

# *CH 222 Winter 2025:*

# **Problem Set #3**

## *Instructions*

*Step One (all sections):*

- **Learn the material** for Problem Set #3 by **reading Chapter 20** of the textbook and/or by watching the videos found on our website (<https://mhchem.org/222>)
- **Try the problems** for Problem Set #3 found on the next pages on your own first. **Write out the answers (and show your work) by hand (on a tablet or paper)**; do not type your answers (and work) to avoid a point penalty. If you write the answers on the problem set itself, you will receive fewer points. Include your name on your problem set!

*Step Two:*

Section 01 and H1: We will go over Problem Set #3 during recitation. ***Self correct all problems*** of your problem set before turning it in at the end of recitation.

- *Section 01:* due **Monday, January 27 at 1:10 PM**
- *Section H1:* due **Wednesday, January 29 at 1:10 PM**

Section W1: **Watch the recitation video** for Problem Set #3 here:  
<http://mhchem.org/y/v.htm>

- **Self correct all of the problems** while viewing the video. Mark correct problems with a star (or other similar mark), and correct all incorrect problems (show the correct answer and the steps required to achieve it.)
- **Submit Problem Set #3 via email (mike.russell@mhcc.edu) as a single PDF file** (use CamScanner (<https://camscanner.com>), CombinePDF (<https://combinepdf.com>), etc.) by **11:59 PM Wednesday, January 29.**

*If you have any questions regarding this assignment, please email (mike.russell@mhcc.edu) the instructor! Good luck on this assignment!*

## CH 222 Problem Set #3

\* Complete problem set on separate pieces of paper showing all work, circling final answers, etc.

\* Self correct your work before turning it in to the instructor.

Covering: Chapter Twenty and Chapter Guide Three

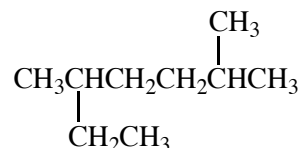
Important Tables and/or Constants: "Organic Chemistry Nomenclature Guide" (Handout, <http://mhchem.org/OCG>), "Organic Chemistry Lab"

1. What is the molecular formula for an alkane with 6 carbon atoms?

Draw and name the five isomers.

2. Give the systematic name for the alkane shown to the right:

3. Draw the structure for cycloheptane. Is the seven-member ring planar? Is this an isomer of n-heptane? Explain.



4. What structural requirement is necessary for an **alkene** to have *cis* and *trans* isomers? Can *cis* and *trans* isomers exist for an alkyne or an alkane? Draw and name the five alkenes with the formula C<sub>7</sub>H<sub>14</sub> and a seven carbon ("straight") chain.

Structure for Problem #2

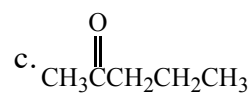
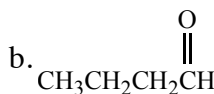
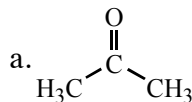
5. Draw structural formulas for the following compounds:

- butan-1-ol and butan-2-ol
- 1,1-dibromoethane
- 3,3-dimethylbutan-2-ol
- 3-methyl-1-butyne

6. Draw the structures of the following compounds:

- diethyl ether
- 2-methoxypropane

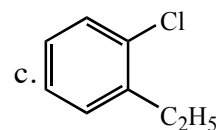
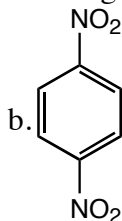
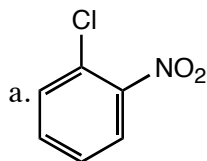
7. Name the following compounds:



8. Regarding structural isomers:

- Draw all the possible isomers for C<sub>3</sub>H<sub>8</sub>O. Give the systematic name for each compound.
- Draw the structural formula for an aldehyde and a ketone with the molecular formula C<sub>4</sub>H<sub>8</sub>O. Name each compound.

9. Give the systematic name for each of the following compounds:



10. Draw structural formulas for the following carboxylic acids:

- 2-methylhexanoic acid
- 3-methylpentanoic acid
- acetic acid

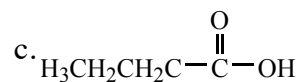
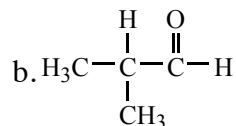
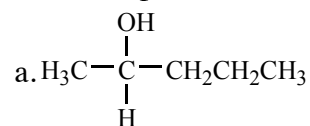
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11. Name the following amines:

- $\text{CH}_3\text{CH}_2\text{CH}_2\text{NH}_2$
- $(\text{CH}_3)_3\text{N}$
- $(\text{CH}_3)(\text{C}_2\text{H}_5)\text{NH}$
- $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{NH}_2$

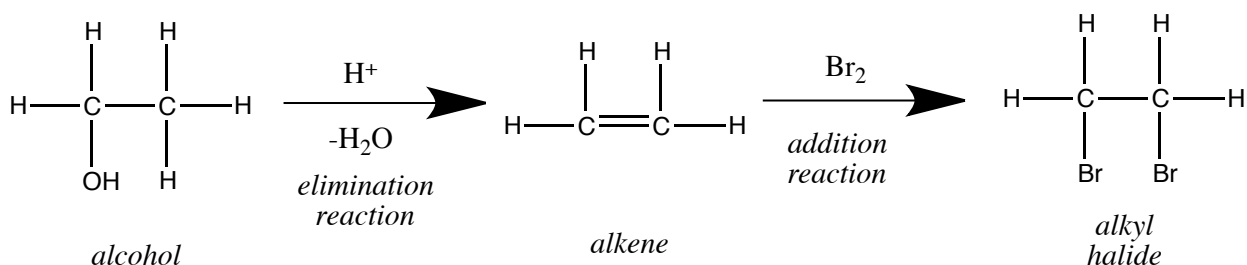
12. Name each compound:



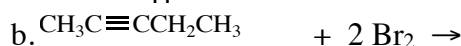
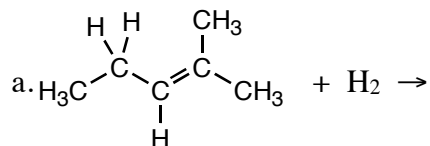
13. Give the official IUPAC organic chemistry name for the following chemical compounds:

- acetone
- toluene
- acetylene
- formaldehyde
- acetaldehyde
- ethylene

The following diagram might prove useful for the following three questions:



14. Draw the structure and give the systematic name for the products of the following addition reactions:



15. The compound 2,3-dibromo-2-methylhexane is formed by addition of  $\text{Br}_2$  to an alkene. Identify the alkene and write an equation for this reaction.

16. Addition of acid ( $\text{H}^+$ ) to propan-2-ol creates an alkene through an elimination reaction. Draw and name the alkene. If the alcohol was propan-1-ol, would the synthesized alkene be different? Explain.

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