

Chemistry – Spring Semester
Unit 7 – Hydrocarbons, Organic Chemistry
 Chapters 21–22 of your book.

Early Booklet E.C.:	+ 2
Unit 7 Hwk. Pts.:	/ 20
Unit 7 Lab Pts.:	/ 18
Late, Incomplete, No Work, No Units <u>Fees?</u>	Y/N

Learning Targets for Unit 7

- 1.1 I can explain the terms ‘organic compound’ and ‘organic chemistry’.
- 1.2 I can identify hydrocarbons and models used to represent them.
- 1.3 I can distinguish between saturated and unsaturated hydrocarbons.
- 1.4 I can describe where hydrocarbons are obtained and how they are separated.
- 1.5 I can name alkanes by examining their structures.
- 1.6 I can draw the structure of an alkane when given its name.
- 1.7 I can describe the properties of alkanes.
- 1.8 I can compare the properties of alkenes and alkynes with those of alkanes.
- 1.9 I can describe the molecular structures of alkenes and alkynes.
- 1.10 I can name an alkene or alkyne by examining its structure.
- 1.11 I can draw the structure of an alkene or alkyne by analyzing its name.
- 1.12 I can name aromatic compounds.
- 1.13 I can define functional group and give examples.
- 1.14 I can identify the halogen, alcohol, and ether functional groups and draw their structures.
- 1.15 I can discuss the properties and uses of alcohols.

Unit Vocabulary for Unit 7

Organic compound	Hydrocarbon	Saturated hydrocarbon	Unsaturated hydrocarbon
Fractional distillation	Alkane	Parent chain	Substituent group
Cyclic hydrocarbon	Alkene	Alkyne	Functional group
Hydroxyl group	Alcohol	Ether	

Possible 7.1 Pts.: 7
Late, Incomplete, No work, No Units Fee: -1 -2 -3
Final Score: / 7

7.1 Problems – Hydrocarbons, Naming Alkanes
Section 21.1 – 21.2 of your textbook.

1. Rank the compounds listed in the following table in order in which they will be distilled out of a mixture. Rank them in order of first to distill to last to distill.

Compound	Boiling Point °C
hexane	68.7
methane	-161.7
octane	125.7
butane	-0.5
propane	-42.1

Draw the line structures of each of the following:

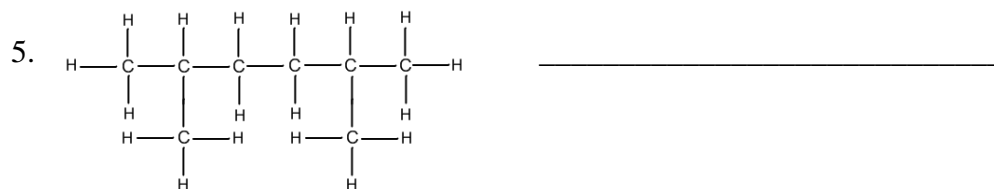
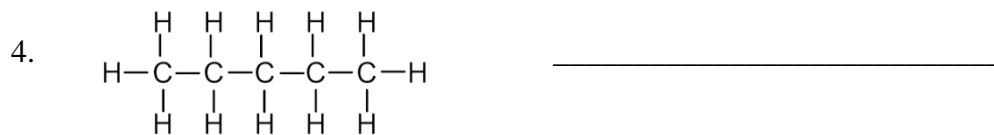
2. A. Ethane

B. Hexane

3. A. Propane

B. Heptane

Name the compound represented by each of the following structural formulas:

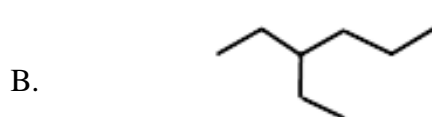
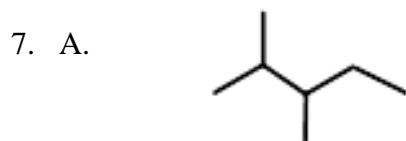


Draw line structures for the following compounds, and report their chemical formulas:

6. A. 4-isopropylheptane

B. 2-methylhexane

Name, and report the chemical formulas for the following two molecules.



7.2 Problems –Alkenes, Alkynes, Aromatics
Section 21.3 & 21.5 of your textbook.

Possible 7.2 Pts.: 7
Late, Incomplete, No work, No Units Fee: - 1 - 2 - 3
Final Score: / 7

1. Explain how alkanes, alkenes, and alkynes; differ from each other.

Name the compound represented by the line structures.



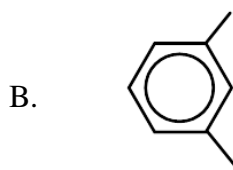
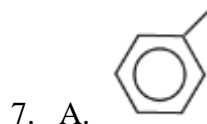
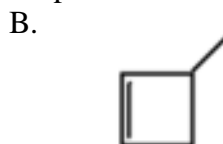
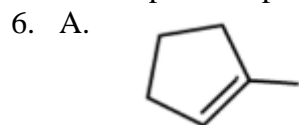
Draw line structures for the following:

4. A. 2, 4-dimethyl-1-octene

- B. 2,2-dimethyl-3-hexyne

5. What structural characteristic do all aromatic hydrocarbons share?

Name the compound represented by each of the structures, and provide their chemical formulas.



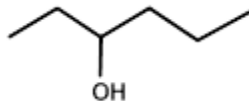
Possible 7.3 Pts.: 6
Late, Incomplete, No work, No Units Fee: - 1 - 2 - 3
Final Score: / 6

7.3 Problems – Functional Groups:
Halogens, Alcohols, Ethers
Section 22.1 – 22.3 of your textbook.

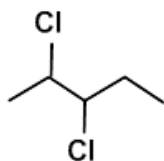
1. What is a functional group?
2. What reactant would you use to convert methane to bromomethane?

Circle and name each of the functional groups in the line structures below, then write the formulas.

3.



4.



Draw structural formulas for the following molecules.

5. A. 4-nonanol

B. butyl ethyl ether

6. A. 2-chloro-1-hexanol

B. 1-fluorocyclopentane

Chemistry		7.1 Lab: Take the Benzene Challenge!				
Name:						Correction Credit: Half
Points:	E.C.	Missed:	Late, No Units, No Work Fee:	First Score:	Corrections:	Final Score:
6	1		-1 -2			

Clear your desks completely!

Back in 1975, marketers for Pepsi launched a campaign called the “Pepsi Challenge”, in which a blindfolded taster tried samples of Coke and Pepsi. The taster then selected which one he or she preferred. There was a significant proportion of the population that preferred Pepsi, so based on this, the Pepsi Corporation claimed a victory over its arch nemesis.

Now, 41 years later, it’s time for you to take a similar challenge – the Benzene Challenge! You won’t get to drink this poisonous, carcinogenic, and flammable hydrocarbon, however.

Materials List:

- 6 – Carbon Atoms
- 6 – Hydrogen Atoms
- 9 – Short Single Bonds
- 6 – Long Multiple Bonds

Your Mission

You must build a benzene molecule, with the materials provided. No books, computers or anything else is permitted – just your great brains.

Remember, each carbon needs to have four bonds. Each hydrogen atom can have only one bond. One hint about this molecule, it is very symmetric.

Scoring:

- 6 points – Figure out the structure of benzene within 10 minutes, and draw it here.
- E. C. 1 Point – Be the first group to determine the structure!

Good Luck!

Chemistry		7.2 Lab: Steam Distillation			
Name:					Correction Credit: Half
Points:	Missed:	Late, No Units, No Work Fee:		First Score:	Corrections:
12		-1	-2	-3	-4
					Final Score:

Overview:

In the early days of organic chemistry research, scientists distilled many different compounds to see what was in them. They discovered that many natural materials produced oily compounds when distilled. These were dubbed “Essential Oils”, because they seemed to contain the essence of the materials.

In this lab, you and your group will extract essential oils from cloves using a technique called steam distillation. Steam distillation is a method to isolate essential oils by using the steam produced by boiling water as a carrier for the less volatile molecules to be distilled.

The primary essential oil in cloves is called eugenol, and has a benzene ring with various side chains. With any luck you will be able to see the clove oil at the end of the lab.

Materials:

10 Whole Cloves

Mortar and Pestle

Distillation Apparatus

- Ring Stand with Wire Mesh
- Evaporation Unit (500 mL Erlenmeyer Flask)
- Transporting Unit (Rubber Stopper With Tubing)
- Condensing Unit (glass bottle with hole drilled in it)
- Collector – (Large Test Tube)

Procedure:

1. Set up the distillation apparatus as demonstrated at Lab Station 1 – Be sure collection tube is well positioned
2. Pour 100 mL tap water into the Erlenmeyer flask.
3. Count out 10 cloves and grind them in the mortar and pestle.
4. Pour the ground cloves into the flask, then put the rubber stopper and tubing on.
5. Bring the water to a gentle boil, making sure that it doesn't boil too rapidly (that causes chunks of cloves to be pushed into the tubing). Adjust flame height accordingly.
6. Boil for about 5-10 minutes, or until the test tube has 2 cm water and oil.
7. After the boiling is done, shut off your gas.
8. Look at the top of the collection tube – hopefully there is a thin layer of oily residue there – that's the clove oil!

Cleanup:

After 10 minutes of cooling, pour the clove/water mixture from your Erlenmeyer flask down the drain and rinse the flask: careful – HOT!!! Pour your water and clove oil down the drain and rinse. Leave the distillation apparatus for the next class.

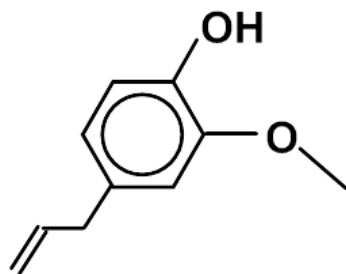
Questions: 3 Points per Molecule.

The following molecules are different essential oils of different plants.

1. Circle and label all the functional groups.
2. Label the benzene rings, and put a box around each non-benzene double bond.
3. Write the chemical formula for each molecule (Example: $C_xH_yO_z$)

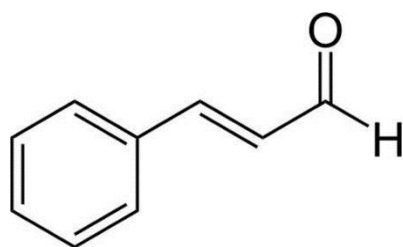
Eugenol – Clove Oil

Formula = _____



Cinnamaldehyde – Cinnamon Oil

Formula = _____



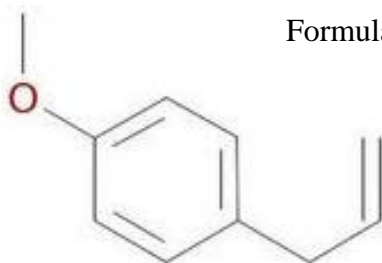
Anise Oil (licorice flavor)

Formula = _____



Cardamom Oil

Formula = _____



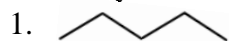
Name:

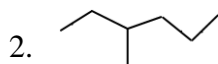
Period:

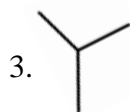
This is practice to prepare you in the short term for a quiz, and for the long term by reinforcing an essential skill needed to identify alkanes.

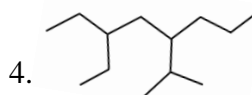
We will correct this two-page worksheet tomorrow in class, but finish it before you leave today. There will be a short naming alkanes quiz.

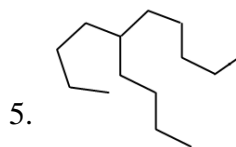
Use your IUPAC rules to name the following alkanes:











Use your IUPAC rules to draw the following alkanes:

6. Hexane

7. 3-ethylheptane

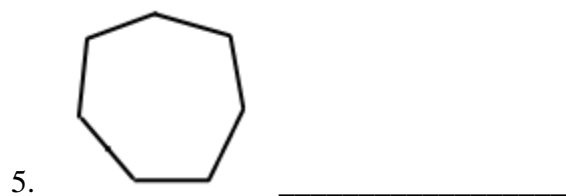
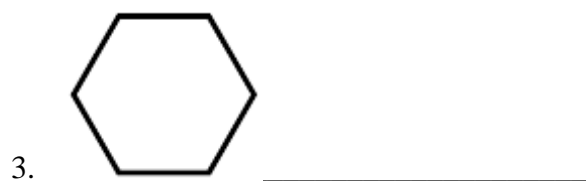
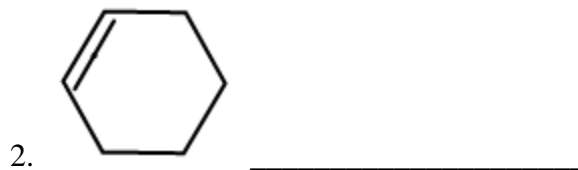
8. 3-isopropyl-2-methyloctane

9. 3,6-diethyldecane

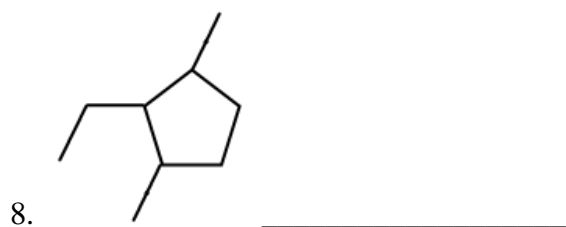
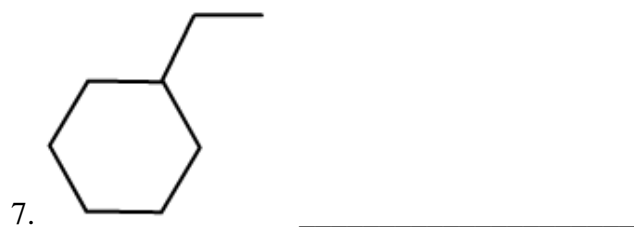
10. 6-ethyl-2,3,5-trimethylnonane

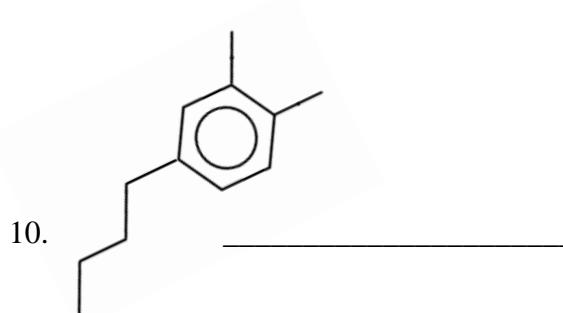
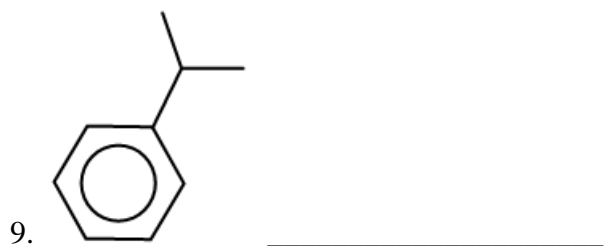
This is practice to prepare you in the short term for a quiz, and for the long term by reinforcing an essential skill needed to identify cyclic hydrocarbons.

Name the cyclic compounds:



Name the branched cyclic/aromatic compounds:





11. (1 Point) What structural characteristic do all aromatic hydrocarbons share?

Draw the structural formula of:

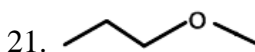
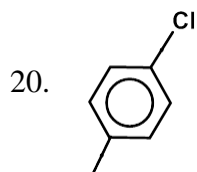
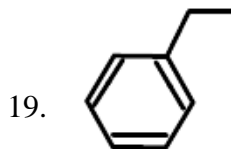
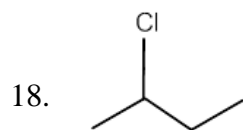
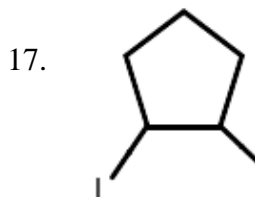
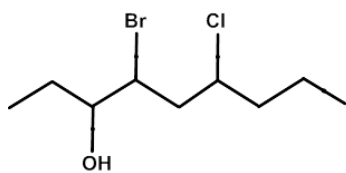
12. 1,3-dimethylbenzene.

13. 1,4-diethyl-2-methylbenzene.

14. 1-butyl-2,4-dimethylcyclooctane

15. 2 - octanol

Name and write the formulas of the following molecules;
16.




Points Possible:	10
Late/Inc. Fee: -1 -2 -3	
Final Score:	/ 10

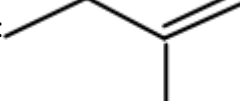
Unit 7 Review – Hydrocarbons & Organic Chemistry

This serves as test preparation for the Unit 5 Test. Points earned are based on completion, and we will go over any questions you have during the review.

1. Which elements are the halogens?
2. What is a functional group? Name three.
3. What is a saturated hydrocarbon?

4. Is this a saturated hydrocarbon? 

5. Draw an example of a saturated hydrocarbon.

6. Name, and write the formula of: 

7. Draw: 1,2-dibromobenzene

8. Draw: 3,4-diethyl-5-methyloctane.

9. All Play: draw and build an unsaturated hydrocarbon.

10. Which element was used in saturated oil research?

11. What functional group is shown? $\text{CH}_3\text{CH}_2\text{CH}(\text{OH})\text{CH}_3$

12. Is $\text{Ca}(\text{HCO}_3)_2$ a hydrocarbon?

13. Draw: isopropyl butyl ether

14. All Play! Build 3 – hexanol

15. How many hydrogen atoms in 2-propanol?

16. What is a parent chain?

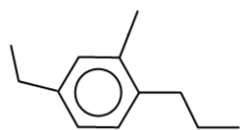
17. What type of bonds does 'alkyne' signify?

18. What type of bonds does 'alkane' signify?

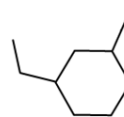
19. What is a "pi bond"?

20. What type of bonds does 'alkene' signify?

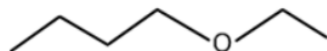
21. A. Name:



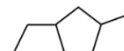
B. Name:



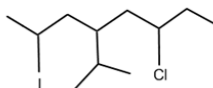
22. A. Name:



B. Name:



23. All Play! Name:



24. Which fat has a longer shelf life, saturated or unsaturated?

25. Describe Frederick Kekule's dream.

26. What is a 'parent ring'?

27. What is Ouroboros?

28. Draw 2 - hexanol

29. Draw: 1,2,3,4,5-pentafluorononane

30. All Play! Build: ethyl methyl ether.