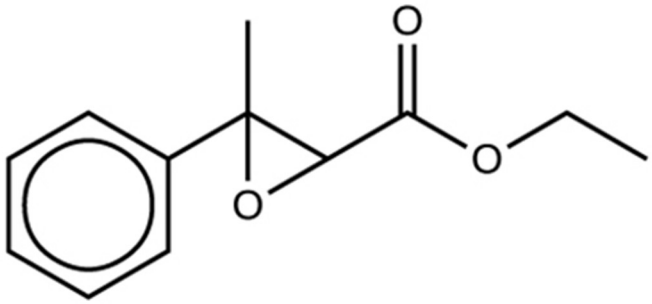
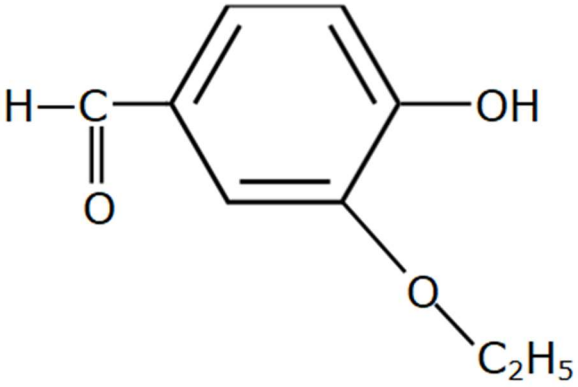
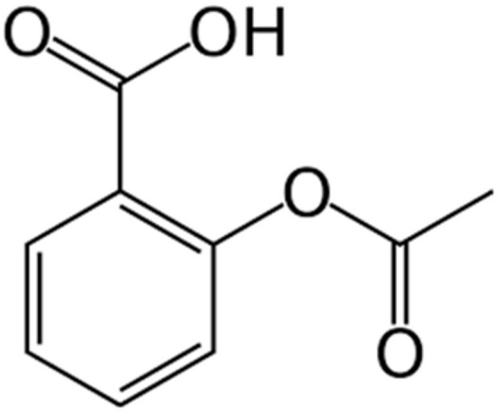
Draw these compounds, 8 per page. You do NOT have to draw all the hydrogen atoms, but you do have to draw all the "H" atoms that are in a functional group, AND in any small sized, single carbon molecule. That will show that you KNOW what you're doing. Use pencil only. Messy diagrams will be marked incorrect.

	Left side of page	Right side of page
page 1	propane 3-nonene ethanol di-propyl ether	pentane 2-butyne methanoic acid 1,1,2 trifluoro ethane
page 2	1-bromo-2-hexyne butane octane 2,3,6, tri-chlorodecane	4-nonyne propene butyl methanoate ethyl propyl ether
page 3	1-butanol methyl-propyl ether pentanal propanoic acid	tri-iodo methane 3-hexanone 2,4 dimethyl hexane ethanamide
page 4	ethanoic acid 1 bromo,4 chloro 2-pentene chloromethane butyl hexyl ether	ethyl butanoate heptanoic acid 3 pentanol 1-bromo, 3-chloro, 4-fluro, 6-iodo-nonane
page 5	ethanal 3-heptanone hexanamide methyl-ethyl ether	ethene propyl hexanoate 3,4 dibromo1-hexyne cyclo-pentane
page 6	4 ethyl,2-methyl octane ethyl ethanoate 2-octene 2-butyne	3-hexanamine pentanamide methyl pentanoate cyclo-butane

SCENT name all functional groups present	Circle all the Functional Groups	Answer these questions
banana		Name this molecule How many H atoms are in this molecule?
Caraway (rye bread)		How many H atoms are in this molecule? How many double bonds are in this molecule?
cinnamon		How many C atoms in this molecule?
coconut		How many C atoms are in this molecule?
Geraniums (flowers)		How many C atoms are in this molecule?

SCENT name all functional groups present	Circle all the Functional Groups	Answer these questions
Hyacinth (flowers)		How many carbon atoms are in this molecule?
jasmine		How many carbon atoms are in this molecule?
licorice		How many H atoms are in this molecule?
mushroom		Why is this molecule NOT a base?
orange		How many atoms are in this molecule?
peach		How many C atoms are in this molecule?

SCENT name all functional groups present	Circle all the Functional Groups	Answer these questions
pear		How many C atoms are in this molecule?
peppermint		How many H atoms are in this molecule?
roses (flowers)		How many atoms are in this molecule?
spearmint		How many double bonds are in this molecule?
violets (flowers)		How many C atoms are in this molecule?

SCENT name all functional groups present	Circle all the Functional Groups	Answer these questions
vinegar		What is the "inorganic" chem name for this molecule? What is the inorganic chem formula for this molecule?
strawberry		How many C atoms are in this molecule? How many H atoms are in this molecule?
vanilla		How many C atoms are in this molecule? How many functional groups are in this molecule?
wintergreen		What atom or atoms are sticking off of the "dash" on far the right side of this molecule?

Homologous Series Name	general formula n = number of carbon atoms	EXAMPLES	
		Example Molecule names	Structural Diagrams with all hydrogen atoms showing and condensed structural formulas
alkanes		propane	
alkenes		propene	
alkynes		propyne	

Draw the Structural Diagrams of 2methyl, 4ethyl, 3fluoroheptane

Draw the Structural Diagrams of 5ethyl 3,6,7 trimethyl 1-octene

Draw the Structural Diagrams of 1chloro 3,3 difluoro 4,5 dimethyl 1 hexyne

Draw the structural diagrams showing these reactions.
INCLUDE condensed structural formulas for the larger products.

Substitute in a fluorine atom with ethane, forming fluoroethane + HF

Substitute in a chlorine atom with propane, forming 1-chloropropane + HCl

Substitute in an iodine atom with propane, this time forming 2-iodopropane + HI

Substitute in a bromine atom with pentane, this time forming 2-bromopentane + HBr

Substitute in a fluorine atom with 2-bromopentane, this time forming 1-fluror,2-bromopentane + HF

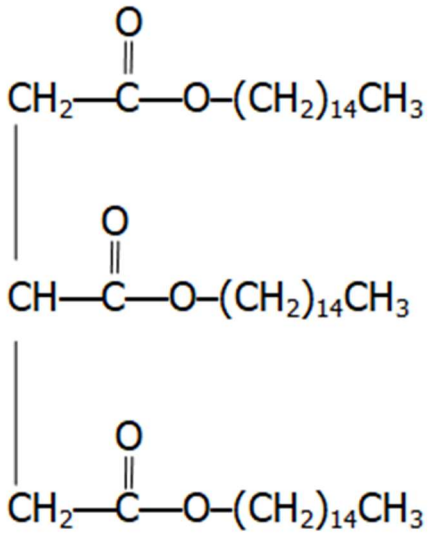
Show the addition reactions require you to start with an alkene or alkyne, an *unsaturated* hydrocarbon, and you will ADD both atoms of each F_2, Cl_2, Br_2, I_2, H_2 molecule. Draw structural formulas for the product.

Add a bromine molecule to 2-pentene

Add a chlorine molecule to 2-butyne

Add a hydrogen molecule to propene

Add a hydrogen molecule to 1-butyne



This molecule is too hard to name in high school chem. This is a reactant in what type of chemical reaction?

What is the important product of this reaction <u>commonly</u> known as?

Esterification

is the process of combining organic acids with alcohols by the removal of $HOH_{(L)}$ that forms an ester.

Draw and label the structural diagrams for propanoic acid and for ethanol, and the two products.
Circle the OH and the H that makes the water. NAME both products that form.

Combine methanol with hexanoic acid to produce the wonderful smell of bananas! Do the same as above, draw 2 structural diagrams for the acid and the alcohol, circle the –OH and the –H that forms into the water, then draw and properly name both products that form.