

Supplemental Exam – CHM1321-B

Professor Sandro Gambarotta

Date: 6-July-2017 Length: 3 hrs Last Name: _____

First Name: _____

Student # _____ Seat #

- **Instructions:**
- **Calculator permitted (Faculty approved or any other non-programmable kind)**
- **Molecular Model Kit strongly encouraged**
- **Closed book exam**

Cellular phones, unauthorized electronic devices or course notes (unless an open-book exam) are not allowed during this exam. Phones and devices must be turned off and put away in your bag. Do not keep them in your possession, such as in your pockets. If caught with such a device or document, the following may occur: you will be asked to leave immediately the exam, academic fraud allegations will be filed which may result in you obtaining a 0 (zero) for the exam.

Read carefully:

By signing below, you acknowledge that you have read and ensured that you are complying with the above statement.

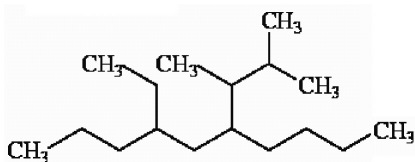
Signature: _____

Please put your INITIALS IN THE BOX when you have verified that there are 16 pages in this exam.

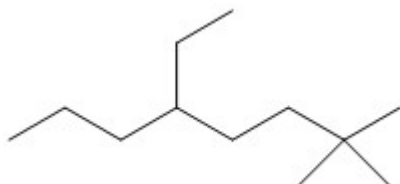
Question 1 (1 point)

Draw an acceptable structure for 4-ethyl-6-(1,2-dimethylpropyl)decane.

Answer:

**Question 2 (1 point)**

Name the alkane shown.

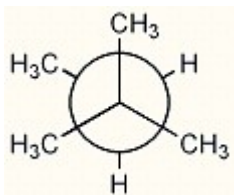


Answer: 5-ethyl-2,2-dimethyloctane

Question 3 (1 point)

Draw the Newman projection of the lowest energy conformation that results from rotation about the C2-C3 bond of 2,2-dimethylbutane.

Answer:



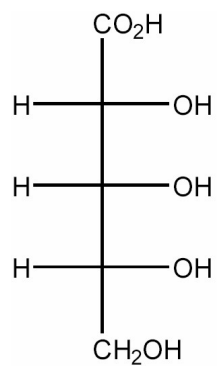
Question 4 (2 point)

Draw the most stable conformation of cis-1-t-butyl-4-methylcyclohexane.

Answer:

**Question 5 (1 point)**

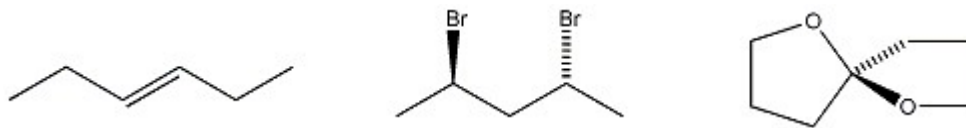
How many enantiomers are there of the molecule shown below?



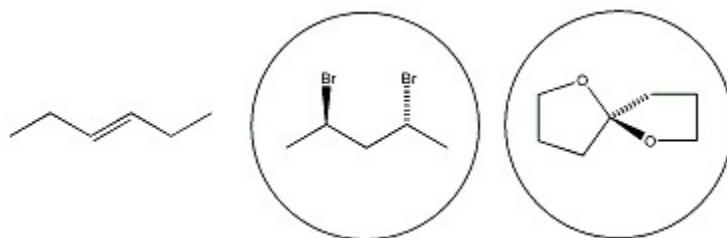
Answer: 1

Question 6 (1 point)

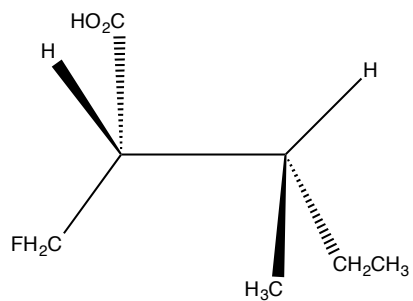
Circle each chiral molecule among those shown below.



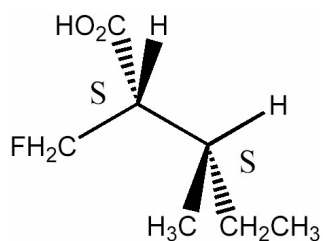
Answer:

**Question 7 (2 point)**

Label each asymmetric carbon in the molecule below as having the *R* or *S* configuration.



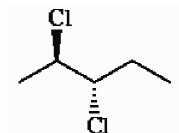
Answer:



Question 8 (3 points)

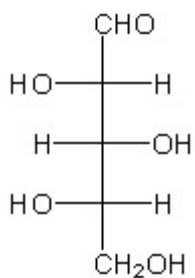
Draw the structure of (2*R*,3*S*)-2,3-dichloropentane. Take particular care to indicate three-dimensional stereochemical detail properly.

Answer:



Question 9 (2 points)

Is the compound a meso form? Explain briefly your choice

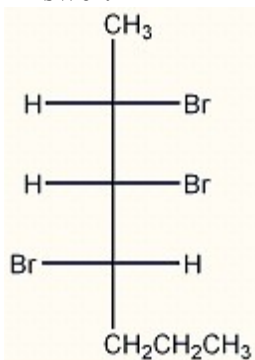


Answer: The functional group at the top (aldehyde) is different from the bottom (alcohol) and thus there is no internal reflective plane in the molecule

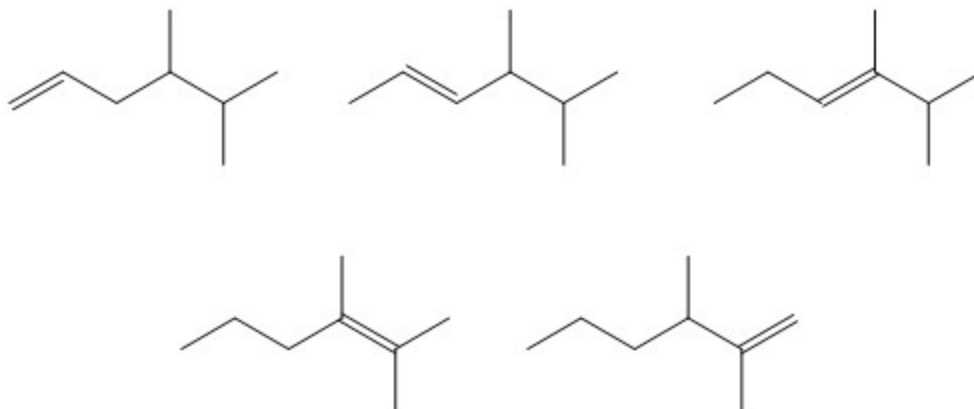
Question 10 (4 points)

Provide a Fischer projection of (2S,3S,4S)-2,3,4-trichloroheptane.

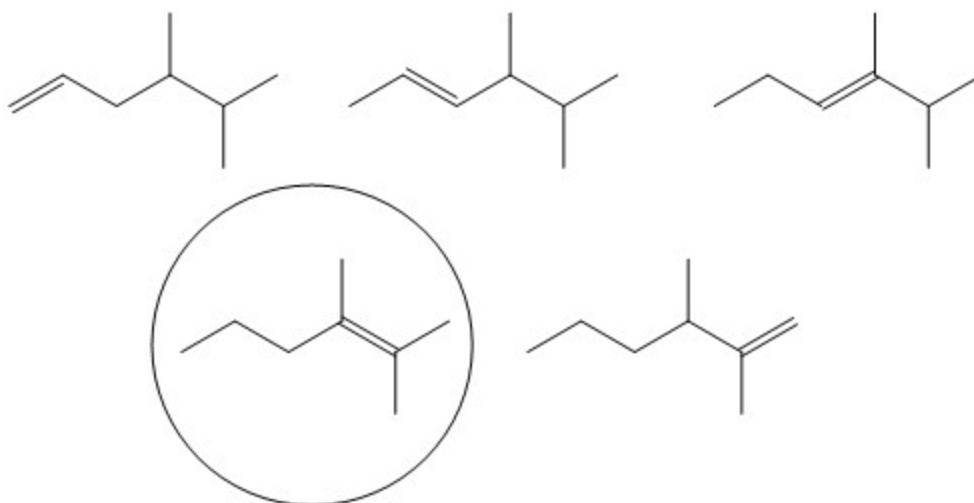
Answer:

**Question 11 (2 points)**

Circle the most stable alkene in the set of isomers below.



Answer:



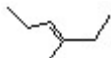
Question 12 (1 point)

Which of the following compounds is an E isomer?

A)



B)



C)



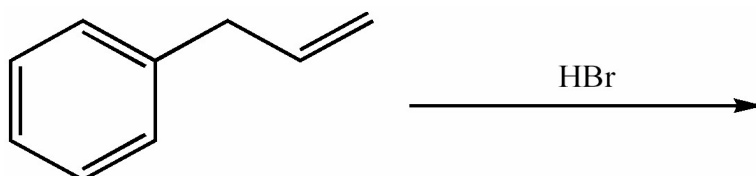
D)



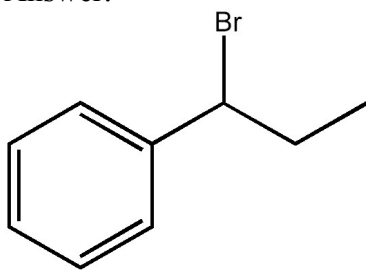
Answer: B

Question 13 (2 points)

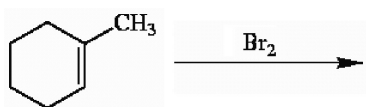
Provide the structure of the major organic product of the reaction below.



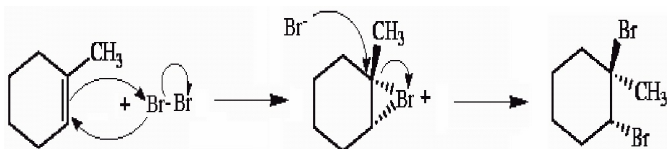
Answer:

**Question 14 (3 points)**

Complete the following reaction and provide a detailed, step-by-step mechanism for the process.



Answer:



Question 15 (3 points)

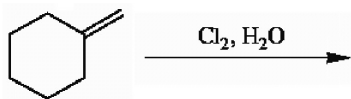
Draw the mechanism for alkene hydroboration.

Answ:

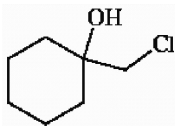
see course slide show

Question 16 (2 points)

Draw the major organic product generated in the reaction below. Pay particular attention to regio- and stereochemical detail.

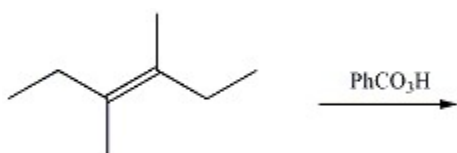


Answer:

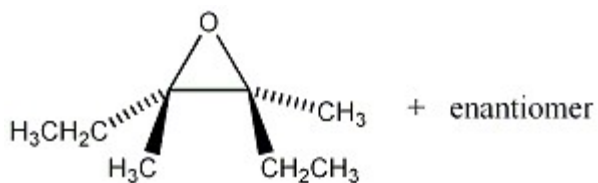


Question 17 (2 points)

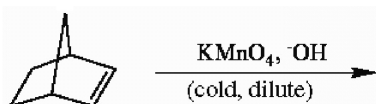
Provide the major organic product of the reaction below.



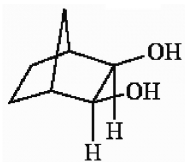
Answer:

**Question 18 (2 points)**

Draw the major organic product generated in the reaction below. Pay particular attention to regio- and stereochemical detail.



Answer:

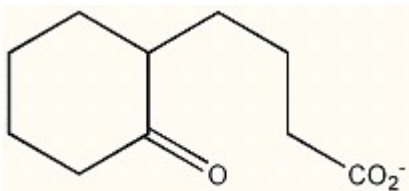


Question 19 (3 points)

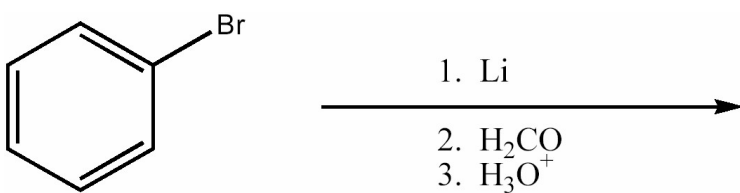
Draw the major organic product generated in the reaction below. Pay particular attention to regio- and stereochemical detail.



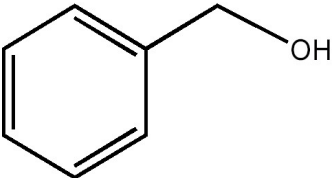
Answer:

**Question 20 (3 points)**

Provide the major organic product of the following reaction.

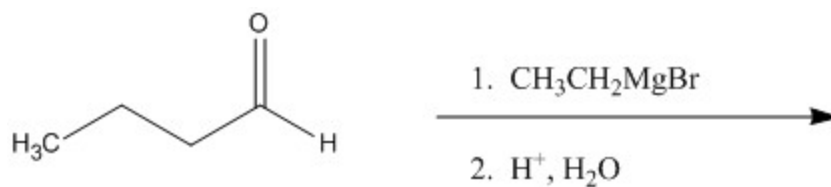


Answer:

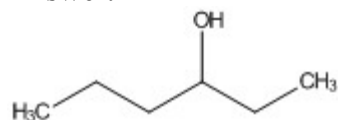


Question 21 (2 points)

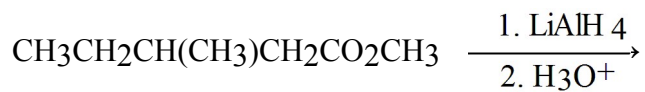
Provide the major organic product(s) of the reaction below.



Answer:

**Question 22 (3 points)**

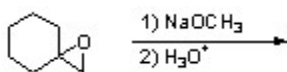
Provide the structure of the major organic product in the reaction below.



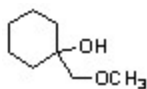
Answer: CH3CH2CH(CH3)CH2CH2OH

Question 23 (3 points)

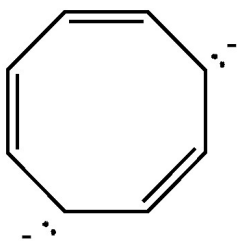
Draw the correct structure of the expected product of the following reaction.



Answer:

**Question 24 (1 point)**

Classify the compound below as aromatic, antiaromatic, or nonaromatic. Assume planarity of the π network.

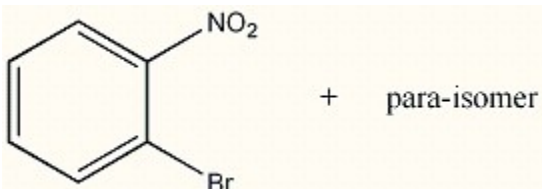


Answer: aromatic

Question 25 (2 points)

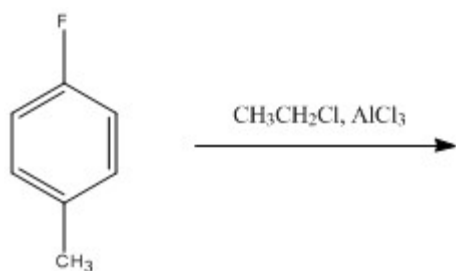
Provide the major organic product(s) when benzene is treated with the following sequence of reagents: 1. Br₂, FeBr₃ 2. HNO₃, H₂SO₄.

Answer:

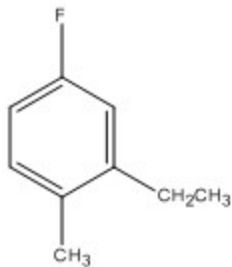


Question 26 (2 points)

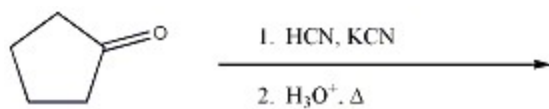
Provide the major organic product of the following reaction.



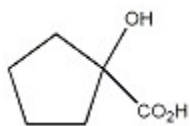
Answer:

**Question 27 (4 points)**

Provide the major organic product of the reaction shown below.

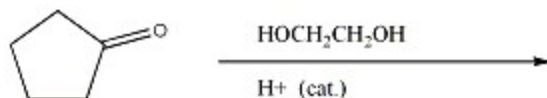


Answer:

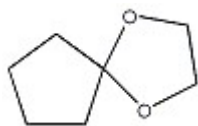


Question 28 (2 points)

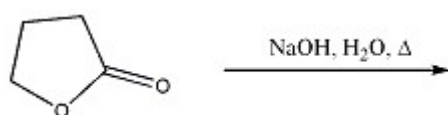
Provide the major organic product of the reaction shown below.



Answer:

**Question 29 (3 points)**

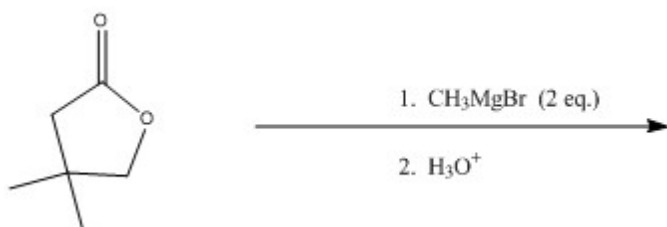
Provide the major organic product in the reaction shown below.



Answer: $\text{HOCH}_2\text{CH}_2\text{CH}_2\text{CO}_2^- \text{Na}^+$

Question 30 (3 points)

Predict the major product of the following reaction.

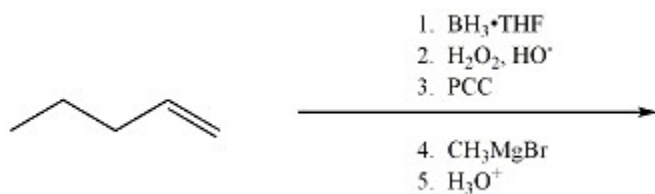


Answer:



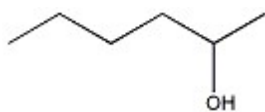
BONUS Questions (4 marks each)!!!

1) Provide the major organic product of the reaction shown below.



PCC = strong oxidant

Answer:



2) Give a detailed, stepwise mechanism for the esterification of acetic acid with methanol.

Answer:

